The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

University of Cape Town

# FIRM-SPECIFIC ATTRIBUTES AND THE CROSS-SECTION OF EQUITY RETURNS ON THE TOKYO STOCK EXCHANGE

JULIETTE F. VELAERS

University of Cape Town

Prepared under the supervision of Professor Paul van Rensburg and presented to the School of Management Studies in fulfilment of the requirements for the degree of

MASTER OF COMMERCE
(Special Field: Finance)

University of Cape Town ©
November 2006

UT 380 VELA
800502

## Abstract

This thesis follows the methodologies of Fama and Macbeth (1973) and van Rensburg and Robertson (2003) and empirically investigates the cross-sectional relationship between firm-specific attributes and stock returns on the Tokyo Stock Exchange (TSE). A dataset of 226 firm-specific attributes are constructed and tested. The data are adjusted for thin-trading and outliers and are free from look-ahead bias. Two separate time periods are investigated in order to reduce the likelihood of data snooping. The in-sample regressions are run over the 1 January 1993 to 31 December 2000 time period and out-sample regressions cover 1 January 2001 to 31 December 2004. Furthermore, out of sample stock returns are risk adjusted to determine if the attributes have the ability to explain variation in returns beyond that of a single-index model and a principal-components-derived multi-factor model. For each dataset, the list of statistically significant attributes is simplified using correlation analyses and an agglomerative hierarchical clustering algorithm. The simplification procedure results in a final list of firm-specific attributes that are significantly related to the cross-section of equity returns and are not highly correlated with one another.

The in-sample regressions result in 29 final significant attributes. These variables are separated into ten style groups: (1) change in size; (2) change in liquidity; (3) performance; (4) change in performance; (5) growth; (6) change in growth; (7) change in momentum/ crossover; (8) change in value; (9) value and (10) short-term momentum. The un-adjusted out of sample regressions result in 19 final significant attributes which are divided into seven style groups, namely: (1) size; (2) value; (3) performance; (4) change in growth; (5) change in value; (6) change in liquidity and (7) change in performance. The majority of the significant characteristics from the out of sample tests persist after risk adjustment. The results of the in- and out-sample tests using un-adjusted returns are considerably different and therefore not robust across different time periods. Only eight characteristics are significant in both the in- and out-sample periods, namely: the six-month change in asset turnover (AssTurn_6m); the six-month change in the interest cover before tax ratio (ICBT_6m); the three-month and six-month change in market value traded to market value ratios (MVT_MV_3m and MVT_MV_6m); the three-month and six-month change in absolute trading volume (VO_3m and VO_6m); and the three-month and six-month change in the trading volume ratio (TV_6m and TV_3m). All eight characteristics exhibit a positive relationship with stock returns in both time periods

The behaviour of the payoffs to the final significant variables is assessed and the predictability of payoffs is examined. Four timing models are constructed and tested, namely: six-month, 12-month and 18-month trailing moving average models and a 12-lag autoregressive model (AR12). The 18-month trailing moving average model is shown to be the most successful in both the in-sample and out-sample datasets. All four models have the ability to predict the direction of monthly payoffs correctly greater than 50% of the time with the 12-month trailing moving average model being the most useful for both the in-sample and out of sample characteristics.

The existence of anomalies on the TSE is in direct conflict with the predictions of the CAPM in an efficient market. However, according to the joint hypothesis problem, it is not possible to determine if the anomalies arise as a result of a misspecified model or an inefficient market. Therefore, it appears that either the TSE is an inefficient market, the CAPM is misspecified or both.

University of Cape Town

## Declaration

I, Juliette Velaers, hereby declare that the work on which this thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other University. I empower the University to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever.

Signed by candidate

November 2006

## Acknowledgements

The author would like to acknowledge the supervision and guidance of Professor Paul van Rensburg of the University of Cape Town.

University of Cape Town

# Table of Contents

**Abstract** ..... ii

**Declaration** ..... iii

**Acknowledgements** ..... iv

**Table of Contents** ..... v

**List of Tables** ..... viii

**List of Figures** ..... x

**1. Introduction** ..... 1

*1.1. Introduction* ..... 1

*1.2. Contribution* ..... 2

*1.3. Thesis organisation* ..... 3

**2. Theoretical Overview** ..... 1

*2.1. Introduction* ..... 1

*2.2. Information efficiency* ..... 1

2.2.1. Random walk model ..... 2

2.2.2. Efficient market hypothesis ..... 3

*2.3. Asset Pricing Theory* ..... 5

2.3.1. Mean variance analysis and portfolio selection ..... 5

2.3.2. The capital asset pricing model (CAPM) ..... 6

2.3.3. Arbitrage pricing theory ..... 10

*2.4. Summary and conclusion* ..... 12

**3. Literature Review** ..... 1

*3.1. Introduction* ..... 1

*3.2. Market efficiency* ..... 1

*3.3. The Capital Asset Pricing Model: An empirical evaluation* ..... 3

*3.4. Style anomalies* ..... 4

*3.5. Explanations for deviations from the CAPM* ..... 8

3.5.1. Risk-based alternatives ..... 8

3.5.2. Non risk-based alternatives ..... 9

*3.6. Japanese specific research* ..... 14

3.6.1. Market efficiency and tests of the CAPM and APT model ..... 14

3.6.2. Style anomalies on the TSE ..... 15

*3.7. Summary and conclusion* ..... 22

**4. Data and Descriptive Statistics** ..... 1

*4.1. Introduction* ..... 1

*4.2. Data* ..... 1

4.2.1. Statistical biases ..... 2

4.2.2. Stock return data ..... 5

4.2.3. Firm-specific attribute data ..... 7

University of Cape Town

*4.3. Descriptive statistics* ..... *14*

*4.4. Summary and conclusion* ..... *19*

**5. Exploratory Analysis and Market Risk Decomposition** ..... **1**

*5.1. Introduction* ..... *1*

*5.2. Data and methodology* ..... *2*
5.2.1. Exploratory analysis ..... 2
5.2.2. Cluster analysis ..... 3
5.2.3. Principal components analysis ..... 4
5.2.4. Model construction ..... 6
5.2.5. Testing the single-index and multi-index models ..... 8

*5.3. Empirical results* ..... *9*
5.3.1. Cluster analysis ..... 9
5.3.2. Principal components analysis ..... 11
5.3.3. Model tests results ..... 14

*5.4. Summary and conclusion* ..... *15*

**6. Firm-Specific Attributes and the Cross-Section of Equity Returns** ..... **1**

*6.1. Introduction* ..... *1*

*6.2. Data and methodology* ..... *2*
6.2.1. Un-adjusted returns ..... 2
6.2.2. Risk-adjusted returns: The single-index model ..... 4
6.2.3. Risk-adjusted returns: The multi-index model ..... 5
6.2.4. Simplification of significant characteristics ..... 6

*6.3. Empirical results: In-sample* ..... *7*
6.3.1. Cross-sectional regression results ..... 7
6.3.2. Simplification of significant characteristics ..... 7
6.3.3. Cumulative monthly payoffs to attributes ..... 14

*6.4. Empirical results: Out-sample* ..... *24*
6.4.1. Un-adjusted and risk adjusted results ..... 24
6.4.2. Simplification of significant characteristics ..... 28
6.4.3. Cumulative monthly payoffs ..... 35
6.4.4. Comparison of in- and out-sample results ..... 41

*6.5. Summary and conclusion* ..... *43*

**7. Style Timing** ..... **1**

*7.1. Introduction* ..... *1*

*7.2. Data and methodology* ..... *2*
7.2.1. Style consistency assessment ..... 2
7.2.2. Style momentum assessment ..... 2
7.2.3. Timing models ..... 4

*7.3. Empirical results* ..... *6*
7.3.1. Style consistency results ..... 6
7.3.2. Style momentum results ..... 8
7.3.3. Timing models ..... 14

*7.4. Summary and conclusion* ..... *25*

**8. Summary of Results and Conclusion** ..... **1**

*8.1. Introduction* ..... *1*

*8.2. Summary of results* ..... *2*

*8.3. Suggested extensions* ..... *5*

University of Cape Town

**References** ..... **1**

**List of Appendices** ..... **1**

University of Cape Town

# List of Tables

**4. Data and Descriptive Statistics** ..... 1

*Table 4.1.: Style Characteristic codes and construction* ..... 9

*Table 4.2.: Descriptive statistics for firm-specific attributes* ..... 15

**5. Exploratory Analysis and Market Risk Decomposition** ..... 1

*Table 5.1.: Eigenvalues and explained variance for five factors* ..... 12

*Table 5.2.: TSE share indices' promax rotated loadings for five factors* ..... 13

*Table 5.3.: Single-index model and multi-index model test results* ..... 14

**6. Firm-Specific Attributes and the Cross-Section of Equity Returns** ..... 1

*Table 6.1.: List of significant variables: In-sample period* ..... 7

*Table 6.2.: Correlation matrix for the value and change in value cluster* ..... 10

*Table 6.3.: Correlation matrix for the growth, crossover and change in performance, size and growth cluster* ..... 11

*Table 6.4.: Correlation matrix for the change in liquidity cluster* ..... 12

*Table 6.5.: Correlation matrix for the short-term momentum cluster* ..... 12

*Table 6.6.: Correlation matrix for simplified list of significant variables* ..... 13

*Table 6.7.: List of final significant characteristics* ..... 14

*Table 6.8.: List of significant variables for un-adjusted returns* ..... 25

*Table 6.9.: List of significant variables for single-index model adjusted returns* ..... 26

*Table 6.10.: List of significant variables for multi-index model adjusted returns* ..... 27

*Table 6.11.: List of final, uncorrelated, significant characteristics for un-adjusted returns* ..... 32

*Table 6.12.: List of final, uncorrelated, significant characteristics for single-index model adjusted returns* ..... 33

*Table 6.13.: List of final, uncorrelated, significant characteristics for multi-index model adjusted returns* ..... 34

*Table 6.14.: Comparison of in- and out-sample results* ..... 42

**7. Style Timing** ..... 1

*Table 7.1.: Autocorrelations for lags one to twelve of monthly payoffs to significant in-sample characteristics* ..... 9

*Table 7.2.: Partial autocorrelations for lags one to twelve of monthly payoffs to significant in-sample characteristics* ..... 10

*Table 7.3.: Ljung-Box Q-statistics for lags one to twelve of monthly payoffs to significant in-sample characteristics* ..... 11

*Table 7.4.: Autocorrelations of lags one to twelve of monthly payoffs to significant out-sample characteristics* ..... 12

*Table 7.5.: Partial autocorrelations of lags one to twelve of monthly payoffs to significant out-sample characteristics* ..... 13

University of Cape Town

*Table 7.6.: Ljung-Box Q-statistics for lags one to twelve of monthly payoffs to significant out-sample characteristics* ..... 14

*Table 7.7.: (Auto) Regressions between payoffs and their moving averages for significant in-sample characteristics* ..... 15

*Table 7.8.: (Auto) Regressions between payoffs and their moving averages for significant out-sample characteristics* ..... 18

*Table 7.9.: AR12 model results for in-sample significant variables* ..... 20

*Table 7.10.: AR12 model results for out of sample significant variables* ..... 21

*Table 7.11.: Direction ratios for in-sample variables* ..... 22

*Table 7.12.: Direction ratios for out-sample variables* ..... 24

University of Cape Town

# List of Figures

**4. Data and Descriptive Statistics** ..... 1

*Figure 4.1: Number of non-thinly traded shares* ..... 6

**5. Exploratory Analysis and Market Risk Decomposition** ..... 1

*Figure 5.1.: Market capitalisation of ten TSE sector indices* ..... 3

*Figure 5.2.: Tree diagram for 108 sector and sub sector indices* ..... 10

*Figure 5.3.: Scree plot of eigenvalues* ..... 12

**6. Firm-Specific Attributes and the Cross-Section of Equity Returns** ..... 1

*Figure 6.1.: Tree diagram of monthly payoffs for in-sample significant variables* ..... 9

*Figure 6.2.: In-sample cumulative monthly payoffs: Growth* ..... 15

*Figure 6.3.: In-sample cumulative monthly payoffs: Value* ..... 16

*Figure 6.4.: In-sample cumulative monthly payoffs: Performance* ..... 17

*Figure 6.5.: In-sample cumulative monthly payoffs: Short-term Momentum* ..... 18

*Figure 6.6.: In-sample cumulative monthly payoffs: Change in liquidity* ..... 19

*Figure 6.7.: In-sample cumulative monthly payoffs: Change in performance* ..... 20

*Figure 6.8.: In-sample cumulative monthly payoffs: Change in growth* ..... 21

*Figure 6.9.: In-sample cumulative monthly payoffs: Change in Value* ..... 22

*Figure 6.10.: In-sample cumulative monthly payoffs: Change in momentum/ crossover* ..... 23

*Figure 6.11.: In-sample cumulative monthly payoffs: Change in size* ..... 24

*Figure 6.12.: Tree diagram of monthly payoffs for un-adjusted returns* ..... 29

*Figure 6.13.: Tree diagram of monthly payoffs for single-index adjusted returns* ..... 30

*Figure 6.14.: Tree diagram of monthly payoffs for multi-index adjusted returns* ..... 31

*Figure 6.15.: Out-sample cumulative monthly payoffs: Size* ..... 35

*Figure 6.16.: Out-sample cumulative monthly payoffs: Value* ..... 36

*Figure 6.17.: Out-sample cumulative monthly payoffs: Performance* ..... 37

*Figure 6.18.: Out-sample cumulative monthly payoffs: Change in value* ..... 38

*Figure 6.19.: Out-sample cumulative monthly payoffs: Change in performance* ..... 39

*Figure 6.20.: Out-sample cumulative monthly payoffs: Change in growth* ..... 40

*Figure 6.21.: Out-sample cumulative monthly payoffs: Change in liquidity* ..... 41

**7. Style Timing** ..... 1

*Figure 7.1.: Consistency in monthly style payoffs: In-sample significant attributes* ..... 7

*Figure 7.2.: Consistency in monthly style payoffs: Out-sample significant attributes* ..... 8

*Figure 7.3.: Average direction ratios for in-sample characteristics* ..... 23

*Figure 7.4.: Average direction ratios for out-sample characteristics* ..... 24

University of Cape Town

# 1. Introduction

*"The empirical counterpart of a theory of asset prices is a model of the cross-section of security returns. Empirical tests of the Capital Asset Pricing Model (CAPM) of Sharpe (1964), Litner (1965) and Black (1972) using cross-sectional methodologies have identified numerous cases where variables apart from beta explain expected returns. Initially termed 'anomalies', these empirical violations of the theory are frequently associated with firm-specific attribute data".*

-Robertson (2003:i)

## 1.1. Introduction

An asset pricing anomaly is a statistically significant difference between realised average returns related to certain characteristics of securities and the returns predicted by asset pricing models. The Capital Asset Pricing Model (CAPM) of Sharpe (1964), Lintner (1965), Mossin (1966) and Black (1972) and the Arbitrage Pricing Theory of Ross (1976) are two such asset pricing models. These models are held as complete accounts of risk and return in efficient capital markets where investors are rational, mean-variance optimisers.

Over the past several decades, numerous firm-specific attributes other than those of the CAPM and APT have been shown to explain the cross-section of expected stock returns. The exploitation of such anomalies can potentially lead to significant abnormal returns. Furthermore, some anomalies appear to be consistent across time and markets thus implying that they are systematically priced variables. The identification of such anomalies are subject to the joint hypothesis problem of Roll (1977) which acknowledges that that any test of the CAPM is a joint hypothesis test because it is simultaneously testing both the market and the model. Therefore any anomaly identified may be due to an inefficient market, a misspecified asset pricing model or a result of both effects acting together.

University of Cape Town

The aim of this thesis is to investigate the cross-sectional relationship between firm-specific attributes and security returns on the Tokyo Stock Exchange (TSE) and to determine if these anomalies are persistent over time. In addition, an examination of the behaviour and predictability of the monthly payoffs to the anomalies identified is conducted. The focus of the study is thus solely on the identification of any anomalies and the examination of their behaviour and not on explaining reasons for their existence.

The remainder of this chapter is set out as follows. Section 1.2. discusses the contribution made by this thesis and Section 1.3. provides and overview of each subsequent chapter.

University of Cape Town

## 1.2. Contribution

This thesis contributes to the body of research that investigates the existence of style anomalies on the TSE. The analyses conducted adds to prior work that focuses on testing stock returns for predictability. Firm-specific variables are tested for forecasting ability and explanatory value after the single-index and multi-index models are used to risk adjust stock returns.

To the author's knowledge, the most comprehensive dataset of firm-specific attributes is constructed and tested on the TSE. The firm-specific attributes tested are a collection of technical, market related, fundamental and momentum variables. The literature is enhanced by presenting previously undocumented evidence on the univariate cross-sectional relationships between these firm-specific attributes and stock returns and by the confirmation of the persistence of several previously identified anomalies. The results indicate that 28 of the 29 in-sample final significant attributes and 14 of the 19 out-sample final significant attributes are previously undocumented.

The behaviour of the monthly payoffs to the significant variables is examined for predictability. Four timing models are constructed and tested for the ability to predict monthly payoffs to the significant variables. Furthermore, using the method of van

Rensburg and Slaney (1997), a multi-index model is constructed for the TSE. The multi-index model is comprised of observable factor proxies and is used to risk adjust out of sample stock returns.

## 1.3. Thesis organisation

Chapter Two provides an overview of the investment theory that is relevant to the research conducted in this thesis. The theory discussed covers informational efficiency which includes the random walk model and the efficient market hypothesis. Furthermore, asset pricing theory which encompasses mean variance analysis, the capital asset pricing model (CAPM) and arbitrage pricing theory (APT) is reviewed.

Chapter Three outlines the prior literature relating to the theory presented in Chapter Two. Both international and Japanese-specific literature is presented. The literature documents the different types of empirical anomalies that are identified in previous studies and presents the major arguments for the existence of such anomalies.

Chapter Four introduces the data used in the analyses conducted in the subsequent chapters. Two datasets are presented, namely: stock return data and firm specific attribute data. Several adjustments are made to the data. These adjustments include a thin trade filter and winsorisation procedure. Both adjustment procedures are discussed in detail. The full list of firm-specific attributes is presented along with their construction formulas and associated descriptive statistics.

Chapter Five attempts to provide some insight as to the structure of the TSE and constructs the single-index and multi-index models used to risk adjust stock return data in Chapter Six. A cluster and principal components analysis is conducted in order to construct the multi-index model. The ability of the two models to explain the time series variation in stock returns is compared.

Chapter Six uses the cross-sectional methodology of Fama and Macbeth (1973) to identify firm-specific attributes that have the ability to significantly predict monthly stock returns on the TSE. The cross-sectional regressions are run over an in-sample

University of Cape Town

period and an out of sample period. Furthermore, the out of sample stock return data are risk adjusted using the single-index and multi-index models constructed in Chapter Five. For each dataset, correlation and cluster analyses are used to simplify the list of significant variables in order to provide a final list of significant variables that are not highly correlated with one another.

Chapter Seven investigates the usefulness of style timing models. An examination of the consistency of the direction of monthly payoffs to the final significant variables is performed. The ability of autoregression and trailing moving average timing models to predict monthly payoffs to the final significant variables is investigated. Four models are constructed and tested for significance using t-tests, correlation coefficients and direction ratios.

Chapter Eight provides a summary of the results obtained in Chapters Five, Six and Seven. The chapter concludes the thesis and provides several possible areas of future research.

University of Cape Town

# 2. Theoretical Overview

## 2.1. Introduction

This chapter reviews the prominent theory relating to information efficiency and asset price modelling. The predictability of security returns and the valuation of asset prices are of significant importance to both practitioners, who employ empirical results in an attempt to achieve superior rates of return, and to academics, who try to develop an understanding of the return generating framework and the efficiency of capital markets. A significant amount of research is thus aimed at developing and testing models that attempt to explain or predict asset price behaviour. This chapter therefore provides a brief review of the theoretical framework underlying the empirical tests of Chapters Five, Six and Seven.

The remainder of the chapter is organised as follows. Section 2.2. discusses information efficiency, Sections 2.3. outlines asset pricing theory and finally Section 2.4. summarises and concludes.

University of Cape Town

## 2.2. Information efficiency

Information efficiency is defined as the degree to which financial markets incorporate information. Market efficiency is originally described by Bachelier (1900:84) who states that: *"...past, present and even discounted future events are reflected in market price, but often show no apparent relation to price changes".*

The price of any security trading in an informationally efficient market fully reflects all publicly available information. It is therefore not possible to earn abnormal profits by trading on public information. It has been shown however, that markets are not always informationally efficient as, on occasion, prices appear to deviate from their fundamental values thereby creating abnormal profit opportunities [Banz, (1981); Bildersee, Cheh and Zutshi, (1993)].

### 2.2.1. Random walk model

"*...in competitive markets there is a buyer for every seller. If one could be sure that a price would rise, it would have already risen... arguments like this are used to deduce that competitive prices must display price changes... that perform a random walk with no predictable bias*".

- Samuelson (1965:41)

If markets are truly informationally efficient then all market prices should follow a random walk. The random walk model states that successive stock price changes are independent of each other so that past trends in stock prices are useless in predicting future values i.e. there should be no evidence of serial correlation in stock returns. Furthermore, it is generally assumed that stock price changes have the same distribution. In other words, the random walk model describes a series of asset returns, $r_t$, $r_{t-1}, \ldots r_{t-n}$, that are serially independent such that:

$$cov(r_t, r_{t-n}) = 0 \text{ for } n \neq 0 \qquad (2.1.)$$

Tests of the random walk model are performed by Kendall (1953) who examines 22 U.K. stock and commodity price series. The study provides evidence that security prices move randomly by demonstrating that weekly price changes cannot be predicted from their own past price behaviour or the behaviour of other securities. The findings of Kendall (1953) are supported by Roberts (1957), using U.S. data.

The random walk model is rejected in studies that show evidence of serial correlation in stock return data [Lo and MacKinlay, (1988); Jegadeesh, (1990)]. Using monthly U.S. data, Jegadeesh (1990) finds negative first order serial correlation in returns and positive serial correlation over the longer term with 12-month serial correlation being particularly strong. The author therefore discards the random walk hypothesis stating that predictability in returns is due to systematic changes in expected stock returns or market inefficiency.

University of Cape Town

### 2.2.2. Efficient market hypothesis

*'...there is no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Markets Hypothesis.'*

-Jensen (1978: 95)

*"...if the efficient markets hypothesis was a publicly traded security, its price would be enormously volatile"*

-Schleifer and Summers (1990:20)

As mentioned previously, an efficient market is one in which prices wholly reflect all public information making it is impossible to earn abnormal profits. At any point in time the prevailing market price is a good indication of a stock's intrinsic value and accordingly all investments have a zero expected net present value at the time the investments are made. The efficient market hypothesis (EMH) thus purports that returns are unpredictable from past returns or other past variables and that the best forecast of returns is the historical mean.

In order for capital market efficiency to hold, the following conditions are sufficient. First, there are no taxes or transactions costs associated with the trading of securities. Second, all available information is costless and easily attainable by market participants. Finally, all market participants agree on the implications of current information for the current price and distributions of future prices of each security.

There are arguments that oppose the EMH. Grossman and Stiglitz (1980) note that as information is not costless, investors are only prepared to collect information until the marginal cost of acquiring information equals the marginal benefit of using that information. Consequently, asset prices would not reflect all available information, but instead only reflect all information up to the point where no gains can be made from the acquisition of additional information.

Fama (1970) identifies three types of market efficiency: weak-form efficient; semi-strong-form efficient; and strong-form efficient. The weak-form hypothesis advocates that, at a minimum, the current price of the share reflects its own past prices. In other

University of Cape Town

words, prices already reflect all information that can be derived from examining market trading data therefore rendering trend analysis useless.

The weak-form hypothesis is tested by examining stock return data to find evidence of serial correlation. Several studies find evidence of serial correlation in returns over both the short and long term [Fama, (1965); Fisher, (1966)]. Lo and MacKinlay (1988) show evidence of autocorrelation in short horizon returns and French and Roll (1986) demonstrate that past returns are able to predict both daily and weekly returns. Furthermore, in tests of the EMH Fama (1970) concludes that the results do indicate strong support for the weak-form of market efficiency.

The semi-strong-form hypothesis states that all public information is reflected in market prices. Attempting to identify mispriced shares using public information, such as financial statement data, is fruitless because that information is already contained in the prevailing share price. Event studies are used in tests of semi-strong-form efficient markets. Treynor (1981:57) agrees with the evidence provided by Fama (1970) but tends to support the semi-strong form hypothesis by stating "... *the securities market will not always be either quick or accurate in processing new information. On the other hand, it is not easy to transform the resulting opportunities to trade profitably against the market consensus into superior portfolio performance*".

University of Cape Town

The strong-form efficient hypothesis asserts that market prices fully reflect all public and non-public information. This version of the EMH is extreme as it is unlikely that shares reflect non-public information as due to the observation that insiders are able to profit by using their inside information [Lakonishok and Lee, (2001); Jaffe, (1974)]. Jaffe (1974) supports the notion that insiders have private information allowing them to earn abnormal returns while Seyhun (1986) argues that one cannot profit from public information without insider trading. Fama (1970) agrees this view and states that the strong-form version of the EMH is most useful as a benchmark against which the importance of deviations from market efficiency can be judged.

Fama (1991) re-evaluates his 1970 EMH classifications. Weak-form tests of market efficiency are re-classified as tests for return predictability. These tests entail the search for autocorrelation in returns over both short- and long-term horizons. Weak-

form tests of market efficiency include those of the Contrarians and the overreaction hypothesis of De Bondt and Thaler (1985) in which past loser stocks tend to outperform in future periods and *vice versa*. Semi-strong-form tests are replaced by event studies. Event studies involve analysing price movements around a specific event, such as a stock split or earnings announcement, in order to determine if there is a significant reaction to that event by financial markets. Fama (1991) argues that event studies are most likely the cleanest evidence of market efficiency available due to the fact that they are not affected by the joint hypothesis problem of Roll (1977).

Although markets appear to be semi-strong form efficient, Fama (1991) shows that there exists a dispersion of returns around the announcement day which is most likely a result of insider trading on private information. Tests of private information measure the extent to which insiders, those with non-public information, are able to earn abnormal returns by trading on the basis of that information. These tests are analogous to those of the strong-form efficient tests of Fama (1970).

In concluding his paper, Fama (1991:1616) supports the efficient market hypothesis, observing: "*Overall it appears the market is quite efficient but not perfectly so. There appears to be some predictability and some mean reversion in the long-run returns, but not so much in the short-run tests. Often at times the apparent market inefficiencies are just that, apparent as they are due to measurement or modelling errors*".

University of Cape Town

## 2.3. Asset Pricing Theory

### 2.3.1. Mean variance analysis and portfolio selection

Mean-variance analysis is first proposed by Markowitz (1952) and is based on the assumption that the portfolio held by an investor depends on his preferences regarding his own risk return trade-off. This is the essence of the separation theorem, which states that all investors should hold the same identical optimum portfolio of risky assets while adjusting for differing risk preferences by either lending or borrowing at

the risk free rate of interest. Prevailing theory prior to Markowitz (1952) suggests that the risk of a security is measured by the volatility (measured by standard deviation) if the security's returns. Markowitz (1952) focuses on examining the risk of a portfolio of stocks rather than individual securities.

Markowitz's (1952) mean-variance theory is illustrated as follows. A portfolio $p$, with mean $E[r_p]$ and variance $\sigma_p$, is mean-variance efficient if either:

i) one cannot create another portfolio $q$ with greater expected return than $p$, and with no more variance than $p$ (i.e. one cannot have $E[r_q] > E[r_p]$ and $\sigma^2_q \leq \sigma^2_p$),
ii) one cannot create another portfolio $q$ with lower variance than $p$, and with no less expected return than $p$ (i.e. one cannot have $\sigma^2_q < \sigma^2_p$ and $E[r_q] \geq E[r_p]$).

Mean-variance analysis focuses solely on the variance or risk and the return of portfolios and how these attributes are related to underlying assets. The covariance between assets is calculated. When two assets have a covariance of close to (-1) investors will always be able to find a combination of the two assets that yields a return independent of market conditions. Using the variance of and covariance between assets, mean-variance analysis allows an investor to calculate the fraction of the portfolio attributable to each asset that maximises portfolio return for each level of risk.

University of Cape Town

### 2.3.2. The capital asset pricing model (CAPM)

The Capital Asset Pricing Model (CAPM) of Sharpe (1964) Lintner (1965) and Black (1972) builds on the Markowitz (1952) efficient portfolio theory. The capital asset pricing model (CAPM) marks the beginning of asset pricing theory and is the original model from first principals that describes the nature of the relationship between risk and the expected return of securities.

The CAPM is based on several underlying assumptions. First, all investors are assumed to be price takers, thus ensuring that security prices are not affected by individual trades. Second, all investors plan for a single holding period in which they

are limited to only those financial assets that are publicly traded. Third, all investors borrow and lend at the risk free rate in interest and there are no taxes or transactions costs. Finally, all investors have homogenous expectations and are rational mean-variance optimisers.

As a result of the aforementioned assumptions, all investors hold a risky portfolio that duplicates the composition of the market portfolio. The market portfolio is defined as a portfolio that includes all securities in the market, held in proportion their market value. In a graph with mean return on the y-axis and standard deviation on the x-axis, the market portfolio lies on the efficient frontier and at the point of tangency with the capital market line (CML). The CML is the line drawn from the risk free rate of interest through the market portfolio. The efficient portfolio held by an investor is a combination of the risky asset (market portfolio) and the risk free asset so that the overall level of risk corresponds to the individuals' personal risk preferences. Therefore portfolios held by investors along the CML differ only to the extent to which the risk free asset is held. The expected return on the efficient portfolio is:

$$E(r_p) = r_i + \frac{E(r_m) - r_f}{\sigma_m}\sigma_p \qquad (2.2.)$$

where $E(r_p)$ is the expected return of the efficient portfolio; $r_f$ is the risk free rate of return; $E(r_m)$ is the expected return on the market portfolio; and $\sigma_m$ and $\sigma_p$ is the standard deviation of returns of the market and efficient portfolios respectively.

As previously mentioned, the market portfolio held by investors contains all risky assets available to those investors and hence the portfolio is completely diversified and contains no unsystematic risk. The standard deviation of an asset is comprised of systematic and unsystematic risk. Standard deviation is not applicable to the market portfolio as there exists no unsystematic risk. Instead a measure of pure systematic risk is used. This measure is the asset's covariance with the market portfolio.

Therefore if all unsystematic risk can be eliminated through diversification, investors are not rewarded for bearing any of this diversifiable risk. As a result, the CAPM only takes the level of systematic risk into account when modelling the expected

University of Cape Town

return of the asset. Precisely, the CAPM calculates the expected return on an asset with respect to a certain level of systematic risk, the expected risk free rate and the return on the market portfolio. The CAPM models the following linear relationship:

$$E(r_i) = r_{f,t} + \beta_i (r_{m,t} - r_{f,t}) \qquad (2.3.)$$

where $E(r_i)$ is the expected return on asset $i$; $r_{f,t}$ is the risk-free rate at time $t$; $r_{m,t}$ is the market return at time $t$; and $\beta_i$ is given by:

$$\beta_i = \frac{Cov_{i,m}}{\sigma_m^2} \qquad (2.4.)$$

where $Cov_{i,m}$ is the asset's covariance with the market; and $\sigma^2_m$ is the expected variance of returns on the market portfolio.

Equation 2.3 represents the Security Market Line (SML). The SML embodies the relationship between the systematic risk of an asset and its expected return in equilibrium. A vital implication of the CAPM is that the only priced factor in the determination of returns is β which, when given the variance of returns, is merely the covariance between the returns on the asset and the returns on the market.

As indicated above, the CAPM defines the relationship between risk and expected returns. In reality, expected returns are not directly observable. In order to move from expected returns to realised returns the single-index model is employed. The single-index model is based on the assumptions of the CAPM and the following two additional assumptions:

i) a specified market index is almost perfectly correlated with the unobservable market portfolio; and
ii) the probability of stock returns is stationary.

The single-index model is as follows:

University of Cape Town

$$R_{t,i} = \alpha + \beta_{i,t} R_{m,t} + \varepsilon_{i,t} \quad (2.5.)$$

Where $R_{i,t}$ is the excess realised return on stock $i$ at time $t$; $R_{m,t}$ represents the excess return of the specified index at time $t$; $\beta_{i,t}$ is the sensitivity of firm $i$ to the specific index at time $t$; and $\varepsilon_i$ represents the unexplained residual return of stock $i$ at time $t$. The random error term is assumed to be normally distributed and has an expected value of zero.

The asset's expected return when the market is neutral is represented by alpha. The CAPM states that the expected value of alpha is zero i.e. that the asset is fairly priced in the market whereas the single-index model holds that the realised value of alpha should average out to zero for a sample of historical observed returns.

A major critique of the CAPM comes from Roll (1977). In order to test the CAPM it is required that the market portfolio be constructed. Prior studies employ a broad market index to proxy for the market portfolio. Roll (1977) argues that an observable market index is not sufficiently broad to be an accurate representation of the market portfolio. This is due to the fact that the market portfolio as defined in the CAPM includes a variety of assets, not merely equities. As a result the CAPM can never be tested because the market portfolio is not observable. It must therefore be accepted that any test of the CAPM is a joint hypothesis test because it is simultaneously testing both the market and the model. If a test of the CAPM concludes that the model does not hold in the market the insignificant result may be due to either an inefficient market or a miss-specified model. Therefore the CAPM can never be truly tested unless the exact marked portfolio is devised. Further evidence against the CAPM is provided by Fama and French (1992) who conclude that when size and the market to book value are included in the model, beta becomes insignificant.

University of Cape Town

### 2.3.3. Arbitrage pricing theory

Arbitrage Pricing Theory (APT), derived by Ross (1976), does not require a market portfolio like that of the CAPM. Arbitrage is defined as a zero net-investment, zero risk investment strategy that generates a profit. The model has two sources of uncertainty, a common risk factor and a firm specific portion. The common risk factor is common to all assets in the market and has a zero expected value because it represents new information. The common risk factor need not be proxied by the return on a market index as in the single-index model. The APT model relies on three simplifying assumptions:

(i) capital markets are frictionless and perfectly competitive;
(ii) investors are risk averse and always favour more wealth to less wealth; and
(iii) the stochastic process generating asset returns can be simplified in the form of the following linear $K$-factor model:

$$R_{i,t} = E(R_{i,t}) + \sum_{k=1}^{K} b_{i,k} f_{k,t} + \varepsilon_{i,t} \qquad (2.6.)$$

where,

$R_{i,t}$ = realised returns earned by asset i in time period t, where $i$ = 1,2… N and $t$ = 1,2… T;

$E(R_{i,t})$ = expected rate of return of asset $i$ for period $t$ at the beginning of period $t$;

$f_{k,t}$ = the $k^{th}$ risk factor that impacts on asset $i$'s returns at time $t$, where $k$ = 1,2… K;

$\beta_{i,k}$ = an OLS regression estimated coefficient that measures the sensitivity of $R_{it}$ to movements in $f_{kt}$; and

$\varepsilon_{i,t}$ = a normally distributed random error term $t$ which measures the unexplained residual return of asset $i$ in period $t$, where $E(\varepsilon_{it}) = 0$.

For this model, systematic risk is represented by the assets' variation of and sensitivity to the common factors included in the model. The APT assumes the return

University of Cape Town

on a zero-investment portfolio with zero systematic risk is zero in equilibrium. This is a result of all firm-specific variation being diversified away. This assumption allows the model to be presented as:

$$E(r_{i,t}) = \lambda_0 + \sum_{k=1}^{K} b_{i,k}\lambda_k \qquad (2.7.)$$

where,

$\lambda_0$ = the expected return on an asset with a zero sensitivity to all factors;

$\lambda_k$ = the risk premium associated with each of the common factors; and

$b_{i,k}$ = the coefficient that measures the sensitivity of returns for an asset, $i$, to movements in a common factor.

The explanatory power of the model is dependant on the common risk factors selected. The risk factors can be obtained either through factors analysis or random selection from the universe of macroeconomic factors. While factor analysis may provide more accurate risk factors, the factors have no distinguishable economic interpretation. In selecting the number of risk factors to be included in the model, a trade-off exists between increasing the amount variation in realised returns explained by the model and increased parsimony. Chen, Roll and Ross (1986) propose that risk factors should include any systematic influences that impact future dividends, the rate at which investors discount future cash flows and the way market participants form expectations.

As with the CAPM, the APT model is a statement about expected returns. Since expected returns are not directly observable the need to move from expected to realised returns arises. The multi-index model is therefore employed and is as follows:

$$(r_{i,t} - r_{f,t}) = \alpha_i + \sum_{k=1}^{K} \beta_{k,i}(r_{k,t} - r_{f,t}) + \varepsilon_{i,t} \qquad (2.8.)$$

University of Cape Town

The APT holds that the expected value of $\alpha_i$ is zero for all assets, however, the multi-index model states that the realised value of $\alpha_i$ should average out to zero for a sample of historical observed returns.

The APT model is favoured over the CAPM due to the fact that the APT yields an expected return-beta relationship using a potentially observable common risk factor such as a market index while the theoretical market portfolio required by the CAPM is unobservable. In addition the APT model easily allows for more than one source of risk. The CAPM, however, by definition holds for all assets in the universe while the APT model holds for all, but a few assets.

## 2.4. Summary and conclusion

This chapter provides a brief outline of the theoretical framework within which the empirical tests contained in this thesis fall. The extent to which capital markets are efficient is discussed and two asset pricing models, the CAPM and the APT, are presented.

The joint hypothesis problem limits the interpretation of the results tests of market efficiency or asset price models. Capital market efficiency can only be tested in conjunction with an asset-pricing model. Resulting evidence against market efficiency may be the result of a problematic asset pricing model and not gross market inefficiency.

The research both supporting and contradicting the theory presented here is discussed in Chapter Three.

University of Cape Town

# 3. Literature Review

## 3.1. Introduction

There exists an overwhelming amount of evidence documenting anomalous financial market behaviour since the birth of asset pricing theory. This chapter attempts to provide a brief overview of the evidence in both the International and Japanese specific literature.

In addition to investigating the different types of anomalies in the literature, a significant portion of the review is dedicated to discussing the possible explanation for the existence of such anomalies.

The remainder of the chapter is organized as follows. Section 3.2. discusses literature relating to market efficiency , Section 3.3. discusses research relating to the CAPM and Section 3.4. discusses research relating to style anomalies. Section 3.5. documents possible explanations for the existence of style anomalies, Section 3.6. reviews Japanese specific research and finally Section 3.7. summarises and concludes.

University of Cape Town

## 3.2. Market efficiency

An efficient market is one in which prices fully reflect all publicly available information. If the efficient market hypothesis (EMH) holds, it is impossible to earn abnormal profits because the prevailing share price already reflects all public information. All investments therefore have a zero expected net present value at the time the investment is made.

If markets are truly efficient then all prices should follow a random walk however, Jegadeesh (1990) finds evidence of serial correlation and therefore rejects the random walk hypothesis stating that predictability in returns is due to systematic changes in expected stock returns or market inefficiency. Fama (1970) identifies three types of

market efficiency: weak-form efficient, semi-strong-form efficient and strong-form efficient. These forms differ with respect to the degree of information reflected in prices. Fama (1970) and Fama and MacBeth (1973) find that the EMH does hold, however later studies identify serial correlation in data indicating that markets are not weak-form efficient [Lo and MacKinlay, (1988); Fama and French, (1988)]. Seyhun (1986) provides adequate evidence indicating that insiders profit from trading on non-public information. Thus it is clear that the strong-form does not hold in markets where asymmetrical information exists.

The EMH has motivated an abundance of studies to investigate the response of financial markets to the announcement of various events such as stock splits [Fama, Fisher, Jensen and Roll, (1969)], earnings [Ball and Brown, (1968)], and takeovers [Jensen and Ruback, (1983)]. These studies appear to agree that stock prices adjust to new information within 24 hours of the announcement. This evidence is consistent with the EMH.

The EMH is, however, weakly supported by the observation that money managers have difficulty outperforming an unmanaged benchmark [Michaud, (1999)]. However, there have been managers that consistently beat their benchmarks. In addition, there are an ever growing number of empirical studies identifying anomalies that challenge the EMH paradigm [Banz, (1981); Reinganum, (1981); Basu, (1983); and Keim, (1982)].

Difficulty arises in establishing whether markets are truly efficient. Market efficiency is required to be tested in conjunction with an equilibrium asset pricing model. When anomalies are identified, one is unable to determine if the anomaly is an effect of an inefficient market or the result of a misspecified asset pricing model. This problem is termed the joint hypothesis theorem [Roll, (1977)]

University of Cape Town

## 3.3. The Capital Asset Pricing Model: An empirical evaluation

The Capital Asset Pricing Model (CAPM) is first described by Sharpe (1964), Linter (1965) and Mossin (1966). The CAPM, which extends Markowitz's (1954) portfolio theory, decomposes portfolio risk into systematic and unsystematic risk. The CAPM proposes that there exists one unique source of risk that determines the return of a stock. This unique source of risk is termed beta.

Early studies of Black (1972), Black, Jensen and Scholes (1972), Fama and MacBeth (1973) and Blume and Friend (1973) show a positive relationship between beta and expected returns, thus supporting the CAPM. Moreover the studies find beta to be the sole measure of risk required to explain the cross section of returns. However the studies do not support the CAPM prediction that the return on zero-beta portfolios is equal to the risk free rate of interest. Basu (1977) provides evidence that violates Roll's joint hypothesis problem. He shows that the single period CAPM does indeed have descriptive validity and that the behaviour of security prices on the NYSE are consistent with the efficient market hypothesis.

Empirical evidence demonstrating that beta is not the sole explanatory variable which is significant in explaining the variation in the cross section of expected returns does exist [Fama and French, (1992)]. In addition, it is shown that beta itself may not be statistically significant.

Bhandari (1988) shows that beta is unable to explain the cross section of expected returns and Jegadeesh (1992) finds beta also does not explain cross sectional differences in average portfolio returns. Daniel and Titman (1997) agree and show that beta has no power in explaining the cross section of returns even after controlling for size and book-to-market (BTMV) ratios. Fama and French (1992) find that beta is insignificant in explaining variation in returns over the 1963 to 1990 period. The authors argue that beta's poor performance is due to anomalies such as size and BTMV ratios being

University of Cape Town

correlated with the true market beta. In addition, beta estimates are noisy and therefore the relationship between beta and expected returns is obscured.

## 3.4. Style anomalies

There is substantial empirical evidence documenting the existence of factors, other than beta, that are significantly related to the cross section of expected returns. These factors are termed anomalies as they cannot be explained by asset pricing model such as the CAPM.

Banz (1981) documents a significant relationship between the size, measured by the market value of the firm's common stock, and expected returns for New York Stock Exchange (NYSE) firms. Using two-way sorted portfolios on size and beta, the study finds that smaller firms produce, on average, larger risk-adjusted returns relative to larger firms. Upon incorporating size and beta within a single model, size is found to improve the explanatory power of the model.

Banz (1981) is unable to determine whether size itself is responsible for the anomalous effect or whether size is a proxy for a missing additional risk factor. He does indicate that due to the longevity of the effect, the findings are not necessarily an attack against market efficiency, but rather a result of model misspecification. Dimson and Marsh (1984) support the findings of Banz (1981) by showing evidence of the size effect on the London Stock Exchange.

Reinganum (1981), using NYSE and AMEX data, finds that portfolios based on size and earnings/price (E/P) ratios produce average returns significantly different from those predicted by the CAPM. The earnings yield effect is rationalised by Ball (1978) who states that the earnings yield is a proxy for expected returns and therefore should be priced. Reinganum (1981) finds that both the size and earnings yield effects are found to exist separately, however, when both attributes are jointly considered the E/P effect is no

University of Cape Town

longer observed. This finding indicates that the two attributes represent similar missing risk factors, however the set of missing risk factors appear to be more closely correlated to size as opposed to the E/P ratio [Reinganum, (1981)]. Reinganum (1981) agrees with Banz (1981) by concluding that the observed effects are not a result of market inefficiency but rather model misspecification due to the persistence of the anomalies over time.

The effects documented in Reinganum (1981) may be a result of failing to adjust for differences in risk [Basu, (1983)]. Failure to control for risk will result in a negative correlation between size and return as small firms naturally have a greater level of systematic risk. After controlling for both systematic and total risk, Basu (1983) finds that both the E/P and size effect persist. However, Basu (1983) contradicts Banz (1981) by showing that the size effect is no longer significant when controlling for E/P ratios and risk. The author argues that the Banz (1981) model is misspecified as the size effect is a proxy for the E/P effect. In addition, Hawawini and Keim (2000) find that the size effect disappears after adjusting returns for the explanatory power of beta, thereby implying that size is a proxy for beta.

The above evidence indicates that a size and E/P effect appear to exist in the data, however, it is difficult to separate the two. Cooke and Rozeff (1984) disagree with Basu (1983) and Reinganum (1981). The authors argue that no interaction exists between size and earnings yield and the attributes are, most likely, representative of different aspect of a single underlying risk factor.

Jaffe, Keim and Westerfield (1989) criticise Cook and Rozeff (1984) for employing the ANOVA approach in their methodology which makes interpretation of physical output difficult. Jaffe, Keim and Westerfield (1989) propose that the two effects cannot be separated easily because past investigations use time periods that are too short and the studies fail to separate the month of January from the remaining eleven months. In doing so, the authors show that the results of previous studies conflict because the magnitude of the size and earnings yield effects is period specific.

University of Cape Town

Berk (1995) argues that size related regularities should not be regarded as anomalies. He shows that even if a firm's operational size is unrelated to its expected return, its market capitalisation is likely to be inversely related to average return in cross sectional regressions. Berk (1995) states that market capitalisation is most likely a proxy for omitted systematic risk factors or model misspecification.

In a prominent paper, Fama and French (1992) identify two characteristics, size and BTMV, that are able to explain the cross section of average returns for US data. These two anomalies combine to absorb the effects of beta, leverage and earnings yield in stock returns. Using two-way sorted portfolios, beta is found not to be significant in explaining average returns. The authors argue that the observed anomalies arise because they proxy for a non-diversifiable factor risk. BTMV and firm size proxy for financial distress. The greater the degree of financial distress the greater the return required by investors. In addition, the BTMV ratio is a proxy for firm value. If a firm has a high BTMV ratio, it is undervalued and therefore increase in price as it moves towards intrinsic value. Chan and Chen (1991) support Fama and French (1992) by stating that the size effect is driven mainly by the fact that smaller firms experience a larger degree of financial distress i.e. firms with low earnings-to-assets ratios and high degrees of leverage. The small firms are therefore riskier than larger firms and hence require a greater return.

Loughran (1997) argues that the evidence found in Fama and French (1992) is driven by the January effect and exceptionally low returns on small growth firms. The author finds that BTMV ratios and firm size explain none of the cross sectional variation of returns for large firms (top three quintiles sorted on size). The BTMV effect is not evident in large firms and is therefore not as important as Fama and French (1992) purport [Loughran, (1997)].

The debt-to-equity ratio is found to be positively related to expected common stock returns [Bhandari, (1988)]. The relationship is significant even after controlling for beta, size and seasonal effects. The debt-to-equity ratio, in theory, appears to be a natural proxy for risk and therefore should be priced. However, Bhandari (1988) argues that the

University of Cape Town

debt-to-equity ratio is not a proxy for the true market beta with respect to the market proxies used in the study but may proxy for the true market beta with respect to the true market portfolio.

An additional anomaly evident in the literature is the ability of the dividend yield to explain security returns. While Black and Scholes (1974) find no significant relationship between divided yields and risk adjusted returns, Blume (1980) does. Using quarterly US data, Blume (1980) shows a significant positive relationship between returns and both beta and expected dividend yields. The relationship between the dividend yield and return is non linear and the significance of the dividend yield is time period dependant. Additionally, Blume (1980) notes that beta is only significant when used in conjunction with the dividend yield and thus indicates that there may be some form of interaction between divided yields and market betas. Blume (1980) attempts to rationalise the dividend yield effect by stating that the market may fail to anticipate the greater relative growth of high dividend yielding stocks compared to low yielding stocks. This however is not an argument for irrationality of investors [Blume, (1980)].

Fama and French (1988) use time series regression to investigate the relationship between the dividend yield and expected returns. The study shows that the forecasting power of dividend yields is positively related to the return horizon. The intuition behind the dividend yield effect, in a seemingly efficient market, is that market prices are high relative to dividends when expected returns and discount rates are low, and *vice versa*, so that the dividend yield fluctuates with expected returns [Fama and French, (1988)].

Ou and Penman (1989), using US data, find that the firms' financial statements capture information not reflected in stock prices. The authors attempt to predict the direction of the one-year-ahead earnings change using financial statement items. The final model contains a single summary measure that captures equity value not reflected in the share price. The authors argue that current financial statement data has the ability to predict future earnings changes due to market prices at times differing from their fundamental values and then correcting back to those values over time.

University of Cape Town

Michaud (1999) investigates style factors on five major equity markets and discovers seven style factors that are identifiable in all five major equity markets for the period January 1991 to December 1995. These style factors include the earnings yield, asset yields, normalised earnings yields, earnings trend, return reversal, size and cyclicality.

## 3.5. Explanations for deviations from the CAPM

MacKinlay (1995) categorises explanations for CAPM based anomalies into two major groups; risked-based alternative and non risk-based alternatives.

### 3.5.1. Risk-based alternatives

#### 3.5.1.1. Multifactor asset pricing models and misestimated risk

Empirical deviations from the CAPM may represent an omitted risk factor(s). The omitted risk factor(s) represent variation in the cross section of stock returns that is not explained by beta [Fama and French, (1992)]. Anomalies appear to be a result of an omitted risk factor if they persist over time [Banz, (1981)]. Furthermore, anomalies may be the result of a misspecified market portfolio [Roll, (1977); Fama and French, (1996b)].

Fama and French (1993) advocate that variation in returns not explained by the CAPM is captured by a three factor model. The factors included represent the market, size and value (book-to-market) premiums. As these factors represent risk, the subsequent related return is compensation for the risk borne. In addition, the model captures the long-term return reversals found in De Bondt and Thaler (1985) and Lakonishok, Shleifer and Vishny (1994) thereby negating their overreaction hypothesis.

Banz (1981) and Reinganum (1981) argue that the size effect is a result of model misspecification due to its persistence over time and are therefore not the result of ephemeral inefficiencies. Banz (1981) argues that the size effect occurs as a result of

University of Cape Town

smaller firms, due to a lack of information, being neglected by investors and therefore temporarily deviating from their fundamental values.

Chan and Chen (1988) argue that the size effect arises due to large measurement errors in beta that allow size to proxy for the true beta. The authors find that when a more accurate beta is used the size effect disappears. However, Jegadeesh (1990) finds that the size effect exists even after controlling for beta and the results are not dependant on the way in which beta is estimated.

### 3.5.2. Non risk-based alternatives

#### 3.5.2.1. Statistical and methodological biases

Several papers cite statistical and methodological biases as a reason for the existence of empirical anomalies. Statistical biases include data-snooping, thin trading, survivorship bias and look-ahead bias.

Data-snooping occurs when a given database is used repeatedly for purposes of inference or model selection. This leads to the likelihood that any result obtained in a statistical study may simply be due to chance rather than to any value inherent in the method yielding the results. Lo and MacKinlay (1990) use Monte Carlo simulations to show that data-snooping can have a substantial effect on results.

Survivorship bias arises due to the tendency for poor performing firms to be excluded from analyses simply because they may no longer exist, resulting in an overestimation of past returns. The findings of Fama and French (1992) are challenged by Kothari, Shanken and Sloane (1995) on the basis of the existence of survivorship bias in their data. Kothari, Shanken and Sloane (1995), using CRSP data free of survivorship bias, report that the BTMV effect is weaker and less consistent than that proposed by Fama and French (1992). In addition, the BTMV effect is found to be sample specific as it is not evident in a larger and longer data set. Kothari, Shanken and Sloane (1995) agree with Fama and

University of Cape Town

French (1992) that there is no relationship between beta and returns over the 1963-1990 period, however this relationship is period specific.

In their rebuttal of Kothari, Shanken and Sloane (1995), Fama and French (1996a) show that survivorship bias does not explain the relationship beween average returns and BTMV ratios. The authors argue that when a sample consisting only of large firms (i.e. survivorship bias is not an issue) is used, the BTMV effect is still significant. Kothari, Shanken and Sloane (1995) find a similar result when their sample is restricted to include only large firms. Chan, Jegadeesh and Lakonishok (1995) and Kim (1997) agree with Fama and French (1996a) that survivorship bias does not explain the BTMV effect.

Look-ahead bias occurs when information used in the analysis was not actually available to investors at that time. The use of such information usually results in an upward shift of the results. A simple example is the untrue assumption that earnings information becomes obtainable immediately at the end of a financial period. Banz and Breen (1986) compile a database that is free from survivorship and look-ahead bias. The authors find no evidence of the size or earnings yield effect that is evident in the COMPUSTAT database and conclude that the discrepancy between their findings and the findings of other researchers is due to statistical biases in COMPUSTAT data.

In a paper investigating the combined effect of statistical biases, Davis (1994) studies pre-COMPUSTAT data from 1940 to 1963. The Moody's data used contains no survivorship, look-ahead and data-snooping biases evident in COMPUSTAT data. In addition, Davis (1994) eliminates the effect of thin trading by using only the top half of stocks sorted on size. The author finds that, despite an unbiased data set, anomalies such as the BTMV, earnings yield and seasonality effects persist. Davis (1994) concludes that deviations from the CAPM cannot be explained by biases in the data. It is important to note that the study does not find evidence of the size effect, however, this finding can be attributed to the fact that small firms are excluded from the sample in order to reduce the effect of thin trading.

University of Cape Town

Anomalies may also arise due to biases that occur as a result of the methodological techniques in the analysis. Michaud (1999) argues that the long-short methodological framework used in many empirical studies has a tendency to magnify portfolio returns without changing the underlying factor-return relationships. The spread between attribute sorted portfolios appears to imply the existence of risk factors even when the attributes are completely unrelated to risk [Ferson, (1988) cited in Michaud, (1999)]. Roll and Ross (1994) argue that statistical techniques such as ordinary least squares regression are exceptionally sensitive to the market index used [Roll and Ross, (1994)]. Results are therefore heavily dependant on the type of index used. In addition, Roll (1977) argues that any test of the CAPM is flawed in the sense that the market portfolio required by the model is unobservable in the real world.

**3.5.2.2. Market frictions**

The CAPM is based on the assumption of a perfect market. In reality, financial markets are not perfect and therefore it is unrealistic to assume that the model will hold in the presence of market frictions such as transaction costs and liquidity effects [MacKinlay, (1995)] i.e. there are no economic profits.

Both Banz (1981) and Reinganum (1981) show that investors who invest in small firms can earn positive abnormal returns irrespective of transaction costs. However, in their 1983 paper, Stoll and Whaley (1983) argue that transaction costs can explain the size effect and therefore should be included in a two factor CAPM. The study finds that transaction costs are higher for small firms and upon adjusting returns for transaction costs the authors find that the size effect is reversed i.e. large firms appear to outperform smaller firms.

Liquidity is cited as an additional market friction to be considered. In an investigation of the relationship between returns and the bid-ask spread, Amihud and Mendelson (1986) propose that liquidity is an additional dimension in asset pricing and subsequently concludes that small capitalisation stocks are, on average, less liquid than large capitalisation stocks and thereby require higher expected returns.

University of Cape Town

### 3.5.2.3. Investor irrationality

The overreaction hypothesis proposes that investors overreact to unexpected news, resulting in exaggerated movements in equity prices which are subsequently followed by rectification.

The overreaction hypothesis, which opposes the EMH and the rationality assumption of the CAPM, is supported by De Bondt and Thaler (1985). De Bondt and Thaler (1985) report that when stocks are ranked by three to five year past returns, past losers become future winners and past winners become future losers. The authors argue that investors are overly pessimistic regarding recent losers and overly optimistic regarding recent winners. As a result, past winners become overpriced and past losers become under-priced. Use of this heuristic by investors causes stock prices to deviate from fundamental value thereby creating inefficient markets. Furthermore, De Bondt and Thaler (1985) show that the overreaction hypothesis cannot be explained by firm size.

The overreaction hypothesis is rejected by Fama (1998) who argues that the evidence suggests that investors both overreact and under-react to new information. It can also be argued that there is a random split between the number of times investors over- and under-react. This occurrence is consistent with market efficiency and is a good describer of the range of existing anomalies [Fama, (1998)]. Furthermore, Fama and French (1992) show that three-year lagged returns for individual stocks have no power in explaining average returns and thus do not support De Bondt and Thaler's (1985) overreaction hypothesis.

Lakonishok, Shleifer and Vishny (1994) argue that ratios comprised partly of market prices proxy for past performance. Firms with low earnings yields (E/P), cash flow yields (CF/P) and BTMV are likely to have strong past earnings growth while firms with high ratios of E/P, CF/P, and BTMV are likely to have poor past earnings growth. Mean reversion surprises investors because they have overreacted to past growth patterns. Consequently, good past performers (low E/P, CF/P and BTMV) have low subsequent

University of Cape Town

returns while poor past performers (high E/P, CF/P and BTMV) have high subsequent returns.

Chan (1988) suggests an additional interpretation of the De Bondt and Thaler (1985) results. The author proposes that the estimation of the abnormal returns to the contrarian investment strategy is sensitive to the model and estimation methods. The study shows two features about loser stocks and winner stocks in financial markets. First, the loser stocks betas' increase after a period of abnormal loss and the winner stocks betas' decrease after a period of abnormal gain. Therefore betas estimated from the past should not be used. Second, when evaluating risk and return over extended periods that involves updating of portfolios, it is incorrect to base the analysis on the relationship between average return and average beta. This is due to the finding that both betas and the expected market risk premium may respond to some common variables and thus be correlated. Therefore the contrarian strategy suggested by De Bondt and Thaler (1985) tends to select riskier losers when the expected market risk premium is high. Chan (1988) concludes by stating that investors who follow the contrarian strategy are likely to find that their risk exposure varies inversely with the level of economic activity. On average investors will realise superior returns, however, excess returns are likely to be a normal compensation for the risk in the investment strategy.

Fama and French (1992) argue that the value effect is due to value stocks being fundamentally riskier and therefore requiring a greater return. Lakonishok, Shleifer and Vishny (1994) however, find no significant evidence indicating that value stocks are indeed riskier than glamour stocks and the difference in risk cannot explain their superior returns. The authors argue that their results can be explained by agency theory. Institutional fund managers invest in glamour stocks in order to appear prudent and to please naive investors who desire a holding of glamour stocks. In addition, institutional investors are evaluated on a short term-basis despite value strategies requiring long term commitment. The agency theory is supported by Haugen (1995).

University of Cape Town

## 3.6. Japanese specific research

### 3.6.1. Market efficiency and tests of the CAPM and APT model

The first tests of the CAPM on the TSE are performed by Lau, Quay and Ramsey (1974) using time series regression analysis over the 1964-1969 period. The results indicate that the CAPM does hold on the TSE over the sample period. In addition, Lau, Quay and Ramsey (1974) use cross-sectional regression to show that the slope of the security market line is significantly positive. The authors conclude that the CAPM is useful in explaining returns on the TSE.

The tests conducted by Lau, Quay and Ramsey (1974) can be criticised on two grounds. First, the time period studied is relatively short and second the tests are of a descriptive nature rather than a predictive nature i.e. the CAPM has the ability to explain past returns but it is unclear if the model can predict future returns. Tests of a predictive nature are conducted by Hawawini (1991). In this paper, no relation between beta and average returns is found for the period 1955-1985. The CAPM is found to be a valid predictor of returns only when the returns are adjusted for differences in size and the analysis is limited to the month of January.

Several empirical studies find beta to be insignificant in explaining returns in the TSE [Bae and Kim, (1998); Daniel, Titman and Wei, (2001)]. Hodoshima, Gorza-Gomez and Kunimura (2000) argue that the CAPM does not hold on the TSE because the assumption of a positive market premium is not satisfied. The study shows that 40% of excess market returns from 1956-1995 are negative. As a result the positive excess market returns are cancelled out significantly and the relationship between average portfolio returns and beta is flat. Once the excess market returns are separated into positive and negative periods, Hodoshima *et al.* (2000) find a clear relationship between average returns and beta in both the positive and negative periods. When excess market returns are positive,

University of Cape Town

beta increases as returns increase. When excess market returns are negative, beta tends to increase as returns decrease.

An empirical examination of the APT using Japanese data is conducted by Hamao (1988). The study tests the robustness of the Chen, Roll and Ross (1986) findings. Chen, Roll and Ross (1986) Chen, Roll, and Ross (1986) examine the legitimacy of the APT model in the US market and find that significantly priced factors include industrial production, inflation, risk premia, and the slope of the yield curve. Hamao (1988) chooses macro economic factors such as industrial production, inflation, risk premia, the term structure of interest rates, foreign exchange rates, market indices and oil prices as possible explanatory variables. Using both time series and cross-sectional regressions, the results indicate that changes in expected inflation, unanticipated changes in risk premia and unanticipated changes in the slope of the term structure are significant. As in Chen, Roll and Ross (1986), Hamao (1988) finds that beta adds no further explanatory power to the model and is not a priced factor.

### 3.6.2. Style anomalies on the TSE

In recent years numerous anomalies have been identified on the TSE. The existence of the anomalies indicates that beta is not the only source of risk. French and Poterba (1991) argue that during the market boom in the late 1980s and early 1990s market prices deviated greatly from fundamental values. Furthermore, earnings ratios do not appear to be useful in explaining variation in returns on the TSE. U.S. market prices are based primarily on earnings valuation while the Japanese market is based primarily on asset valuation [Bildersee, Cheh and Lee, (1990)]. Hall, Hamao and Harris (1994) report that Japanese investors use less accounting information, such as earnings, in their pricing of equities than do their U.S. counterparts.

Hawawini (1991) investigates the monthly returns of Section One stocks over the 1955-1985 period. Using a portfolio sorting methodology, the study finds no evidence of the size effect. When the data are adjusted for systematic risk, only the month of January exhibits a significant size premium. Hawawini (1991) justifies the absence of the size

University of Cape Town

effect in the sample by stating that the data used consisted solely of Section One firms on the TSE. The TSE consists of two sections, namely Section One and Section Two. Section One contains larger more established firms while Section Two contains smaller and younger firms. When the data consists primarily of large firms a significant size effect is difficult to identify due to the small spread between firm sizes.

Hodoshima, Gorza-Gomez and Kunimura (2000) find opposing evidence using Section One data. Employing cross sectional regression over the 1962-1995 period, the size effect is found to be significant with the expected negative coefficient. Kato and Schallheim (1985) support Hodoshima, Gorza-Gomez and Kunimura (2000). The authors find evidence of the size effect using Section One data. Furthermore, the authors use the market model to adjust returns for systematic risk. The size effect is found to persist after risk adjustment, however, the effect is sensitive to the type of index used. The equally weighted index is found to be more sensitive to small firms thereby resulting in a more significant size effect than the value weighted index.

Several studies find evidence contradicting that of Hawawini (1991) using both Section One and Section Two data. Bae and Kim (1998) find size to be the more significant than EY, BTMV, real estate holdings (as a percentage of total assets) and the degree of cross-corporate ownership in explaining the cross-section of equity returns. Cai (1997) reports size to be individually significant in explaining the cross section of returns on both sections of the TSE. In the multivariate analysis, BTMV and size are found to be the dominant variables.

Using data from both sections, Chan, Hamao and Lakonishok (1991) utilise portfolio sorting techniques to report that small stocks significantly outperform larger stocks. The data used is free of survivorship bias. Upon using seemingly unrelated regression (SUR) techniques it is found that the size effect is model dependant. In the regression using un-adjusted data, the size coefficient is found to be significant but has an unexpected positive sign. Once the data are adjusted to take the large surge in prices during the late

University of Cape Town

1980s and early 1990s in account, the size coefficient is significant and has the expected negative sign.

Chen and Zhang (1998) use both cross-sectional regression analysis and portfolio sorting techniques to identify a significant size effect. The portfolio sorting technique finds the size premium to be, on average, 0.785% per month, however the effect is weakly significant.

Elton and Gruber (1988) find small firms to have lower betas than large firms and provider higher returns. Kato (1990) agrees with Elton and Gruber (1988) that small firms have lower betas than larger firms, indicating that the fact that low beta stocks are likely to outperform the market is related to firm size.

Chan, Hamao and Lakonishok (1991) investigate the cross-sectional predictability of stock returns on the TSE. Using portfolio sorting techniques the authors find evidence of the size, BTMV and CF/P effects. As mentioned previously, the size coefficient has an unexpected positive sign. In, addition the regression shows that there is no significant individual earnings yield effect. The data are adjusted for the dramatic surge in prices in the late 1980s and early 1990s. The two most significant variables are BTMV and CF/P. The CF/P ratio is highly correlated with the E/P ratio but is more significant. Chan, Hamao and Lakonishok (1991) argue that the CF/P ratio is relevant to investors due to the fact that Japanese firms have to use the same method of depreciation for both tax and reporting purposes. The majority of firms use accelerated depreciation in order to minimize current taxes [Hall, Hamao and Harris, (1994)]. Therefore firms that have large capital investments tend to have distorted earnings figures. Including the CF/P ratio eliminates any effects that the depreciation policy may have. Furthermore, Chan, Hamao and Lakonishok (1991) study the returns of firms that have been delisted over the period and find a significant relationship between fundamental variables and expected returns indicating that survivorship bias cannot explain the anomalies present in the data.

University of Cape Town

Bae and Kim (1998) document the ability of earnings and book value to explain average returns. The study reports that both E/P and BTMV are individually and incrementally significant in predicting future stock returns.

The price earnings (P/E) effect is investigated by Bildersee, Cheh and Lee (1990) for the period 1976-1987. Although the P/E effect in evident in US markets it is not found to be useful in Japanese markets. Bildersee, Cheh and Lee (1990) report that Japanese P/E ratios are much larger than those in the U.S. Japanese P/E ratios are greater than the U.S. for a number of reasons. First, Japanese firms tend to be highly levered thereby depressing earnings [Cai, (1997)]. Choi *et al.* (1983) show that during 1976-1978, US firms had an average times interest earned ratio four times higher than Japanese firms. Furthermore, the study reports that the average Japanese firm has an interest expense/income ratio three times that for the typical US firm and that the average debt to total assets ratio for the Japanese firms almost double than for the U.S. Second, as mentioned previously, the use of accelerated depreciation further depresses earnings thus leading to a high P/E ratio. Third, numerous Japanese firms hold shares in other Japanese firms that, in turn, hold shares in them. The sale of shares to another company and reinvestment of the funds back in the other company leads to an increase in the number of shares outstanding. An increase in the number of shares outstanding results in reduced earnings per share ratios and increased P/E ratios [Bildersee, Cheh and Lee, (1990)].

French and Poterba (1991) agree that the above factors lead to higher P/E ratios in Japan, however they cannot explain the increase in Japanese P/E ratios during the mid to late 1980s and the decrease in 1990s. Furthermore, accounting practices in Japan result in earnings figures having a downward bias. This bias is found to decrease the coefficient in cross-sectional regression analysis but need not reduce the explanatory power of the coefficient itself [Hall, Hamao and Harris, (1994)].

Bildersee, Cheh and Lee (1990) suggest that the degree of asset ownership and Tobin's Q (measured by price relative to net asset value) can be used as alternatives to the P/E ratio. It is argued that Japanese investors, contrary to US investors, place more value on asset

University of Cape Town

ownership than earnings power [Black, (1980)]. Tobin's Q indicates if the firm is fully valued in the market. In a transitional period, the Q ratio is predictive as both the numerator and the denominator reflect potential future benefits while the P/E ratio reflects only past achievements [Bildersee, Cheh and Lee, (1990)].

The premise that Japanese stock prices are based on asset value rather than earnings potential is extended by Bildersee, Cheh and Zutshi (1993). The study investigates the relationship between net current asset value (current assets less current liabilities) and net current asset value relative to market value (NCAV/MV). Those firms with market values less than fundamental values will earn abnormal returns when the market corrects. Any possible interaction between NCAV/MV and P/E ratios is controlled for by randomising the distribution of P/E ratios across the portfolios. The study finds that portfolios containing firms with positive NCAV and NCAV/MV ratios outperform the market even when controlling for P/E ratios. The evidence indicates that NCAV is useful in explaining returns on the TSE [Bildersee, Cheh and Zutshi, (1993)].

Daniel Titman and Wei (2001) investigate the significance of Fama and French's (1993) three factor model on the TSE. The authors reject the factor model in favour of a characteristics model. They find the size and market premium to have small, variable and insignificant effects on the TSE. The BTMV effect is found to be significant. Elton and Gruber (1988) identify a four factor model that explains variation in returns of large Japanese stocks. The model has an $R^2$ of 0.78. The factors identified by Elton and Gruber (1988) were found to have a strong relationship with a number of macroeconomic variables.

Up to the early nineties, Japan had the most expensive real estate in the world [Bae and Kim, (1998)]. Real estate ownership is of great economic importance in Japan. Due to the scarcity of land, ownership of the resource is greatly valued. This provides rationale for a possible relationship between the degree of land ownership and stock prices. Bae and Kim (1998) find that there is a significant relationship between a firms holding of real estate relative to total assets and the firm's stock price.

University of Cape Town

In a study investigating the relationship between returns and accounting measures in Japan, Hall, Hamao and Harris (1994) find that Japanese investors make use of fewer accounting measures in the pricing of equity than do their U.S. counter parts. Using correlation and regression analysis, the study shows that stock prices on the TSE are for the most part unrelated to accounting measures for the majority of the 1980s. At the time of writing it appeared that prices were beginning to correct towards fundamental values. The authors show depreciation to be significant in explaining variation in the cross section of returns. Hall, Hamao and Harris (1994) rationalise the depreciation effect by stating that depreciation may proxy for some other relevant variable(s), such as growth from capital investment, or it may reflect investors' perceptions with respect to a measurement error. The authors state that a possible reason for the lack of attention given to accounting measures is due to the fact that Japanese accounting regulations, as prescribed by the Commercial Code, are orientated more towards the protections of creditors as opposed to providing information to investors.

Xu and Zhang (2004) show that the research and development intensity has the ability to explain returns over the 1993-2000 period. Research and development intensity is measured by the ratio between research and development expenditure to total assets and total equity. The finding makes intuitive sense as Japan is a major producer of high-tech goods which are essentially powered by research and development.

There exists a large amount of literature arguing the benefits of value versus glamour strategies on the TSE [Bauer, Derwall and Molenaar, (2003); Cai, (1997)]. A value stock can be defined as a stock that tends to trade at a lower price relative to its fundamentals and is thus considered to be undervalued by an investor. Value stocks tend to have a high dividend yield, low price-to-book ratio and/or low price-to-earnings ratio. Glamour stocks are stocks whose earnings are expected to grow at an above average rate relative to the market.

In a study by Cai (1997), value strategies outperform glamour strategies due to the greater risk involved with implementing a value strategy. Value firms tend to have a

University of Cape Town

larger degree of financial distress relative to glamour strategies thereby requiring a greater return [Fama and French, (1993)]. Cai (1997) finds that value stocks outperform glamour stocks by 6-12% per annum for the five years after portfolio formation. In addition, BTMV, size and CF/P are all individually significant in explaining the cross section of returns. Consistent with previous evidence, the E/P ratio is found not to be significant. In the multivariate analysis, BTMV and size are found to be the most significant variables. Bauer, Derwall and Molenaar (2003) document a significant value premium (defined by the BTMV ratio) on the TSE but no evidence of the size premium.

A contrarian strategy on the TSE is profitable even after adjusting for systematic risk and size [Chang, McLeavy and Rhee, (1995)]. Using weekly data, Bremer and Hiraki (1999) find evidence supporting De Bondt and Thaler (1985). Previous losers on the TSE tend to achieve positive returns in the following week and previous winners also experience price reversals in the subsequent week however the reversal is of a smaller magnitude. Chan, Hamao and Lakonishok (1991) find that looser stocks, defined as those with negative fundamental values, appear to achieve return reversals in the subsequent months.

Kato (1990) replicates De Bondt and Thaler's (1985) methodology using TSE data in order to determine if any overreaction effects are evident. The Kato (1990) study shows that past winners earn negative returns over the long-term (three years). Past losers also experience return reversals in the long-term, however, the positive performance of the loser portfolio does not appear to be significant. The evidence opposes De Bondt and Thaler (1985) who find that most of the over reaction can be attributed to the loser portfolio. Bremer and Hiraki (1999) find evidence in support of De Bondt and Thaler (1985) however, conclude that a contrarian strategy is unlikely to earn substantial profits.

University of Cape Town

## 3.7. Summary and conclusion

The presence of style anomalies is clearly evident in both the international and Japanese specific literature. While findings relating to market efficiency differ, the difficulty in testing market efficiency is well recognised. The evidence does appear to support the notion that markets are semi-strong-form efficient and not strong-form efficient. Furthermore, the persistence of anomalies over time is indicative of model misspecification rather than gross market inefficiency [Reinganum, (1981)].

Numerous studies document that beta is not the sole determinant of risk in equity markets. It is shown that size and value variables have the ability to explain variation in returns beyond that explained by beta [Fama and French, (1992)]. Furthermore, several anomalies appear to persist across different markets and time periods [Michaud, (1999)].

Possible explanations for the presence of anomalies include both risk-based and non-risk based alternatives [MacKinlay, (1995)]. Risk-based alternatives comprise multifactor asset pricing models and misestimated risk. Non-risk based alternatives include statistical and methodological biases, market frictions and investor irrationality.

Japanese specific research appears to support international findings. Beta does not seem to be the sole determinant of risk on the TSE as the size and value effects are clearly evident. The Japanese market does appear to differ from the U.S. market in that Japanese market prices are based primarily on asset valuation as opposed to earnings valuation [Bildersee, Cheh and Lee, (1990)].

The following anomalies are documented by several authors as having the ability to explain the cross section of stock returns on the TSE. The are: size [Chan, Hamao and Lakonishok, (1991); Cai, (1997); Bae and Kim, (1998); Chen and Zhang (1998) and Hodoshima *et al,* (2000)]; BTMV [Chan, Hamao and Lakonishok, (1991); Cai, (1997); Bae and Kim, (1998); and Daniel, Titman and Wei, (2001)]; cash-flow yield [Chan, Hamao and Lakonishok, (1991); and Cai, (1997)]; earnings yield [Bae and Kim, (1998)];

University of Cape Town

dividend yield [Michaud, (1999)]; net current asset value [Bildersee, Cheh and Zutshi, (1993)]; real estate to total assets [Bae and Kim, (1998)]; depreciation [Hall, Hamao and Harris, (1994)]; and research and development intensity [Xu and Zhang, (2004)].

University of Cape Town

# 4. Data and Descriptive Statistics

## 4.1. Introduction

This chapter introduces the data used in the empirical analyses conducted in Chapters Five, Six and Seven. The data consists of two subsets, stock return data and firm-specific attribute data. Each dataset and associated adjustments are discussed in detail. An investigation into statistical biases that may be evident in the data is also presented. An awareness of these statistical biases is required due to their ability to significantly affect statistical results. Finally, the descriptive statistics for the firm-specific attribute data are presented.

The remainder of the chapter is organised as follows. Section 4.2. presents the data and discusses the associated statistical biases, Section 4.3. displays the firm-specific descriptive statistics and finally, Section 4.4. summarises and concludes.

University of Cape Town

## 4.2. Data

Both stock return data and firm-specific attribute data are obtained from Datastream International at the University of Cape Town. Monthly data are collected for the period 1 January 1990 to 31 May 2005. In-sample data covers the eight years from 1 January 1993 to 31 December 2000. Out of sample data covers the four years from 1 January 2001 to 31 December 2004. Data collected prior to 1993 is used for momentum calculations and where lagged data are required.

All stocks listed on the Tokyo Stock Price Index (TOPIX) 1000 index as of 31 May 2005 are included in the sample. Appendix A.1. presents the organisation of indices on the TSE as provided by the TSE itself. The TOPIX is market value weighted and is

calculated and published by the TSE. Only stocks that are listed on the First Section of the TSE are used in the analyses. The TSE comprises two sections, the First and Second Sections. Shares listed on the First Section of the stock exchange are larger, older and more frequently traded than those listed on the Second Section. At the end of each business year all stocks are reviewed according to specific criteria. A stock may be relegated to the Second Section or promoted to the First Section depending on whether they meet the criteria or not. As of 31 May 2005 there are 1677 stocks listed on the First Section and 524 stocks listed on the Second Section.

### 4.2.1. Statistical biases

Numerous past studies are criticised on the grounds of statistical biases in the data. These biases include look-ahead bias, infrequent trading, data snooping and survivorship bias. It is important to minimise statistical biases in the data in order to ensure that the results obtained are statistically sound.

#### 4.2.1.1. Look-ahead bias

Look-ahead bias occurs when the variables used in the analysis are unknown to investors at the time that they are included in the dataset. For example, the assumption that earnings figures become available at the end of the financial year is false. The earnings figures only become public knowledge several weeks after the financial year end. Both Banz and Breen (1986) and van Rensburg and Robertson (2003) use lagged data to avoid look-ahead bias. Datastream International records information only once it is available to market participants. This thesis is therefore free from look-ahead bias.

#### 4.2.1.2. Infrequent trading bias

Infrequent trading bias can arise in two forms namely non-synchronous trading and non-trading. Non-synchronous trading refers to the fact that security prices are often studied as if those prices are determined at the same moment in time, however, securities do not necessarily trade at the same moment in time. As a result, the price of a security recorded at the end of a time period may actually represent a transaction that occurred some time

University of Cape Town

prior to the recording date. Non-trading occurs when securities are not traded in every time period, resulting in a stale market price.

The effect of non-synchronous trading on empirical results can be significant. Fama (1965) and Fisher (1966) demonstrate that non-synchronous trading results in measurement error in the recorded returns of stocks, portfolios and indices. More specifically, non-synchronous trading results in positive serial correlation in the returns of portfolios and indices constructed from the prices of shares that are not traded at the end of a certain time period. The positive serial correlation results in the estimated variance of returns on the index to be downward biased.

The effect of non-trading of a share during a time period is also relevant. If the share does not trade over the period and no dividend is paid a rate of return of zero, for that share over that time period, will exist [Janari, (2005)].

Infrequent trading results in a bias in the estimation of systematic risk. Scholes and Williams (1977) argue that non-synchronous trading results in inconsistent and biased market model coefficients. The study finds that, for stocks that are traded both infrequently and very frequently, the alpha estimates obtained are upward biased while the beta estimates obtained are downward biased. Dimson (1979) agrees with Scholes and Williams (1977), reporting that the covariance between thinly traded shares and the market is downward biased and therefore beta coefficients are significantly miss-estimated.

Several solutions to the infrequent trading problem are proposed. Dimson and Marsh (1983) use information on the timing of the last trade to adjust the data. Returns are no longer calculated on a month-to-month basis but rather on a trade-to-trade basis. Market returns are measured over the same calendar period. Betas are then calculated from these trade-to-trade regressions. The observations are weighted to allow for different period length since the last trade. In other words, the weights are proportional to the frequency of trades. Weighting observations ensures that the coefficients are unbiased and efficient.

University of Cape Town

Data regarding the timing of a trade is not easily obtainable. In the absence of this data alternative adjustment techniques are proposed. Ibbotson (1975) and Schwert (1977) adapt the market model to include a lagged market index as an additional explanatory variable. Dimson (1979) argues that this method is only justified if the constituents of the market index do not suffer from more than a negligible amount of non-trading.

The Aggregate Coefficients Method (ACM) is proposed by Dimson (1979). This method involves regressing security returns against lagged, matching and leading market returns. A beta estimate is attained by aggregating the slope coefficients calculated in this multiple regression. Dimson (1979) argues that the method is advantageous because it requires neither the market index to be continuously traded nor data regarding the timing of transactions to be available. The ACM eliminates most of the bias attributable to infrequent trading.

Davis (1994) eliminates the problem of infrequent trading by only including stocks in the top half of the size spectrum in his study. Elton and Gruber (1988) report that Japanese financial stocks are thinly traded and therefore exclude them from the analysis.

This study adjusts the data for infrequent trading bias by using a thin trade filter to remove shares that are thinly traded form the sample. This method is similar to that of van Rensburg and Robertson (2003). Van Rensburg and Robertson (2003) filter their data set to include only shares with a monthly trading volume ratio greater than 0.01%. This method only removes the thinly traded share from the month in which it is thinly traded and retains the share for months that it is not thinly traded. The thin trade filter used here is slightly different in that if a share is thinly traded in any month it is removed from the sample entirely. The thin trade filter is discussed further in Section 4.2.2.1.

#### 4.2.1.3. Outliers

The dataset used may contain outliers or influential observations which can possibly be a result of abnormal events or errors in the data. The outliers, despite the possibility that they may represent accurate observations, have a dominating influence on statistical tests

University of Cape Town

and hence may affect results. Outliers are thus truncated using the winsorisation procedure discussed in Section 4.2.2.1.

#### 4.2.1.4. Survivorship bias

Companies may be excluded from the dataset due to the fact that they have delisted, liquidated or merged. This occurrence gives rise to survivorship bias. Survivorship bias will significantly affect statistical results because only companies that survive till the end of the specified period studied are included. This study is subject to survivorship bias as only stocks listed as of the 31 May 2005 are included in the sample. Some studies argue that survivorship bias does not affect results. Chan, Hamao and Lakonishok (1991) study 123 stocks that delisted from the TSE over the period the period 1971-1988. The study shows the significant relationship between security returns and fundamental values to persist. Cai (1997) argues that survivorship bias is not particularly relevant in the Japanese market because the number of delistings is small.

The Davis (1994) paper, discussed in Chapter Three, Section 3.5.2.1, studies Moody's data which contains no survivorship, look-ahead and thin-trading biases that are evident in COMPUSTAT data. The study finds that anomalies such as the BTMV, earnings yield and seasonality effects persist even though the dataset does not suffer from any methodological biases. Davis (1994) concludes that deviations from the CAPM cannot be explained by biases in the data.

University of Cape Town

### 4.2.2. Stock return data

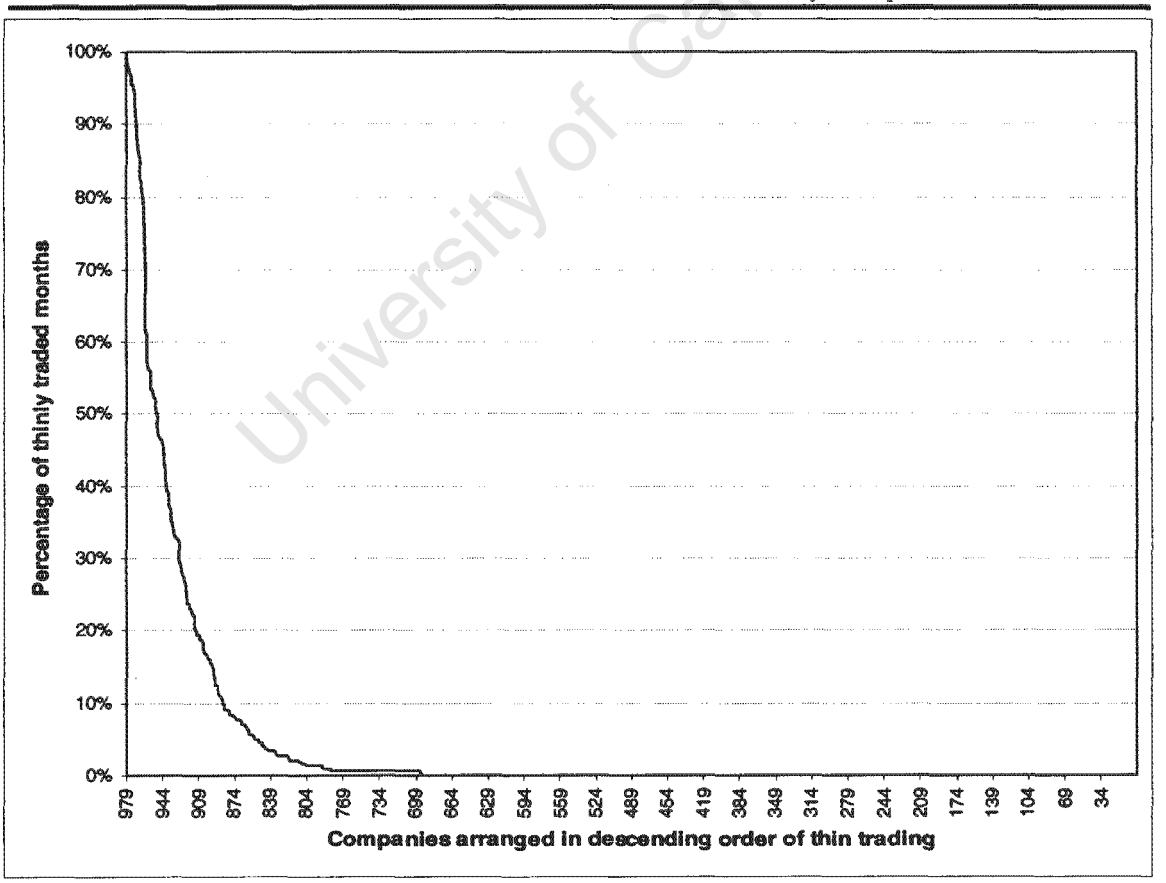
Stock return data are obtained from Datastream International for the period 31 January 1990 to 31 May 2005. Datastream computes the return index (RI) for each stock. The return index calculates the theoretical growth in value of a share for a specific holding period. This return includes both capital gain and dividend yield and is adjusted to incorporate the effect of any other capital event. The index assumes that dividends are re-invested to purchase additional units of the stock at the closing price on the ex-dividend date.

#### 4.2.2.1. Adjustments to stock return data

The data collected is required to be adjusted for possible statistical biases arising from infrequent or non-synchronous trading and outliers. In order to adjust the data for thin trading, a method similar to Janari (2005) is used. The trading volume ratio (TV) is calculated, for each share in each month, as the volume traded per day divided by the number of shares in issue on the last day of the previous month. If the share has a trading volume ratio below 0.01% the share is categorised as being as thinly traded. For each company the ratio of thinly traded months to total months for which volume data are available is calculated. Figure 4.1 shows the results graphically.

**Figure 4.1: Number of non-thinly traded shares**

The graph shows the proportion of thinly traded months relative to total months for which volume data are available for the period January 1993 to December 2004. The trading volume ratio is calculated for each share in each month as the volume traded per day divided by the number of shares in issue on the last day of the previous month. If the share has a trading ratio below 0.01% the share is categorised as being thinly traded. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

Figure 4.1 indicates that the Japanese market is moderately liquid. Only two shares are thinly traded in every month. If all shares that are thinly traded in at least one month are removed from the sample, 694 stocks would remain. These 694 stocks are never thinly traded i.e. the percentage of thinly traded months is zero. It is decided that the sample will be comprised of these 694 stocks. Thus 286 stocks are removed from the sample. Finally, 43 stocks are removed for lack of return data.

Stock return data may be affected by extreme observations and outliers. Stock return data are adjusted using the following winsorisation procedure similar to Janari (2005). First the mean and standard deviation is calculated for each variable in each month. All observations that are greater than three standard deviations away from the mean are temporarily removed from the sample. Once these observations are removed, the mean and standard deviation is re-calculated for each variable in each month. Finally any observation (including those previously removed from the sample) that is greater than three re-calculated standard deviations away from the re-calculated mean is truncated so that it is exactly equal to three re-calculated standard deviations from the re-calculated mean. This procedure is successful in truncating extreme outliers from the data without reducing the number of observations.

University of Cape Town

### 4.2.3. Firm-specific attribute data

Firm-specific attribute data are obtained from Datastream International for the period 31 January 1990 to 31 May 2005. As previously mentioned, empirical tests are performed on the data covering only the 1 January 1993 to 31 December 2004 period. Data collected prior to 1993 are used for momentum calculations and where lagged data are required. Firm-specific attribute data refers to any financial information relating to a particular firm. These may include financial ratios, accounting line items and technical indicators. Firm-specific attributes may also be referred to as attributes, style characteristics, characteristics, variables or anomalous factors. The data set consists of 226 attributes. Several attributes included in the analysis have been identified by previous studies as having the ability to explain the cross-sectional variation in stock

returns on the TSE. Numerous additional attributes and their respective percentage changes are tested here for the first time.

Table 4.1. lists the firm-specific attributes used in the empirical analysis. For most attributes the six-month, one-year and two-year percentage change is computed. In addition the one-month and three-month percentage change is computed for a handful of attributes. The percentage change variables are clearly indicated by including either "_1m", "_3m", "_6m", "_1yr", or "_2yr" at the end of the attributes' name. Table 4.1. also displays the construction of the firm-specific attributes using Datastream International items. A correlation matrix displaying the Pearson correlation coefficient between all firm-specific variables is shown in Appendix A.5.

Attributes are either obtained directly from Datastream International or calculated using Datastream International items. Appendix A.2. presents the definitions of the Datastream International items used. Appendix A.3. displays attribute availability in the first month of each year in the sample and Appendix A.4. displays the average attribute availability over the in-sample and out-sample periods. Datastream International obtains firm-specific attribute data from the quoted published accounts of the companies. In most cases consolidated financials are used unless they are unavailable. In such cases parent financial statements are used. As previously mentioned, Datastream International records this data once it has become publicly available therefore eliminating the effects of look-ahead bias.

University of Cape Town

#### 4.2.3.1. Adjustments to firm-specific attribute data

The data in the sample are required to be adjusted for outliers and influential observations which may significantly affect statistical results of tests and procedures. A winsorisation procedure, identical to the one discussed in Section 4.2.2.1, is used to remove outliers and influential observations from the firm-specific attribute data. Finally, in order to allow direct comparison of regression coefficients in Chapter Six, the firm-specific attribute data are standardised so that each variable has a mean of zero and a standard deviation of one.

**Table 4.1.: Style Characteristic codes and construction**

Shows the name, code and construction for each style characteristic employed in the analysis. For most attributes the -6m, -1yr and -2yr percentage change is computed. In addition the -1m and -3m percentage change is computed for a handful of attributes. Market an accounting line items obtained from Datastream International at the University of Cape Town are defined in Appendix A.2.

| Style Group | Code Used | Style Characteristic | Formula for Construction |
|---|---|---|---|
| Size | BVpS | Book Value per Share | [Book Value per Share] |
| | CPS | Cash Flow per Share | [Cash Earnings] / [Number of Shares] |
| | DIV | Dividends Paid | [Dividends Paid] |
| | DPS | Dividends per Share | [Dividends per Share] |
| | EPS | Earnings per Share | [Earnings per Share] |
| | LnMV | Log of Market Value | ln[MV] |
| | NAVpS | Net Asset Value per Share | ([Total Assets] - [Total Liabilities]) / [Number of Shares] |
| | NS | Number of Shares | [Number of Shares] |
| | P | Price | [Price] |
| Value | BTMV | Book to Market Value | 1 / [Market to Book Value] |
| | CEY | Cash Earnings Yield | ([Cash Earnings] / [Number of Shares]) / [Price] |
| | DY | Dividend Yield | [Dividend Yield] |
| | EY | Earnings Yield | [Earnings per Share] / [Price] |
| | Intan_MV | Intangibles to Market Value | [Total Intangibles] / [Market Value] |
| | MTBV | Market Value to Book Value | [Market Value to Book Value] |
| | NCA_MV | Net Current Assets to Market Value | ([Total Current Assets] - [Total Current Liabilities]) / [Market Value] |
| | PEGI | Price Earnings to Sustainable Rate of Growth | ([Price] / [Earnings per Share]) / [Return on Equity (published)] x (1- [Payout Ratio]) |

University of Cape Town

**Table 4.1.: Style characteristic codes and construction**
-continued

| Style Group | Code Used | Style Characteristic | Formula for Construction |
|---|---|---|---|
| Performance | AccRec | Accounts Receivable | [Total Debtors and Equivalent] |
| | AssTurn | Asset Turnover | [Total Sales] / [Total Assets] |
| | Borrow | Borrowing Ratio | [Total Loan Capital] / ([Total Equity Capital and Reserves] - [Total Intangibles]) |
| | CFMtP | Cash Flow Margin to Price | [Cash Flow Margin] / [Price] |
| | ChEPS_P_1yr | 1-year Change in EPS to Price | $([\text{Earnings per Share}]_t - [\text{Earnings per Share}]_{t-12}) / [\text{Price}]_{t-12}$ |
| | ChEPS_P_2yr | 2-year Change in EPS to Price | $([\text{Earnings per Share}]_t - [\text{Earnings per Share}]_{t-24}) / [\text{Price}]_{t-24}$ |
| | ChEPS_P_6m | 6-month Change in EPS to Price | $([\text{Earnings per Share}]_t - [\text{Earnings per Share}]_{t-6}) / [\text{Price}]_{t-6}$ |
| | ChSalelsChAR | One Year Change in Sales less One Year Change in Accounts Recievable | $([\text{Total Sales}]_t - [\text{Total Sales}]_{t-12}) - ([\text{Total Debtors and Equivalent}]_t - [\text{Total Debtors and Equivalent}]_{t-12})$ |
| | ChSalelsChInv | One Year Change in Sales less One Year Change in Inventory | $([\text{Total Sales}]_t - [\text{Total Sales}]_{t-12}) - ([\text{Total Stock and WIP}]_t - [\text{Total Stock and WIP}]_{t-12})$ |
| | DepAmort_TA | Depreciation and Amortisation to Total Assets | ([Total Depreciation] + [Amortisation]) / [Total Assets] |
| | EPS_2yrAV | Earnings per Share 2-year Average | $([\text{Earnings per Share}]_t + [\text{Earnings per Share}]_{t-12}) / 2$ |
| | EqCapRes | Equity Capital and Reserves | [Equity Capital and Reserves] |
| | Gear | Capital Gearing | [Capital Gearing Ratio] |
| | ICBT | Interest Cover Before Tax | [Profit before Interest and Tax] / [Total Interest Charge] |
| | INV | Inventories | [Total Stock and Work in Progress] |

University of Cape Town

**Table 4.1.: Style characteristic codes and construction**
-continued

| Style Group | Code Used | Style Characteristic | Formula for Construction |
|---|---|---|---|
| Performance | NCF | Net Cash Flow | [Net Cash Flow] |
| | NCF_BP1yr | Net Cash Flow to Borrowings Payable in One Year | [Net Cash Flow] / [Borrowings Payable in One Year] |
| | NCF_BP1yrDiv | Net Cash Flow to Borrowings Payable in One Year plus Dividends | [Net Cash Flow] / ([Borrowings Payable in One Year] + [Dividends]) |
| | NCF_TD | Net Cash Flow to Total Debt | [Net Cash Flow] / [Total Debt] |
| | NPMtP | Net Profit Margin to Price | [Net Profit Margin] / [Price] |
| | OPMtP | Operating Margin to Price | [Operating Margin] / [Price] |
| | PPMtP | Pre-tax Profit Margin to Price | [Pre-tax Profit Margin] / [Price] |
| | Quick | Quick Assets Ratio | ([Total Current Assets] - [Total Stock and WIP]) / [Total Current Liabilities] |
| | ROCE | Return on Capital Employed | [Return on Capital Employed] |
| | ROEpub | Return on Equity Published | [Return on Equity (Published)] |
| | Sales_Emp | Sales per Employee | [Total Sales] / [Number of Employees] |
| | Sales_P | Sales to Price Ratio | ([Total Sales] / [Number of Shares]) / [Price] |
| | TD_TA | Total Debt to Total Assets | [Total Debt] / [Total Assets] |
| | TLC_TA | Total Loan Capital to Total Assets | [Total Loan Capital] / [Total Assets] |
| | WC | Working Capital Ratio | [Total Current Assets] / [Total Current Liabilities] |

University of Cape Town

**Table 4.1.: Style characteristic codes and construction**
-continued

| Style Group | Code Used | Style Characteristic | Formula for Construction |
|---|---|---|---|
| Growth | Growth | Sustainable Rate of Growth | [Return on Equity (published)] x (1- [Payout Ratio]) |
| | RD_EQ | Research and Development to Total Equity | [Research and Development] / [Equity Capital and Reserves] |
| | RD_TA | Research and Development to Total Assets | [Research and Development] / [Total Assets] |
| | Reten | Retention Ratio | 1 - [Payout Ratio] |
| Momentum | Crossover1_18 | 1-month Crossover of 18-month Momentum | ([One Month Momentum] - [Eighteen Month Momentum]) / [Eighteen Month Momentum] |
| | Crossover1_3 | 1-month Crossover of 3-month Momentum | ([One Month Momentum] - [Three Month Momentum]) / [Three Month Momentum] |
| | Crossover3_1 | 3-month Crossover of 1-month Momentum | ([Three Month Momentum] - [One Month Momentum]) / [One Month Momentum] |
| | Crossover3_12 | 3-month Crossover of 12-month Momentum | ([Three Month Momentum] - [Twelve Month Momentum]) / [Twelve Month Momentum |
| | Crossover3_18 | 3-month Crossover of 18-month Momentum | ([Three Month Momentum] - [Eighteen Month Momentum]) / [Eighteen Month Momentum] |
| | Crossover6_12 | 6-month Crossover of 12-month Momentum | ([Six Month Momentum] - [Twelve Month Momentum]) / [Twelve Month Momentum] |
| | Crossover6_18 | 6-month Crossover of 18-month Momentum | ([Six Month Momentum] - [Eighteen Month Momentum]) / [Eighteen Month Momentum] |
| | MOM_12m | 12-month Momentum in Returns | $([\text{Return Index}]_t - [\text{Return Index}]_{t-12}) / [\text{Return Index}]_{t-12}$ |
| | MOM_18m | 18-month Momentum in Returns | $([\text{Return Index}]_t - [\text{Return Index}]_{t-18}) / [\text{Return Index}]_{t-18}$ |
| | MOM_1m | 1-month Momentum in Returns | $([\text{Return Index}]_t - [\text{Return Index}]_{t-1}) / [\text{Return Index}]_{t-1}$ |
| | MOM_3m | 3-month Momentum in Returns | $([\text{Return Index}]_t - [\text{Return Index}]_{t-3}) / [\text{Return Index}]_{t-3}$ |
| | MOM_6m | 6-month Momentum in Returns | $([\text{Return Index}]_t - [\text{Return Index}]_{t-6}) / [\text{Return Index}]_{t-6}$ |

University of Cape Town

**Table 4.1.: Style characteristic codes and construction**
-continued

| Style Group | Code Used | Style Characteristic | Formula for Construction |
|---|---|---|---|
| Liquidity | MVT | Market Value Traded | [Turnover by Volume] * [Price] |
| | MVT_MV | Market Value Traded to Market Value | ([Turnover by Volume] * [Price]) / [Market Value] |
| | TV | Trading Volume Ratio | $([\text{Turnover by Volume}]_t / [\text{Trading Days}]_t) / [\text{Number of Shares in Issue}]_{t-1}$ |
| | VO | Share Volume Traded | [Turnover by Volume] |

University of Cape Town

## 4.3. Descriptive statistics

The descriptive statistics are the average of the monthly cross-sectional averages for all stocks after conducting the thin trade and winsorisation procedures and before the standardisation procedure. The in-sample data covers the eight years from 1 January 1993 to 31 December 2000 while out-sample data covers the four years from 1 January 2001 to 31 December 2004.

Table 4.2. displays the mean of monthly means, mean of monthly medians and the mean of monthly standard deviations for each style characteristic calculated for both the in- and out-sample periods. Characteristics are separated into their respective style groups as shown in Table 4.1.

University of Cape Town

**Table 4.2.: Descriptive statistics for firm-specific attributes**

The table shows the mean of monthly means, mean of monthly medians and the mean of monthly standard deviations for each style characteristic calculated for both the in- and out-sample periods. The in-sample data covers the eight years from 1 January 1993 to 31 December 2000 while out-sample data covers the 4 years from 1 January 2001 to 31 December 2004. The percentage change variables are clearly indicated by including either "_1m", "_3m", "_6m", "_1yr", or "_2yr" at the end of the attributes' name. The data are obtained from Datastream International at the University of Cape Town.

| | Mean of Monthly Means | | Mean of Monthly Medians | | Mean of Monthly Standard Deviations | |
|---|---|---|---|---|---|---|
| Characteristic | In Sample | Out Sample | In Sample | Out Sample | In Sample | Out Sample |
| ***SIZE*** | | | | | | |
| BVPS | 876.943 | 1407.691 | 1420.795 | 662.967 | 544.985 | 3354.072 |
| BVPS_1YR | 0.027 | 0.036 | 0.110 | 0.037 | 0.025 | 0.181 |
| BVPS_2YR | 0.055 | 0.079 | 0.171 | 0.068 | 0.050 | 0.283 |
| BVPS_6M | 0.013 | 0.018 | 0.058 | 0.017 | 0.010 | 0.092 |
| CPS | 156.489 | 258.047 | 427.895 | 82.703 | 72.627 | 823.458 |
| CPS_1YR | 0.017 | 0.000 | 0.747 | 0.006 | 0.002 | 1.724 |
| CPS_2YR | 0.034 | 0.048 | 0.811 | 0.044 | 0.001 | 1.722 |
| CPS_6M | 0.010 | -0.002 | 0.385 | -0.005 | 0.002 | 0.874 |
| DIV | 1982135.568 | 2069157.668 | 2787196.361 | 920076.042 | 957764.026 | 3029273.505 |
| DIV_1YR | 0.026 | 0.242 | 0.303 | 0.000 | 0.001 | 2.389 |
| DIV_2YR | 0.061 | 0.356 | 0.420 | 0.006 | 0.014 | 2.873 |
| DIV_6M | 0.013 | 0.118 | 0.156 | 0.000 | 0.000 | 1.172 |
| DPS | 13.316 | 20.030 | 26.741 | 9.167 | 7.740 | 48.005 |
| DPS_1YR | 0.010 | 0.046 | 0.245 | 0.000 | 0.000 | 0.297 |
| DPS_2YR | 0.024 | 0.074 | 0.354 | 0.004 | 0.000 | 0.428 |
| DPS_6M | 0.006 | 0.023 | 0.150 | 0.000 | 0.000 | 0.167 |
| EPS | 45.373 | 64.827 | 98.690 | 18.176 | 18.598 | 157.463 |
| EPS_1YR | 0.021 | 0.265 | 0.686 | -0.027 | -0.048 | 1.576 |
| EPS_2YR | 0.042 | 0.288 | 0.917 | -0.012 | -0.117 | 1.385 |
| EPS_6M | 0.008 | 0.165 | 0.512 | 0.001 | -0.022 | 1.073 |
| LNMV | 11.736 | 11.520 | 1.170 | 11.302 | 11.568 | 1.268 |
| LNMV_1M | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.007 |
| LNMV_1YR | -0.001 | 0.003 | 0.025 | 0.002 | -0.003 | 0.028 |
| LNMV_2YR | -0.006 | 0.000 | 0.033 | -0.001 | -0.009 | 0.039 |
| LNMV_3M | 0.000 | 0.001 | 0.012 | 0.001 | -0.001 | 0.013 |
| LNMV_6M | 0.000 | 0.001 | 0.018 | 0.001 | -0.002 | 0.019 |
| NAVPS | 1155.279 | 1727.480 | 2810.240 | 778.463 | 630.976 | 4643.040 |
| NAVPS_1YR | 0.028 | 0.042 | 0.092 | 0.034 | 0.022 | 0.153 |
| NAVPS_2YR | 0.054 | 0.080 | 0.148 | 0.066 | 0.048 | 0.224 |
| NAVPS_6M | 0.013 | 0.021 | 0.048 | 0.017 | 0.009 | 0.077 |
| NS | 216561.475 | 209526.734 | 239933.685 | 116755.208 | 127885.314 | 244793.709 |
| NS_1YR | 0.007 | 0.003 | 0.023 | -0.001 | 0.000 | 0.037 |
| NS_2YR | 0.014 | 0.010 | 0.037 | -0.001 | 0.001 | 0.059 |
| NS_6M | 0.003 | 0.001 | 0.012 | 0.000 | 0.000 | 0.018 |
| P | 2046.883 | 2331.066 | 4567.176 | 706.458 | 868.963 | 6213.947 |
| P_1M | 0.003 | 0.007 | 0.083 | 0.002 | -0.004 | 0.083 |
| P_1YR | 0.040 | 0.072 | 0.309 | 0.034 | -0.028 | 0.316 |
| P_2YR | 0.011 | 0.065 | 0.404 | -0.008 | -0.091 | 0.436 |
| P_3M | 0.010 | 0.020 | 0.141 | 0.008 | -0.007 | 0.148 |
| P_6M | 0.027 | 0.037 | 0.212 | 0.015 | -0.009 | 0.217 |
| ***VALUE*** | | | | | | |
| BTMV | 0.691 | 0.951 | 0.355 | 0.865 | 0.638 | 0.560 |
| BTMV_1YR | 0.103 | 0.059 | 0.308 | 0.006 | 0.080 | 0.386 |
| BTMV_2YR | 0.226 | 0.198 | 0.434 | 0.084 | 0.174 | 0.655 |
| BTMV_6M | 0.057 | 0.027 | 0.224 | 0.008 | 0.045 | 0.248 |
| CEY | 0.089 | 0.126 | 0.076 | 0.111 | 0.078 | 0.122 |
| CEY_1YR | 0.087 | 0.018 | 0.887 | -0.022 | 0.036 | 1.765 |
| CEY_2YR | 0.163 | 0.093 | 1.005 | 0.032 | 0.087 | 1.961 |
| CEY_6M | 0.053 | 0.021 | 0.504 | -0.002 | 0.028 | 0.906 |

University of Cape Town

**Table 4.2.: Descriptive statistics for firm-specific attributes**
-continued

| Characteristic | Mean of Monthly Means | | Mean of Monthly Medians | | Mean of Monthly Standard Deviations | |
|---|---|---|---|---|---|---|
| | In Sample | Out Sample | In Sample | Out Sample | In Sample | Out Sample |
| DY | 0.961 | 1.251 | 0.604 | 1.173 | 0.899 | 0.815 |
| DY_1YR | 0.089 | 0.088 | 0.390 | 0.015 | 0.065 | 0.466 |
| DY_2YR | 0.198 | 0.209 | 0.547 | 0.074 | 0.144 | 0.696 |
| DY_6M | 0.046 | 0.045 | 0.267 | 0.015 | 0.037 | 0.297 |
| EY | 0.023 | 0.030 | 0.018 | 0.026 | 0.021 | 0.027 |
| EY_1YR | 0.080 | 0.255 | 0.749 | -0.063 | -0.028 | 1.528 |
| EY_2YR | 0.114 | 0.294 | 0.912 | -0.018 | -0.054 | 1.343 |
| EY_6M | 0.046 | 0.174 | 0.563 | -0.004 | -0.001 | 1.093 |
| INTAN_MV | 12.469 | 35.231 | 18.047 | 18.910 | 4.787 | 42.727 |
| INTAN_MV_1YR | 0.597 | 0.497 | 1.495 | 0.084 | 0.147 | 1.307 |
| INTAN_MV_2YR | 0.981 | 2.382 | 2.319 | 0.541 | 0.302 | 5.092 |
| INTAN_MV_6M | 0.315 | 0.126 | 0.875 | 0.012 | 0.076 | 0.486 |
| MTBV | 2.008 | 1.500 | 1.315 | 1.154 | 1.626 | 1.196 |
| MTBV_1YR | 0.011 | 0.054 | 0.307 | 0.015 | -0.045 | 0.343 |
| MTBV_2YR | -0.038 | 0.015 | 0.378 | -0.057 | -0.115 | 0.473 |
| MTBV_6M | 0.012 | 0.033 | 0.225 | 0.006 | -0.021 | 0.242 |
| NCA_MV | 243.781 | 234.780 | 335.289 | 243.341 | 236.987 | 544.327 |
| NCA_MV_1YR | 0.115 | 0.018 | 1.092 | -0.038 | 0.056 | 1.367 |
| NCA_MV_2YR | 0.147 | 0.119 | 1.367 | -0.015 | 0.067 | 2.007 |
| NCA_MV_6M | 0.065 | 0.009 | 0.602 | -0.009 | 0.041 | 0.681 |
| PEGI | 79.838 | 60.564 | 363.977 | 7.258 | 12.166 | 276.057 |
| PEGI_1YR | 0.743 | 1.667 | 3.763 | -0.148 | 0.028 | 12.230 |
| PEGI_2YR | 2.980 | 3.002 | 12.994 | -0.242 | 0.211 | 20.263 |
| PEGI_6M | 0.305 | 0.554 | 1.848 | -0.086 | -0.005 | 4.910 |
| ***PERFORMANCE*** | | | | | | |
| ACCREC | 73081053.931 | 78587565.961 | 87581899.878 | 40319902.000 | 38893156.417 | 98956872.845 |
| ACCREC_1YR | 0.035 | 0.036 | 0.149 | 0.018 | 0.020 | 0.171 |
| ACCREC_2YR | 0.065 | 0.080 | 0.218 | 0.033 | 0.031 | 0.269 |
| ACCREC_6M | 0.017 | 0.016 | 0.078 | 0.008 | 0.009 | 0.087 |
| ASSTURN | 0.908 | 0.933 | 0.456 | 0.885 | 0.858 | 0.483 |
| ASSTURN_1YR | -0.006 | 0.017 | 0.085 | 0.014 | -0.006 | 0.103 |
| ASSTURN_2YR | -0.018 | 0.026 | 0.119 | 0.019 | -0.022 | 0.143 |
| ASSTURN_6M | -0.002 | 0.008 | 0.045 | 0.005 | -0.002 | 0.053 |
| BORROW | 143.862 | 138.572 | 242.883 | 48.402 | 66.300 | 300.219 |
| BORROW_1YR | -0.005 | -0.043 | 0.371 | -0.087 | -0.027 | 0.489 |
| BORROW_2YR | 0.048 | 0.033 | 0.635 | -0.147 | -0.031 | 1.078 |
| BORROW_6M | -0.005 | -0.027 | 0.189 | -0.039 | -0.011 | 0.243 |
| CFMTP | 0.008 | 0.011 | 0.010 | 0.007 | 0.006 | 0.015 |
| CFMTP_1YR | 0.066 | -0.032 | 0.858 | -0.050 | 0.023 | 1.725 |
| CFMTP_2YR | 0.123 | 0.009 | 0.992 | -0.021 | 0.053 | 1.924 |
| CFMTP_6M | 0.043 | -0.001 | 0.495 | -0.015 | 0.022 | 0.876 |
| CHEPS_P_1YR | -0.001 | 0.004 | 0.015 | 0.002 | -0.001 | 0.031 |
| CHEPS_P_2YR | -0.002 | 0.007 | 0.018 | 0.003 | -0.002 | 0.035 |
| CHEPS_P_6M | -0.001 | 0.002 | 0.011 | 0.001 | 0.000 | 0.022 |
| CHSALELSCHAR | -0.012 | -0.003 | 0.127 | 0.004 | -0.006 | 0.140 |
| CHSALELSCHINV | -0.002 | -0.002 | 0.172 | 0.013 | 0.001 | 0.245 |
| DEPAMORT_TA | 0.074 | 0.101 | 0.041 | 0.088 | 0.067 | 0.061 |
| DEPAMORT_TA_1YR | 0.020 | -0.022 | 0.162 | -0.014 | -0.002 | 0.163 |
| DEPAMORT_TA_2YR | 0.022 | -0.025 | 0.245 | -0.013 | -0.027 | 0.215 |
| DEPAMORT_TA_6M | 0.007 | -0.013 | 0.075 | -0.009 | -0.003 | 0.076 |
| EPS_2YRAV | 42.137 | 67.327 | 80.437 | 17.711 | 19.189 | 168.661 |
| EQCAPRES | 120884906.274 | 144672814.754 | 148531681.580 | 68937700.833 | 64106497.500 | 194420417.554 |
| EQCAPRES_1YR | 0.046 | 0.041 | 0.154 | 0.033 | 0.028 | 0.207 |
| EQCAPRES_2YR | 0.095 | 0.101 | 0.265 | 0.064 | 0.059 | 0.392 |
| EQCAPRES_6M | 0.021 | 0.020 | 0.078 | 0.015 | 0.011 | 0.106 |
| GEAR | 41.016 | 35.819 | 26.500 | 32.846 | 39.717 | 27.872 |
| GEAR_1YR | -0.024 | -0.045 | 0.241 | -0.041 | -0.012 | 0.330 |
| GEAR_2YR | -0.013 | -0.021 | 0.400 | -0.070 | -0.012 | 0.674 |
| GEAR_6M | -0.013 | -0.025 | 0.122 | -0.019 | -0.005 | 0.165 |

University of Cape Town

**Table 4.2.: Descriptive statistics for firm-specific attributes**
-continued

| Characteristic | Mean of Monthly Means | | Mean of Monthly Medians | | Mean of Monthly Standard Deviations | |
|---|---|---|---|---|---|---|
| | In Sample | Out Sample | In Sample | Out Sample | In Sample | Out Sample |
| ICBT | 46.879 | 119.349 | 216.660 | 8.684 | 4.935 | 433.266 |
| ICBT_1YR | 0.086 | -0.009 | 1.650 | 0.019 | 0.059 | 2.505 |
| ICBT_2YR | 0.318 | 0.452 | 2.379 | 0.099 | 0.099 | 4.931 |
| ICBT_6M | 0.037 | 0.001 | 0.856 | 0.006 | 0.024 | 1.190 |
| INV | 37742776.809 | 37473228.122 | 50208940.450 | 16804787.573 | 16582813.295 | 51223208.995 |
| INV_1YR | 0.031 | 0.039 | 0.171 | 0.007 | 0.016 | 0.288 |
| INV_2YR | 0.064 | 0.090 | 0.253 | 0.008 | 0.030 | 0.498 |
| INV_6M | 0.016 | 0.016 | 0.091 | 0.005 | 0.009 | 0.127 |
| NCF | 2217326.628 | -171336.703 | 22893335.241 | -176144.292 | 393232.891 | 17900958.114 |
| NCF_1YR | -0.207 | -0.690 | 6.492 | -1.069 | -0.959 | 8.435 |
| NCF_2YR | 9.434 | -0.967 | 26.082 | -1.039 | -1.177 | 8.533 |
| NCF_6M | -0.316 | -0.373 | 2.706 | -0.498 | -0.424 | 4.002 |
| NCF_BP1YR | 0.328 | 0.999 | 5.275 | -0.008 | 0.010 | 13.356 |
| NCF_BP1YR_1YR | -1.897 | -0.877 | 10.480 | -1.065 | -0.834 | 12.636 |
| NCF_BP1YR_2YR | -1.518 | -1.109 | 6.607 | -1.027 | -1.108 | 19.084 |
| NCF_BP1YR_6M | -0.929 | -0.473 | 5.043 | -0.505 | -0.392 | 6.089 |
| NCF_BP1YRDIV | 0.055 | 0.133 | 1.469 | -0.005 | 0.010 | 1.508 |
| NCF_BP1YRDIV_1YR | -1.369 | -0.874 | 8.638 | -1.063 | -0.952 | 9.480 |
| NCF_BP1YRDIV_2YR | -1.382 | -1.046 | 6.179 | -1.026 | -1.102 | 10.079 |
| NCF_BP1YRDIV_6M | -0.671 | -0.453 | 4.155 | -0.498 | -0.426 | 4.509 |
| NCF_TD | 0.036 | 0.250 | 0.556 | -0.004 | 0.004 | 4.447 |
| NCF_TD_1YR | -0.891 | -0.728 | 6.157 | -1.080 | -0.928 | 10.561 |
| NCF_TD_2YR | -1.316 | -1.209 | 5.884 | -1.036 | -1.236 | 12.232 |
| NCF_TD_6M | -0.445 | -0.397 | 2.996 | -0.502 | -0.422 | 5.032 |
| NPMTP | 0.001 | 0.001 | 0.005 | 0.002 | 0.002 | 0.010 |
| NPMTP_1YR | -0.175 | -0.450 | 2.229 | -0.164 | -0.084 | 3.020 |
| NPMTP_2YR | -0.294 | -0.549 | 3.183 | -0.179 | -0.138 | 5.963 |
| NPMTP_6M | -0.056 | -0.171 | 1.073 | -0.058 | -0.011 | 1.435 |
| OPMTP | 0.006 | 0.008 | 0.006 | 0.006 | 0.005 | 0.010 |
| OPMTP_1YR | 0.012 | 0.008 | 1.317 | -0.020 | 0.004 | 1.083 |
| OPMTP_2YR | -0.002 | 0.026 | 1.630 | -0.006 | 0.005 | 1.738 |
| OPMTP_6M | 0.022 | 0.018 | 0.719 | 0.002 | 0.018 | 0.565 |
| PPMTP | 0.004 | 0.003 | 0.007 | 0.004 | 0.003 | 0.014 |
| PPMTP_1YR | -0.148 | -0.469 | 1.776 | -0.167 | -0.064 | 3.077 |
| PPMTP_2YR | -0.187 | -0.512 | 2.137 | -0.180 | -0.103 | 4.088 |
| PPMTP_6M | -0.048 | -0.186 | 0.914 | -0.054 | -0.008 | 1.461 |
| QUICK | 1.360 | 1.291 | 0.889 | 1.021 | 1.092 | 0.922 |
| QUICK_1YR | 0.012 | -0.002 | 0.187 | -0.013 | 0.002 | 0.199 |
| QUICK_2YR | 0.015 | -0.011 | 0.239 | -0.032 | -0.002 | 0.261 |
| QUICK_6M | 0.005 | -0.001 | 0.097 | -0.005 | 0.002 | 0.101 |
| ROCE | 3.629 | 3.220 | 3.663 | 2.929 | 3.323 | 5.299 |
| ROCE_1YR | -0.162 | -0.394 | 1.242 | -0.120 | -0.097 | 2.578 |
| ROCE_2YR | -0.245 | -0.374 | 1.331 | -0.187 | -0.211 | 2.667 |
| ROCE_6M | -0.098 | -0.186 | 0.630 | -0.046 | -0.046 | 1.301 |
| ROEPUB | 4.212 | 3.746 | 8.280 | 4.351 | 4.159 | 13.483 |
| ROEPUB_1YR | -0.206 | -0.407 | 2.019 | -0.158 | -0.126 | 2.890 |
| ROEPUB_2YR | -0.297 | -0.360 | 2.663 | -0.241 | -0.258 | 4.805 |
| ROEPUB_6M | -0.098 | -0.190 | 1.024 | -0.063 | -0.050 | 1.461 |
| SALES_EMP | 76977.833 | 54218.959 | 57258.108 | 42716.329 | 58930.992 | 38048.734 |
| SALES_EMP_1YR | -0.007 | -0.004 | 0.139 | 0.001 | -0.015 | 0.141 |
| SALES_EMP_2YR | 0.021 | -0.082 | 0.203 | -0.082 | 0.004 | 0.216 |
| SALES_EMP_6M | -0.007 | 0.006 | 0.073 | 0.007 | -0.010 | 0.068 |
| SALES_P | 1.925 | 2.569 | 1.646 | 1.841 | 1.419 | 2.285 |
| SALES_P_1YR | 0.099 | 0.076 | 0.296 | 0.003 | 0.071 | 0.373 |
| SALES_P_2YR | 0.225 | 0.208 | 0.427 | 0.067 | 0.169 | 0.582 |
| SALES_P_6M | 0.051 | 0.037 | 0.213 | 0.009 | 0.038 | 0.242 |
| TD_TA | 0.292 | 0.252 | 0.202 | 0.220 | 0.276 | 0.208 |
| TD_TA_1YR | -0.018 | -0.005 | 0.257 | -0.048 | -0.015 | 0.630 |
| TD_TA_2YR | 0.024 | 0.002 | 0.491 | -0.081 | -0.005 | 0.762 |
| TD_TA_6M | -0.013 | -0.010 | 0.128 | -0.023 | -0.007 | 0.283 |

University of Cape Town

**Table 4.2.: Descriptive statistics for firm-specific attributes**
-continued

| Characteristic | Mean of Monthly Means | | Mean of Monthly Medians | | Mean of Monthly Standard Deviations | |
|---|---|---|---|---|---|---|
| | In Sample | Out Sample | In Sample | Out Sample | In Sample | Out Sample |
| TLC_TA | 0.156 | 0.125 | 0.127 | 0.100 | 0.141 | 0.125 |
| TLC_TA_1YR | 0.016 | 0.032 | 0.603 | -0.066 | -0.042 | 0.739 |
| TLC_TA_2YR | 0.212 | 0.065 | 1.600 | -0.122 | -0.045 | 1.035 |
| TLC_TA_6M | -0.002 | 0.012 | 0.283 | -0.026 | -0.020 | 0.369 |
| WC | 1.769 | 1.756 | 0.997 | 1.454 | 1.454 | 1.062 |
| WC_1YR | 0.011 | 0.007 | 0.167 | -0.003 | 0.003 | 0.173 |
| WC_2YR | 0.016 | 0.008 | 0.211 | -0.011 | -0.001 | 0.222 |
| WC_6M | 0.005 | 0.003 | 0.086 | -0.002 | 0.001 | 0.087 |
| ***GROWTH*** | | | | | | |
| GROWTH | 2.935 | 2.663 | 6.941 | 2.844 | 2.432 | 12.102 |
| GROWTH_1YR | -0.182 | -0.344 | 2.984 | -0.166 | -0.144 | 3.766 |
| GROWTH_2YR | -0.211 | -0.086 | 5.946 | -0.270 | -0.316 | 8.391 |
| GROWTH_6M | -0.087 | -0.169 | 1.389 | -0.067 | -0.056 | 1.799 |
| RD_EQ | 0.062 | 0.065 | 0.063 | 0.037 | 0.040 | 0.078 |
| RD_EQ_1YR | 0.066 | 0.047 | 0.358 | -0.008 | -0.002 | 0.368 |
| RD_EQ_2YR | 0.076 | 0.248 | 0.437 | 0.020 | -0.003 | 0.812 |
| RD_EQ_6M | 0.039 | 0.005 | 0.193 | -0.007 | 0.001 | 0.151 |
| RD_TA | 0.022 | 0.024 | 0.020 | 0.017 | 0.016 | 0.023 |
| RD_TA_1YR | 0.071 | 0.062 | 0.326 | 0.017 | 0.006 | 0.277 |
| RD_TA_2YR | 0.075 | 0.273 | 0.401 | 0.061 | 0.004 | 0.694 |
| RD_TA_6M | 0.042 | 0.014 | 0.177 | 0.006 | 0.003 | 0.111 |
| RETEN | 0.646 | 0.700 | 0.247 | 0.737 | 0.700 | 0.214 |
| RETEN_1YR | 0.078 | 0.090 | 0.498 | 0.001 | 0.000 | 0.453 |
| RETEN_2YR | 0.131 | 0.202 | 0.723 | 0.006 | -0.009 | 0.802 |
| RETEN_6M | 0.037 | 0.038 | 0.247 | 0.000 | 0.000 | 0.207 |
| ***LIQUIDITY*** | | | | | | |
| MVT | 8533225.133 | 16486431.800 | 13149833.847 | 3549672.485 | 3206699.378 | 36456127.148 |
| MVT_1M | 0.159 | 0.337 | 0.630 | 0.015 | 0.015 | 1.240 |
| MVT_1YR | 0.777 | 0.938 | 1.900 | 0.175 | 0.140 | 2.473 |
| MVT_2YR | 0.911 | 1.416 | 2.215 | 0.249 | 0.131 | 3.533 |
| MVT_3M | 0.339 | 0.492 | 0.947 | 0.060 | 0.064 | 1.521 |
| MVT_6M | 0.519 | 0.612 | 1.308 | 0.098 | 0.098 | 1.723 |
| MVT_MV | 37.220 | 65.616 | 39.050 | 38.462 | 24.565 | 96.396 |
| MVT_MV_1M | 0.140 | 0.305 | 0.565 | 0.011 | 0.018 | 1.158 |
| MVT_MV_1YR | 0.457 | 0.614 | 1.101 | 0.132 | 0.133 | 1.685 |
| MVT_MV_2YR | 0.579 | 0.866 | 1.292 | 0.253 | 0.189 | 2.008 |
| MVT_MV_3M | 0.257 | 0.409 | 0.782 | 0.044 | 0.053 | 1.349 |
| MVT_MV_6M | 0.340 | 0.439 | 0.933 | 0.076 | 0.071 | 1.318 |
| TV | 0.002 | 0.003 | 0.002 | 0.002 | 0.001 | 0.005 |
| TV_1M | 0.139 | 0.305 | 0.556 | 0.011 | 0.020 | 1.157 |
| TV_1YR | 0.448 | 0.616 | 1.070 | 0.131 | 0.135 | 1.707 |
| TV_2YR | 0.556 | 0.848 | 1.219 | 0.250 | 0.191 | 1.961 |
| TV_3M | 0.256 | 0.409 | 0.769 | 0.043 | 0.056 | 1.348 |
| TV_6M | 0.334 | 0.437 | 0.910 | 0.075 | 0.073 | 1.316 |
| VO | 6709.678 | 12695.410 | 8215.107 | 4344.494 | 3315.280 | 18525.203 |
| VO_1M | 0.141 | 0.306 | 0.565 | 0.012 | 0.019 | 1.160 |
| VO_1YR | 0.473 | 0.649 | 1.116 | 0.140 | 0.142 | 1.776 |
| VO_2YR | 0.614 | 0.954 | 1.333 | 0.272 | 0.208 | 2.259 |
| VO_3M | 0.260 | 0.414 | 0.783 | 0.046 | 0.055 | 1.357 |
| VO_6M | 0.346 | 0.452 | 0.936 | 0.079 | 0.075 | 1.348 |
| ***MOMENTUM*** | | | | | | |
| CROSSOVER1_18 | -0.944 | -0.963 | 1.223 | -0.960 | -0.956 | 1.023 |
| CROSSOVER1_3 | -0.702 | -0.667 | 1.799 | -0.678 | -0.699 | 1.832 |
| CROSSOVER3_1 | -0.075 | -0.033 | 4.937 | 0.019 | -0.079 | 5.167 |
| CROSSOVER3_12 | -0.798 | -0.804 | 2.134 | -0.800 | -0.790 | 1.895 |
| CROSSOVER3_18 | -0.850 | -0.874 | 2.164 | -0.868 | -0.873 | 1.755 |
| CROSSOVER6_12 | -0.555 | -0.552 | 2.735 | -0.526 | -0.551 | 2.327 |
| CROSSOVER6_18 | -0.670 | -0.714 | 2.973 | -0.691 | -0.691 | 2.265 |
| MOM_12M | 0.096 | 0.033 | 0.058 | 0.091 | -6.307 | 17.208 |
| MOM_18M | -0.052 | -0.050 | 0.057 | 0.053 | -14.475 | 16.662 |
| MOM_1M | 0.090 | 0.008 | 0.004 | 0.006 | -0.625 | 5.869 |
| MOM_3M | 0.007 | 0.002 | 0.005 | 0.009 | -1.388 | 6.458 |
| MOM_6M | 0.058 | 0.084 | 0.043 | 0.061 | -2.181 | 9.342 |

University of Cape Town

## 4.4. Summary and conclusion

The chapter introduces the two datasets used in Chapters Five, Six and Seven, namely: stock return data and the firm specific attribute data. The data are adjusted in order to reduce the effect of statistical biases described in Section 4.2.1. In order to reduce the effect of non-synchronous and thin trading, 286 thinly traded stocks are removed from the sample and a further 43 stocks are removed for lack of return data. The data are free from look-ahead bias but not free from survivorship bias.

The firm specific attributes tested in Chapter Six are displayed. The attributes are divided into six major style groups. Both stock return and firm-specific attribute data are adjusted for outliers and influential observations using the winsorisation procedure outlined in Section 4.2.2.1. Firm specific attribute data are standardised in order to allow for comparison of payoffs in Chapter Six. Finally, descriptive statistics for each firm-specific attribute is presented.

University of Cape Town

# 5. Exploratory Analysis and Market Risk Decomposition

## 5.1. Introduction

The aim of this chapter is to provide insight into the risk structure of the TSE and to construct the single-index model and the multi-index model which are derived from the CAPM and APT models respectively. The single-index and multi-index models are used to compute risk adjusted returns in Chapter Six.

A brief overview of the TSE is conducted and a sectoral breakdown of the market is presented. The single-index and multi-index models used for risk adjustment in Chapter Six are constructed and tested. The construction of the multi-index model is more complex than that of the single-index model and is based on the results of two exploratory techniques, namely: cluster analysis and principal components analysis. Both procedures are discussed in detail.

Finally, the single-index model and multi-index model are assessed using two separate tests. The first test simply tests the average statistics obtained from running time series regressions of the single-index and multi-index models over the out of sample period. The second test regresses the dependant variable of one model against the independent variable(s) of the other model and assesses the resulting statistics. The second test allows one to determine if one model has the ability to explain return beyond that of the other model.

The remainder of the Chapter is set out as follows: Section 5.2. outlines that data and methodologies employed in the analyses; Section 5.3. presents the results obtained and finally, Section 5.4. summarises and concludes.

University of Cape Town

## 5.2. Data and methodology

### 5.2.1. Exploratory analysis

Cluster and principal factor analyses are performed on a dataset of Datastream International level six indices over the period 1 January 2001 to 31 December 2004 to identify sources of common variation in share returns. Datastream International makes use of six levels of indices for share classification. Levels one to five are those of the FTSE Actuaries classification structure while level six is specifically customised by Datastream International. Appendix B.1. displays the six Datastream International industry classification levels and Appendix B.2. shows the FTSE Actuaries classification structure in detail.

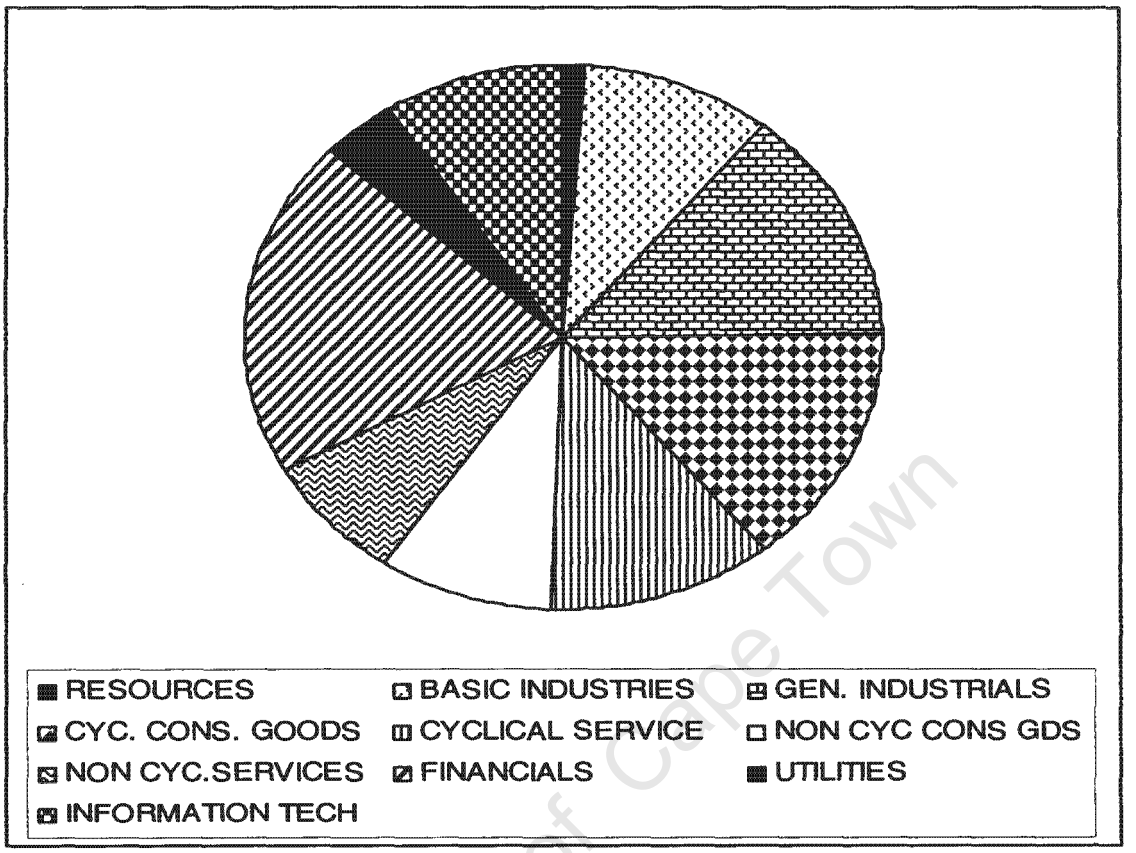
The TSE has 123 sector and sub-sector indices. Principal components analysis requires the computation of a correlation matrix which in turn requires the data to be continuous i.e. there are no missing observations [Cheng, (1995)]. Accordingly, indices that have missing values are excluded from the analysis. Fifteen indices are thus removed due to missing data values. Missing data is most commonly a result of the index not being in existence for a portion of the sample period. The full list of indices included in the sample and the indices removed at each stage of the analysis is displayed in Appendix B.3.

The total market capitalisation for each of the level three indices is displayed in Figure 5.1. as of 31 December 2004. The largest sector on the TSE according to market capitalisation is the Financial sector. Apart from the financial sector, the market is dominated by Cyclical Services, Basic Industries and General Industrials while the Resources and Utilities sectors are the smallest.

University of Cape Town

**Figure 5.1.: Market capitalisation of ten TSE sector indices**

The graph displays the market capitalisation for ten TSE level three indices as of 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

### 5.2.2. Cluster analysis

The term cluster analysis encompasses a number of different algorithms and methods for grouping objects of similar kind into respective categories. In other words, a cluster analysis is an exploratory data analysis tool that sorts objects into clusters so that the degree of association between constituents of the same cluster is strong and the degree of association between constituents of a different cluster is weak. The purpose of a cluster analysis is to organise objects into groups that have similar characteristics. It is important to note that cluster analysis simply discovers structures in the data and does not attempt to explain why these structures exist.

Clusters are formed by using distances or similarities between objects. Euclidean distances are used to determine the distance between objects in a multi-dimensional framework. Euclidean distance is the geometric distance in a multi-dimensional space and is computed as follows (Statsoft Inc. Electronic Textbook):

$$Distance(x,y) = [\sum_i (x_i - y_i)^2]^{1/2} \qquad (5.1)$$

Cluster analyses can use the complete linkage (furthest neighbour rule) where the distances between clusters are determined by the greatest distance between any two objects in the different clusters (Statsoft Inc. Electronic Textbook). First, there exist as many clusters as there are objects (in this analysis objects will be the shares indices on the TSE). At each consecutive iteration, the two clusters that are most closely associated are amalgamated. The results of the cluster analysis are depicted in a vertical tree diagram. The vertical tree diagram is then visually inspected in order to determine the number of clusters and associated constituents.

### 5.2.3. Principal components analysis

Principal components analysis is a statistical technique used to determine the underlying structure in a data matrix. Principal components analysis and common factor analysis are both used to analyse the relationships between variables by defining a set of common underlying factors. The two methods differ with respect to the measure of variance used in the analysis. Principal components analysis uses total variance while common factor analysis uses only common variance in extracting factors. As a result, factors extracted from principal components analysis contain both common and unique variance.

University of Cape Town

Principal components analysis has three primary uses. First, the technique is used to identify the structure of relationships among variables. Second, one can identify variables that can represent a much larger set of variables. Finally, principal components analysis can be used to create a new set of variables to replace or summarise original variables. The second use of principal components analysis is the most important here as the aim of the analysis is to identify a few indices that represent the larger sample of indices and thus allowing a parsimonious multi-index model to be constructed.

In performing principal components analysis, problems arise due to the existence of multicollinearity and singularity. Multicollinearity occurs when variables are highly correlated with each other. Singularity occurs when variable are perfectly correlated with each other. Variables that are either highly or perfectly correlated with each other become redundant and the need to remove one of the variables arises. A correlation

matrix including all variables is constructed. If two indices are highly correlated with each other, the index that is lower down in the hierarchical classification in removed from the analysis. If the correlated indices are at the same level an arbitrary decision is made when choosing the one that is removed. The Pearson (1986) correlation statistic is used and is calculated as follows:

$$\rho_{x,y} = \frac{\sum_{t=1}^{n}(x_t - \bar{x})(y_t - \bar{y})}{\sqrt{\sum_{t=1}^{n}(x_t - \bar{x})^2 \sum_{t=1}^{n}(y_t - \bar{y})^2}} \qquad (5.2.)$$

Each factor has an associated eigenvalue which represents the variance extracted by that factor. Only factors with an eigenvalue greater than or equal to one are considered significant as any individual factor should account for the variance of at least a single variable if it is to be included as a factor. In order to determine the number of factors to be extracted, a scree test is performed. The scree test is a cumulative plot with eigenvalues on the vertical axis and the number of factors extracted on the horizontal axis. Initially the plot is downward sloping and eventually levels out. Factors are extracted to the point where the extraction of one additional factor does not result in a significant increase in the total variation of the model.

The decision regarding the number of factors to be extracted is essentially a trade-off between increased parsimony obtainable as a result of a smaller number of factors and the increased explanatory power that arises as more factors are extracted [van Rensburg and Slaney, (1997)]. Two possible cut-off points are proposed. First, the last factor extracted is the factor at which the scree plot begins to level out [Hair, Anderson, Tatham and Black, (1992)] and second, the last factor extracted is the last factor before the scree plot begins to level out [Cattell and Jaspers, (1967)]. The first factor extracted tends to be a common factor as it accounts for the largest amount of variance and most variables have significant factor loadings on it. The second and subsequent factors extracted are then based on the residual amount of variance (Statsoft Inc. Electronic Textbook).

University of Cape Town

A factor loading for each variable is calculated and is a means for deducing the role that each variable plays in defining each factor. The factor loading represents the correlation between each variable and the factor in question. The greater the factor loading, the greater the correlation between the factor and the variable and hence that variable is a good representation of that factor (Statsoft Inc. Electronic Textbook). As a general rule of thumb, in a sample size of greater than 350 observations, a factor loading greater than 0.3 is regarded as significant [Hair, Anderson, Tatham and Black, (1992)].

In order to achieve a theoretically more meaningful factor solution, factor rotation is employed. In factor rotation, the reference axes of the factors are rotated about the origin (Statsoft Inc. Electronic Textbook). The effect of rotating the factor matrix is to redistribute the variance from earlier factors to later ones in order to achieve a theoretically more meaningful factor pattern (Statsoft Inc. Electronic Textbook). Two primary rotational methods are employed, namely: orthogonal rotation (varimax) and oblique rotation (promax). In orthogonal rotation the axes are maintained at a 90° angle while for oblique rotation the axes are not restricted to a 90° angle. The latter method is found to be more flexible because the important underlying dimensions are not assumed to be uncorrelated with each other (Statsoft Inc. Electronic Textbook).

University of Cape Town

### 5.2.4. Model construction

#### 5.2.4.1. The single-index model

The TOPIX is used to proxy for the market portfolio and the one-month Gensaki rate is used to proxy for the risk free rate of interest. Stock return data are described in Chapter Four. The model is as follows:

$$\left(r_{i,t} - r_{f,t}\right) = \alpha_i + \beta_i (r_{m,t} - r_{f,t}) + \varepsilon_{i,t} \qquad (5.3.)$$

where $r_{i,t}$ is the realised return of stock $i$ for month $t$; and $r_{m,t}$ represents the return on the market index for month $t$. The risk free rate of interest is represented by $r_{f,t}$. The

time series regression coefficient is represented by $\beta_i$; and the intercept by $\alpha_{i,t}$. The error term for stock *i* in month *t* is represented by $\varepsilon_{i,t}$.

**5.2.4.2. The multi-index model**

In deriving the multi-index model cluster analysis and principal components analysis using both varimax rotation and promax rotation are employed. The cluster analysis and varimax rotation are performed using the STATISTICA 7 software and promax rotation is performed using "R" statistical software.

The return index (RI) for 108 sector and sub-sector indices on the TSE are used as variables for all three methods mentioned above. As only out-sample data are risk adjusted, the 1 January 2001 to 31 December 2004 time period is analysed. First, a cluster analysis using all 108 indices is performed. The cluster analysis provides some insight into how many factors may exist on the TSE. Second, principal components analysis is used to derive the factors employed in the multi-index model. Before conducting a principal components analysis a correlation matrix including all variables is constructed. Wherever two indices have a correlation of greater than 0.875 or less than -0.875 the index that is lower down in the hierarchical classification (displayed in Appendix B.2.) is removed from the analysis. If the correlated indices are at the same level an arbitrary decision is made when choosing the one that is removed. The removal of highly correlated indices is required in order to negate multicollinearity and singularity problems that may arise.

All uncorrelated indices are used in the principal components analysis. A scree plot is constructed to determine how many factors are to be extracted. Un-rotated, varimax rotated and promax rotated factor analyses are performed using the number of factors extracted from the scree plot. The factor loading for each index in each rotation is computed. The index with the highest loading on each respective factor is used to proxy for that factor in the regression analysis. As mentioned previously, the promax rotation is the most flexible and therefore shall be used for the identification of factor proxies.

University of Cape Town

The multi-index model is as follows:

$$(r_{i,t} - r_{f,t}) = \alpha + \sum_{j=1}^{j} \beta_{i,j} F_{j,t} + \varepsilon_{i,t} \qquad (5.4.)$$

where,

$r_{i,t}$ = realised returns on stock $i$ for time period $t$;

$r_{f,t}$ = the risk-free rate of interest at time $t$;

$F_{j,t}$ = the excess return on each factor proxy $j$ at time $t$;

$\beta_{i,j}$ = the OLS regression coefficient for each factor proxy; and

$\varepsilon_{it}$ = the random error term of stock $i$ at time $t$.

### 5.2.5. Testing the single-index and multi-index models

Tests are performed in order to determine if the single-index and multi-index models are correctly specified and thus have the ability to explain returns on the TSE. Two tests are performed on each model. The tests are performed over the period 1 January 2001 to 31 December 2004 using the data described in Chapter Four. The stock return data are not adjusted for outliers or extreme observations.

The first test (Test 1) involves testing the single-index model and multi-index model by performing time series regression using the models outlined in equation 5.3. and 5.4. respectively. The regressions are performed for each firm over the sample period. The regressions provide measures of $R^2$, adjusted-$R^2$, F-statistic and a time series of residuals.

The second test (Test 2) determines whether one model has the ability to explain returns beyond that of the other model. Here, in testing the single-index model, the time series residuals obtained from the multi-index model regressions are regressed against the market risk premium. Similarly, in testing the multi-index model, the time series residuals obtained from the single-index model regressions are regressed against the excess return of the five indices used to construct the multi-index model.

University of Cape Town

As in the previous test the regressions provide measures of $R^2$, adjusted-$R^2$, F-statistic and a time series of residuals.

## 5.3. Empirical results

### 5.3.1. Cluster analysis

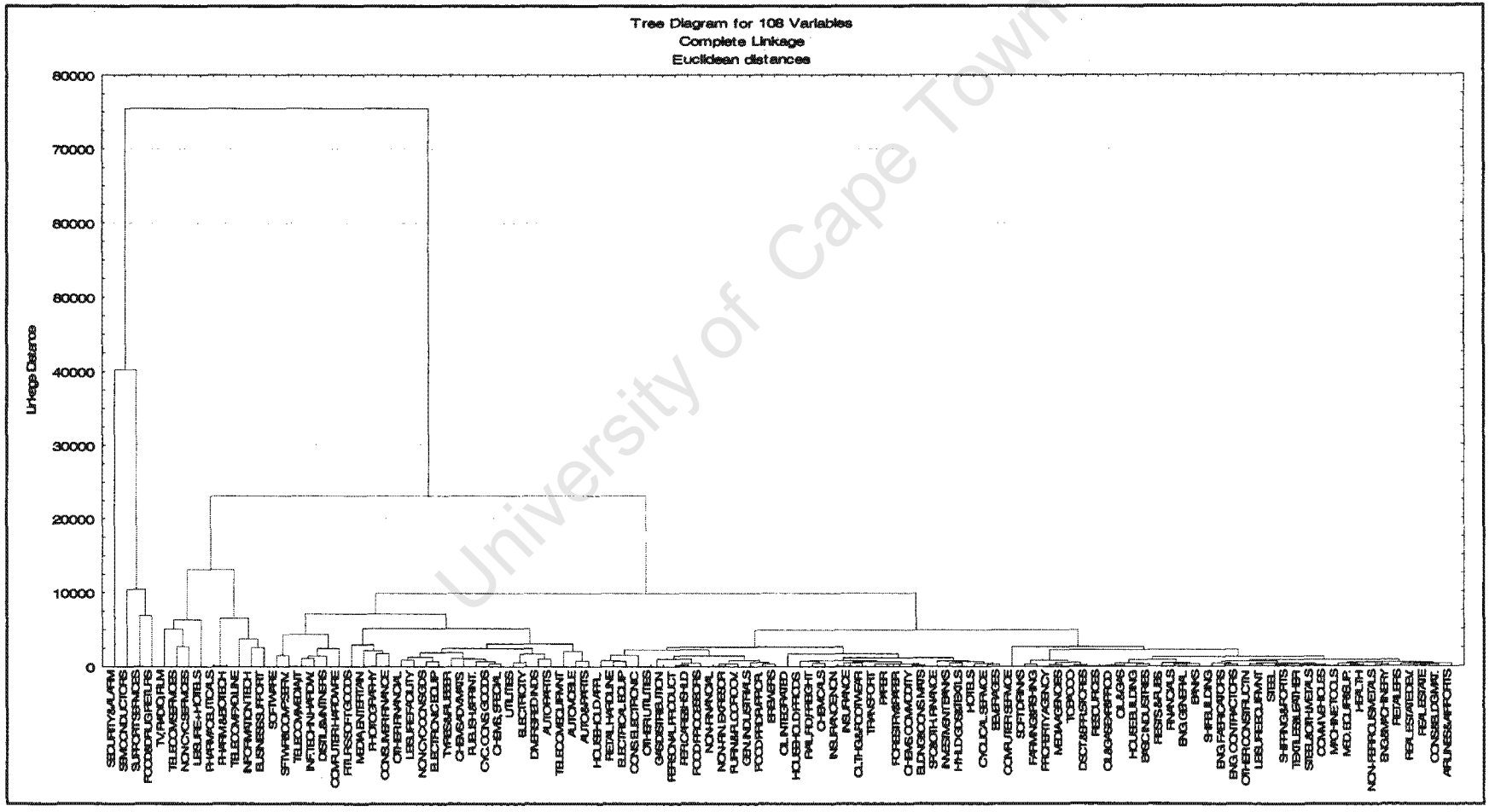
The result of the cluster analysis is presented in Figure 5.2. The vertical axis displays the linkage distance between clusters and the horizontal axis displays the constituents of each cluster. At a linkage distance of zero there are 108 clusters or indices. As the linkage distance increases i.e. as we move up the vertical axis similar indices cluster together therefore fewer clusters exist as the linkage distance increases.

The tree diagram indicates that three to five clusters exist. The first two clusters comprised of Security and Alarm and Semiconductors, Support Services and Food and Drug Retailers have large linkage distances. For clarity purposes a cluster analysis excluding theses four indices is computed and displayed in AppendixB.4. Appendix B.5., B.6. and B.7. display the cluster constituents for three-, four- and five-clusters respectively.

University of Cape Town

**Figure 5.2.: Tree diagram for 108 sector and sub sector indices**

The vertical tree diagram shows the results of the cluster analysis using 108 level six sector and sub sector indices. Initially 123 indices are used, however, 15 indices are excluded due to insufficient data. The analysis covers the 1 January 2001 to 31 December 2004 time period. The data are obtained from Datastream International at the University of Cape Town




University of Cape Town

Looking specifically at the five-cluster breakdown, the first four clusters are relatively easy to characterise. The first cluster simply consists of Security and Alarm while the second cluster is characterised by Semiconductors, Support Services and Food and Drug Retailers. The third cluster can be described as Non-Cyclical Services, Leisure and Hotels and TV, Radio and Film. The fourth cluster is characterised by Pharmaceuticals, Telecom, Information Technology and Business Support Services. The fifth cluster is almost impossible to characterise due to the large number of constituents. At best the cluster is characterised by Utilities, Financials, Resources, Basic Industries, General Industrials, and Cyclical- and Non-Cyclical Goods.

### 5.3.2. Principal components analysis

Initially 108 indices are used in the analysis however, due to multicollinearity and singularity problems, highly correlated indices are excluded from the principal components analysis. The correlation matrix comprising all 108 indices is shown in Appendix B.8. Indices that are highly or perfectly correlated are highlighted with a black background and a white font. The removal procedure outlined in Section 5.2.4.2. is performed. Once all highly correlated indices are removed, 29 uncorrelated indices remain. Appendix B.9. displays the correlation matrix for the remaining variables.

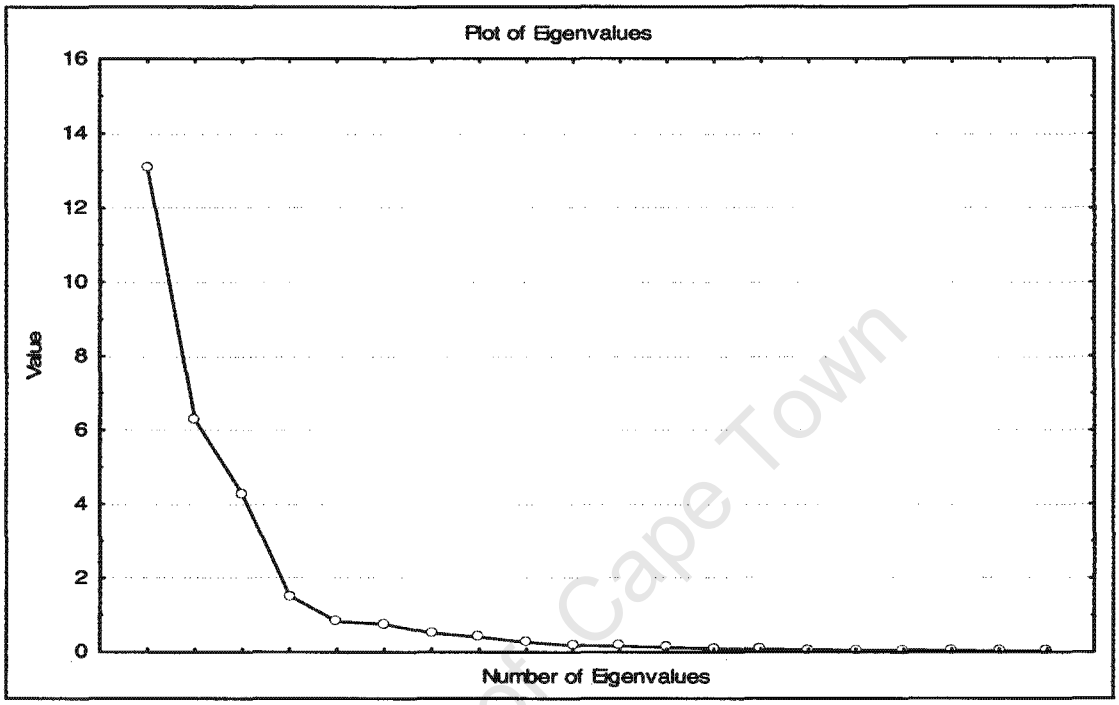
The principal components analysis is performed and the resulting scree plot is displayed in Figure 5.3. The scree plot shows the existence of four or five factors depending on the extraction method used.

All factors with an eigenvalue of less the one are ignored and thus a maximum of five factors can be extracted. The scree plot appears to start levelling at the fifth factor. The extraction method proposed by Hair, Anderson, Tatham and Black (1992) is used and therefore the last factor extracted is the factor where the scree plot begins to level out. Thus, five factors are extracted from the analysis.

University of Cape Town

**Figure 5.3.: Scree plot of eigenvalues**

The scree plot displays eigenvalues for each factor extracted from the principal components analysis. The plot is limited to 20 factors. The principal components analysis is performed using 29 TSE sector and sub-sector indices over the period from 1 January 2001 to 31 December 2004. Initially 123 indices are used, 15 indices are excluded due to insufficient data and 79 indices are removed due to multicollinearity and singularity problems. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

Table 5.1. displays the eigenvalue of each factor and the associated variance and cumulative variance explained by each factor. All factors extracted are greater than one and therefore each individual factor accounts for the variance of at least a single variable. The first factor extracted explains the majority of the variance in the sample and each successive factor explains progressively less. Cumulatively, the five factors together explain almost 90% of total variation in the data.

**Table 5.1.: Eigenvalues and explained variance for five factors**

The table presents the eigenvalue and cumulative eigenvalue of each factor extracted from the principal components analysis. The percentage and cumulative percentage of total variance explained by the five factors is also displayed. Originally 123 indices are used in the analysis however 15 indices are excluded due to insufficient data and 79 indices are removed due to multicollinearity and singularity problems. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| Factor | Eigenvalue | % Total variance | Cumulative Eigenvalue | Cumulative % |
|---|---|---|---|---|
| 1 | 13.102 | 45.178 | 13.102 | 45.178 |
| 2 | 6.281 | 21.660 | 19.383 | 66.838 |
| 3 | 4.284 | 14.772 | 23.667 | 81.609 |
| 4 | 1.525 | 5.257 | 25.191 | 86.867 |
| 5 | 1.028 | 2.855 | 26.019 | 89.722 |

The promax rotated factor loadings on each factor are displayed in Table 5.2. Un-rotated and varimax rotated factor loadings are shown in Appendix B.10. and B.11. respectively. The indices are sorted according to the absolute value of the factor loading.

**Table 5.2.: TSE share indices' promax rotated loadings for five factors**

The table displays the results of principal components analysis on 29 TSE sector and sub-sector indices for the period 1 January 2001 to 31 December 2004. The loadings are promax rotated. The indices are sorted according to the absolute value of the associated promax rotated factor loading. Initially 123 indices are used, 15 are excluded due to insufficient data and 79 are removed due to multicollinearity and singularity problems. The data are obtained from Datastream International at the University of Cape Town.

| Factor 1 | | Factor 2 | | Factor 3 | | Factor 4 | | Factor 5 | |
|---|---|---|---|---|---|---|---|---|---|
| Index | Loading | Index | Loading | Index | Loading | Index | Loading | Index | Loading |
| HOTELS | 1.052 | DSCTSPRSTORES | 0.943 | RESOURCES | 0.909 | DIVERSIFIEDINDS | 0.930 | FOODPRDRPRCR | 0.626 |
| SECURITYALARM | 0.955 | TYRESRUBBER | 0.882 | OTHERUTILITIES | 0.860 | BLDNGCONSMATS | 0.639 | PERCAREHSHLD | 0.364 |
| CONSUMERFINANCE | 0.853 | HOUSEHOLDPRODS | 0.879 | TRANSPORT | 0.815 | BASICINDUSTRIES | 0.562 | TOBACCO | 0.339 |
| PERCAREHSHLD | 0.792 | RETAILHARDLINE | 0.717 | CLTHGFOOTWEAR | 0.791 | AIRLINESAIRPORTS | 0.553 | PUBLISHPRINT | -0.208 |
| FINANCIALS | 0.688 | PUBLISHPRINT | 0.670 | OTHERCONSTRUCTN | 0.775 | CHEMSADVMATS | 0.543 | OTHERUTILITIES | 0.181 |
| PHOTOGRAPHY | 0.684 | CYCCONSGOODS | 0.613 | RETAILERS | 0.643 | SHIPPINGPORTS | 0.360 | RETAILERS | -0.179 |
| SHIPBUILDING | 0.657 | CHEMSADVMATS | 0.561 | SHIPPINGPORTS | 0.605 | CLTHGFOOTWEAR | -0.349 | HOUSEHOLDPRODS | 0.137 |
| FOODPRDRPRCR | 0.647 | CLTHGFOOTWEAR | 0.554 | INFORMATIONTECH | -0.549 | CYCCONSGOODS | 0.344 | FINANCIALS | 0.132 |
| INFORMATIONTECH | 0.632 | INFORMATIONTECH | 0.477 | TOBACCO | 0.539 | SHIPBUILDING | 0.337 | HOTELS | 0.132 |
| AIRLINESAIRPORTS | 0.612 | BASICINDUSTRIES | 0.408 | SECURITYALARM | -0.397 | DSCTSPRSTORES | -0.328 | SHIPBUILDING | 0.131 |
| FORESTRYPAPER | 0.549 | SHIPBUILDING | -0.370 | BASICINDUSTRIES | 0.357 | FORESTRYPAPER | 0.315 | RETAILHARDLINE | 0.128 |
| RETAILHARDLINE | 0.539 | FINANCIALS | 0.363 | CONSUMERFINANCE | 0.356 | OTHERCONSTRUCTN | 0.289 | OTHERCONSTRUCTN | -0.126 |
| SHIPPINGPORTS | -0.490 | AIRLINESAIRPORTS | -0.362 | PERCAREHSHLD | -0.344 | HOTELS | -0.247 | CONSUMERFINANCE | 0.125 |
| RETAILERS | 0.479 | PHOTOGRAPHY | -0.355 | FOODPRDRPRCR | 0.318 | FINANCIALS | 0.231 | TRANSPORT | 0.121 |
| CHEMSADVMATS | -0.431 | PERCAREHSHLD | 0.330 | SHIPBUILDING | 0.269 | PUBLISHPRINT | 0.182 | AIRLINESAIRPORTS | |
| OTHERUTILITIES | -0.388 | SHIPPINGPORTS | 0.327 | CHEMSADVMATS | 0.254 | HOUSEHOLDPRODS | 0.160 | BASICINDUSTRIES | |
| TRANSPORT | 0.381 | OTHERUTILITIES | -0.210 | RETAILHARDLINE | -0.253 | RESOURCES | 0.122 | BLDNGCONSMATS | |
| BLDNGCONSMATS | 0.335 | CONSUMERFINANCE | 0.207 | DSCTSPRSTORES | 0.179 | FOODPRDRPRCR | 0.116 | CHEMSADVMATS | |
| PUBLISHPRINT | 0.330 | TOBACCO | 0.181 | HOUSEHOLDPRODS | -0.144 | TYRESRUBBER | -0.112 | CLTHGFOOTWEAR | |
| CYCCONSGOODS | 0.307 | RESOURCES | -0.175 | DIVERSIFIEDINDS | 0.131 | TRANSPORT | 0.109 | CYCCONSGOODS | |
| CLTHGFOOTWEAR | 0.270 | TRANSPORT | -0.174 | AIRLINESAIRPORTS | 0.130 | CONSUMERFINANCE | -0.104 | DIVERSIFIEDINDS | |
| TOBACCO | 0.249 | FORESTRYPAPER | 0.168 | BLDNGCONSMATS | 0.122 | INFORMATIONTECH | | DSCTSPRSTORES | |
| TYRESRUBBER | -0.142 | OTHERCONSTRUCTN | 0.151 | FINANCIALS | -0.106 | OTHERUTILITIES | | FORESTRYPAPER | |
| OTHERCONSTRUCTN | -0.130 | DIVERSIFIEDINDS | -0.151 | PHOTOGRAPHY | 0.105 | PERCAREHSHLD | | INFORMATIONTECH | |
| HOUSEHOLDPRODS | -0.126 | BLDNGCONSMATS | 0.132 | CYCCONSGOODS | | PHOTOGRAPHY | | PHOTOGRAPHY | |
| BASICINDUSTRIES | | FOODPRDRPRCR | 0.111 | FORESTRYPAPER | | RETAILHARDLINE | | RESOURCES | |
| DIVERSIFIEDINDS | | HOTELS | | HOTELS | | RETAILERS | | SECURITYALARM | |
| DSCTSPRSTORES | | RETAILERS | | PUBLISHPRINT | | SECURITYALARM | | SHIPPINGPORTS | |
| RESOURCES | | SECURITYALARM | | TYRESRUBBER | | TOBACCO | | TYRESRUBBER | |
| Proportion Var | 0.276 | Proportion Var | 0.201 | Proportion Var | 0.200 | Proportion Var | 0.111 | Proportion Var | 0.028 |
| Cumulative Var | 0.276 | Cumulative Var | 0.476 | Cumulative Var | 0.677 | Cumulative Var | 0.788 | Cumulative Var | 0.816 |

The promax rotation shows that Hotels (HOTELS), Discount, Superstores and Warehouses (DSCTSPRSTORES), Resources (RESOURCES), Diversified Industrials (DIVERSIFIEDINDS) and Food Producers and Processors (FOODPRDRPRCR) have the greatest loadings on factors one to five respectively and are therefore used to proxy for these factors in the multi-index model. The benefit of using indices as proxies for the multi-index factors is that the indices are directly observable and have a clear economic interpretation.

The multi-index model is therefore as follows:

$$(r_{i,t} - r_{f,t}) = \alpha_i + \beta_{F_1,i}F_{1,t} + \beta_{F_2,i}F_{2,t} + \beta_{F_3,i}F_{3,t} + \beta_{F_4,i}F_{4,t} + \beta_{F_5,i}F_{5,t} + \varepsilon_{i,t} \qquad (5.5.)$$

The $r_{i,t}$ and $r_{f,t}$ terms again represent realised share return for share $i$ and the risk-free rate at time $t$ respectively. The $F_{n,t}$ terms represent the excess return for each index at time $t$ and the $\beta_{F_n,i}$ terms represent the payoff to each index factors: one to five. Factors one to five are proxied by the HOTELS, DSCTSPRSTORES, RESOURCES, DIVERSIFIEDINDS and FOODPRDRPRCR indices respectively.

### 5.3.3. Model tests results

Table 5.3. presents the summarised results of both Tests 1 and 2 for the single-index and multi-index models. All tests are at the 5% level of significance ($p < 0.05$). The mean $R^2$, mean adjusted $R^2$, mean F-statistic, mean p-value and the proportion of regressions significant at the 5% level of confidence are displayed. The $R^2$-adjusted figure adjusts for the degrees of freedom lost when more explanatory variables are used in the analysis.

University of Cape Town

**Table 5.3.: Single-index model and multi-index model test results**

The table displays the single-index model and multi-index model test results for both Test 1 and 2. Test 1 involves testing the single-index model and multi-index model by performing time series regression using the models outlined in equation 5.3. and 5.4. respectively. Test 2 determines whether the one model has the ability to explain returns beyond that of the other model by regressing the time series residuals of one model against the independent variables of the other. Stock return data are described in Chapter Four. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| | Mean $R^2$ | Mean adjusted $R^2$ | Mean F-statistic | Mean P-value | Regressions significant at the 5% level |
|---|---|---|---|---|---|
| **Single-Index Model** | | | | | |
| -Test 1 | 0.235 | 0.218 | 16.144 | 0.036 | 86.32% |
| -Test 2 | 0.019 | -0.003 | 0.893 | 0.487 | 1.08% |
| **Multi-Index Model** | | | | | |
| -Test 1 | 0.305 | 0.223 | 4.130 | 0.056 | 74.96% |
| -Test 2 | 0.140 | 0.038 | 1.526 | 0.389 | 15.21% |

Test 1 indicates that the single-index model is valid with a significant F-statistic. The single-index model explains 23.5% of the variation in excess returns on the TSE. Furthermore, 86.32% of the time series regressions are significant. The multi-index model has the ability to explain a greater proportion of variation in returns than the single-index model. The multi-index model explains 30.5% of variation in excess returns and has an adjusted $R^2$ of 22.3%. The F-statistic, however, reveals that the model is weakly significant and only 74.96% of regressions are significant.

Test 2 results indicate that the single-index model does not have any ability to explain variation in excess returns beyond that of the multi-index model. This finding is indicated by a $R^2$ statistic of only 1.9%. The F-statistic shows that the model is not valid and only 1.08% of regressions are significant. The multi-index model explains 14% of the variation in returns not explained by the single-index model. However the F-statistic indicates that the model is not valid with only 15.21% of regressions being significant.

University of Cape Town

## 5.4. Summary and conclusion

The chapter provides some insight into the structure of the TSE. The TSE is dominated by the Financial sector, followed closely by the Cyclical Services, Basic Industries and General Industrials sectors. As expected, the Resources and Utilities sectors are the smallest in terms of market capitalisation.

The single-index and multi-index models are constructed and tested. The construction of the single-index model is relatively simple, requiring only the monthly market risk premium. The construction of the multi-index model is more complex and requires the use of exploratory techniques such as a cluster analysis and a principal components analysis. The results of the exploratory analyses indicates that the multi-index model is comprised of five factors proxied by the excess return on the Hotels (HOTELS), Discount, Superstores and Warehouses (DSCTSPRSTORES), Resources (RESOURCES), Diversified Industrials (DIVERSIFIEDINDS) and Food Producers and Processors (FOODPRDRPRCR) indices respectively.

Both models are tested to ensure that they are correctly specified. The results indicate that while the multi-index model has the ability to explain a greater proportion of the variation in returns than the single-index model. In addition, the multi-index model explains more of the variation in returns that is not explained by the single-index model than the single-index model explains with respect to the multi-index model.

Both models are used in Chapter Six to risk adjust stock return data. The risk adjustment procedure is performed in order to determine if firm-specific attributes have the ability to explain variation in returns beyond that of the dependant variables of the single-index and multi-index models.

University of Cape Town

### 6.3.2.1. Value and change in value

The correlation matrix for the value and change in value cluster is shown in Table 6.2. The correlation matrix indicates that there are no highly correlated variables in this group. All characteristics are therefore retained in the analysis as each variable explains variation that is not explained by another variable.

**Table 6.2.: Correlation matrix for the value and change in value cluster**

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the cross-sectional regression analysis. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.1 Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| | *Sales_Emp* | *TD_TA_6m* | *PEGI_1yr* | *PEGI_2yr* | *PEGI* | *NCA_MV_1yr* | *NCA_MV_2yr* |
|---|---|---|---|---|---|---|---|
| Sales_Emp | 1.000 | | | | | | |
| TD_TA_6m | 0.166 | 1.000 | | | | | |
| PEGI_1yr | -0.271 | -0.317 | 1.000 | | | | |
| PEGI_2yr | -0.146 | 0.087 | 0.543 | 1.000 | | | |
| PEGI | 0.053 | 0.235 | 0.142 | 0.673 | 1.000 | | |
| NCA_MV_1yr | 0.535 | 0.303 | -0.401 | 0.042 | 0.313 | 1.000 | |
| NCA_MV_2yr | 0.473 | 0.192 | -0.178 | -0.116 | 0.187 | 0.684 | 1.000 |

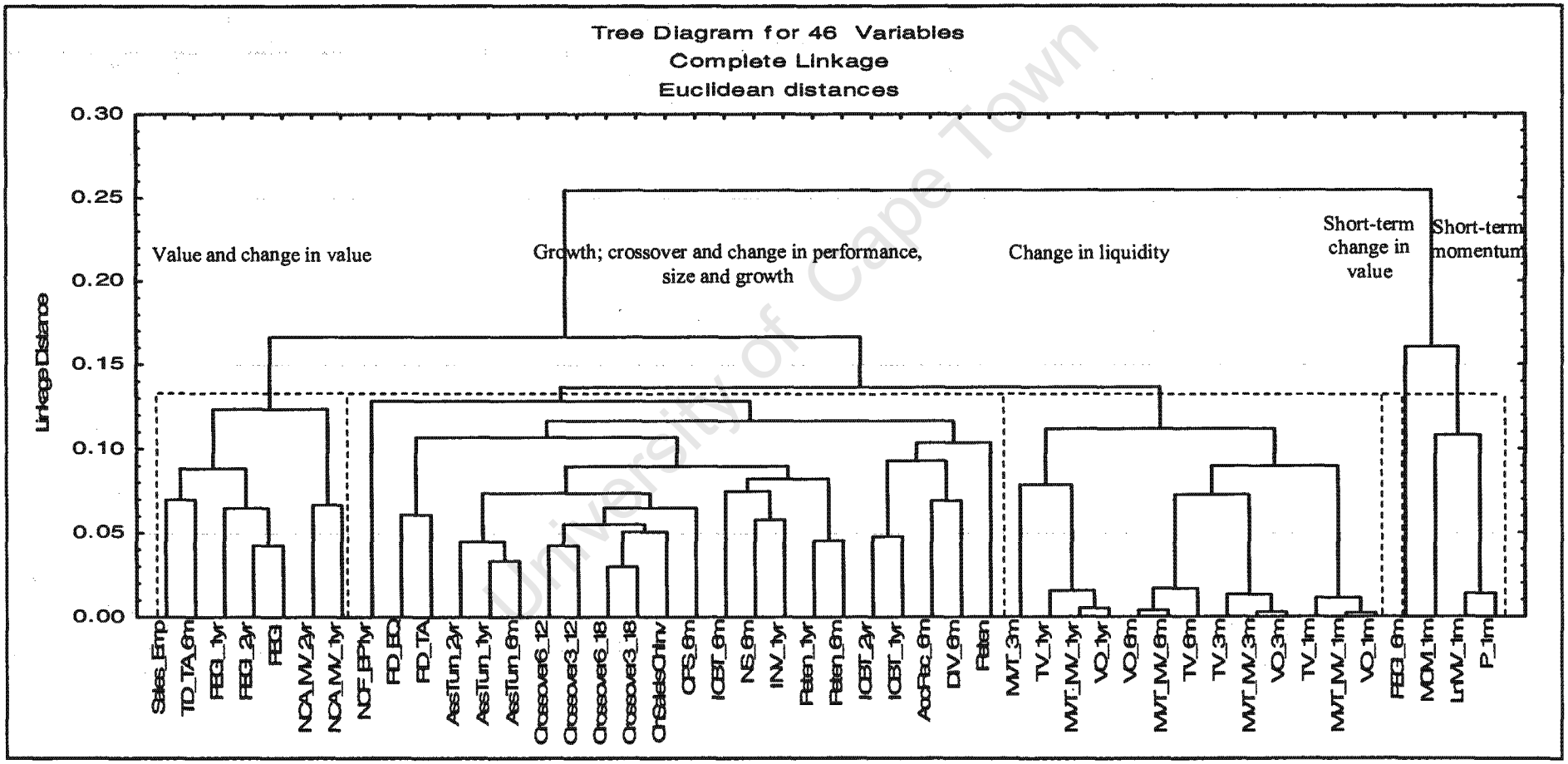
University of Cape Town

### 6.3.2.2. Growth, crossover and change in performance, size and growth

The correlation matrix for the growth, crossover and change in performance and growth cluster is shown in Table 6.3. The correlation matrix indicates five instances where characteristics are highly correlated. Using the methodology mentioned in Section 6.2.1. the following variables are removed: ICBT_2yr; RD_EQ; AssTurn_1yr and Crossover3_18.

**Figure 6.1.: Tree diagram of monthly payoffs for in-sample significant variables**

The vertical tree diagram displays the results of the cluster analysis using all the significant variables listed in Table6.1.These variables are significant at the 5% level using Students (1908) t-statistic. The cluster analysis is constructed from monthly cross-sectional coefficients obtained from the cross-sectional regression analyses. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

and adjusted for thin-trading and outliers. The mean information coefficient measures the average monthly correlation between expected and realised returns. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. The variables are arranged in descending order of the absolute value of the t-statistic. A full list of results is displayed in Appendix C.1. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| Characteristic | T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| AssTurn_6m | 4.4507 | 0.0022 | 0.0499 | 651 |
| PEGI_2yr | -4.4409 | -0.0025 | 0.0614 | 635 |
| ICBT_6m | 4.1690 | 0.0026 | 0.0581 | 638 |
| VO_1yr | 3.9401 | 0.0040 | 0.0881 | 645 |
| MVT_MV_1yr | 3.9228 | 0.0040 | 0.0883 | 582 |
| PEGI_1yr | -3.9059 | -0.0020 | 0.0495 | 636 |
| AssTurn_2yr | 3.8863 | 0.0024 | 0.0579 | 651 |
| NCA_MV_2yr | 3.5994 | 0.0027 | 0.0642 | 602 |
| MVT_MV_6m | 3.5674 | 0.0037 | 0.0877 | 583 |
| VO_3m | 3.5523 | 0.0034 | 0.0760 | 636 |
| MVT_MV_3m | 3.5462 | 0.0034 | 0.0755 | 651 |
| TV_1yr | 3.5173 | 0.0036 | 0.0882 | 651 |
| VO_6m | 3.5125 | 0.0036 | 0.0876 | 650 |
| Crossover6_18 | 3.4541 | 0.0014 | 0.0406 | 494 |
| TV_6m | 3.4511 | 0.0036 | 0.0901 | 651 |
| PEGI | -3.4078 | -0.0018 | 0.0573 | 637 |
| TV_3m | 3.4025 | 0.0034 | 0.0787 | 651 |
| Reten | 3.2851 | 0.0034 | 0.0815 | 638 |
| Reten_1yr | 3.1569 | 0.0017 | 0.0505 | 638 |
| MOM_1m | -2.9986 | -0.0041 | 0.1268 | 618 |
| ICBT_2yr | 2.8150 | 0.0026 | 0.0858 | 587 |
| ChSalesChInv | 2.8000 | 0.0012 | 0.0407 | 649 |
| INV_1yr | -2.7538 | -0.0015 | 0.0585 | 637 |
| Crossover6_12 | 2.7409 | 0.0013 | 0.0446 | 503 |
| AssTurn_1yr | 2.7262 | 0.0015 | 0.0557 | 639 |
| RD_TA | 2.6915 | 0.0025 | 0.0781 | 540 |
| ICBT_1yr | 2.6752 | 0.0024 | 0.0812 | 589 |
| AccRec_6m | 2.6640 | 0.0020 | 0.0635 | 651 |
| Crossover3_12 | 2.6314 | 0.0012 | 0.0422 | 651 |
| Reten_6m | 2.5772 | 0.0012 | 0.0446 | 638 |
| MVT_MV_1m | 2.5596 | 0.0019 | 0.0655 | 587 |
| VO_1m | 2.5503 | 0.0019 | 0.0656 | 651 |
| P_1m | -2.4335 | -0.0046 | 0.1463 | 573 |
| TV_1m | 2.4184 | 0.0019 | 0.0658 | 651 |
| MVT_3m | 2.3693 | 0.0028 | 0.0921 | 597 |
| CPS_6m | 2.3508 | 0.0014 | 0.0536 | 650 |
| LnMV_1m | -2.3361 | -0.0045 | 0.1463 | 637 |
| Crossover3_18 | 2.2283 | 0.0010 | 0.0433 | 543 |
| RD_EQ | 2.2146 | 0.0016 | 0.0653 | 423 |
| Sales_Emp | -2.1948 | -0.0014 | 0.0582 | 583 |
| NCA_MV_1yr | 2.0662 | 0.0019 | 0.0731 | 600 |
| TD_TA_6m | -2.1102 | -0.0010 | 0.0415 | 599 |
| PEGI_6m | -2.1052 | -0.0022 | 0.0747 | 636 |
| DIV_6m | 2.0884 | 0.0017 | 0.0723 | 626 |
| NCF_BP1yr | 2.0560 | 0.0021 | 0.0923 | 587 |
| NS_6m | 1.9853 | 0.0010 | 0.0495 | 611 |

University of Cape Town

## 6.3. Empirical results: In-sample

### 6.3.1. Cross-sectional regression results

The results of the univariate cross-sectional regressions for the in-sample period are displayed in Table 6.1. Only characteristics that are significant at the 95% (two-tailed) level of confidence are shown. The complete list of results is displayed in Appendix C.1. The time series average coefficient and t-statistic, mean monthly information coefficient and the number of observations in the final month of analysis is displayed for each characteristic. Appendix C.2. displays the cross-sectional univariate regression results by year. The regressions results in 46 significant variables.

University of Cape Town

### 6.3.2. Simplification of significant characteristics

The significant variables are employed in the cluster analysis and the results are displayed in Figure 6.1. The cluster diagram indicates the existence of five clusters. These clusters can be approximately described as: (1) value and change in value; (2) growth, crossover and change in performance, size and growth; (3) change in liquidity; (4) short-term change in value and; (5) short-term momentum.

In order to simplify the list of significant characteristics, a correlation matrix for each cluster (which contains more than one characteristic) is constructed. Variables that have a correlation coefficient greater that 0.7 or less than -0.7 are defined as being highly correlated. The characteristic with the lower significance as indicated by the t-statistic is removed from the list. The correlation matrices are displayed in Tables 6.2. to 6.5. Variables that are highly correlated are displayed with a black background and white font. A correlation matrix containing all 46 significant variables is shown in Appendix C.3.

**Table 6.1.: List of significant variables: In-sample period**

The table shows the t-statistic, mean coefficient, information coefficient and the number of observations in the final month of analysis for each significant variable obtained from the cross-sectional regression analysis. Variables are significant at the 5% level using Student's (1908) t-statistic. Results are obtained from monthly univariate cross-sectional regressions and the data are standardised

Once again the abnormal return is lagged by one month to ensure that the tests are of a predictive nature. As for the un-adjusted and single-index model adjusted returns, the time series average of the cross-sectional coefficients is calculated for each variable. Student's t-test is used to determine whether the average cross-sectional coefficient is significantly different from zero and finally, the mean monthly information coefficient (IC) for each firm-specific attribute is calculated and presented.

### 6.2.4. Simplification of significant characteristics

The complete list of significant characteristics, while being fully comprehensive, may include similar or highly correlated variables. The list of significant characteristics is simplified by employing cluster and correlation analyses using the time series of characteristic payoffs.

To simplify the list of significant characteristics, the following procedure is used. The coefficient for each characteristic in each month is recorded and a cluster analysis is performed in order to group similar characteristics together. However, due to the limited number of characteristics employed in the analysis, a characteristic may be grouped within a cluster not because it is similar to the other variables within that cluster but rather because it is highly dissimilar to the other characteristics in the analysis. In order to obtain a more accurate reflection of the relationship between characteristics within each cluster, a correlation matrix for each separate cluster is computed. If two characteristics within a cluster are highly correlated, defined as having a Pearson correlation coefficient greater than 0.7 or less that -0.7, the characteristic with the greater t-statistic is retained in the analysis while the other is removed. The Pearson correlation coefficient is presented in equation 5.2.

Finally, a correlation matrix including all remaining characteristics is computed. If any of the remaining variables are highly correlated, the variable with the lower t-statistic is removed from the analysis. The final list of significant characteristics is thus composed of the most significant characteristics that are not highly correlated with each other.

University of Cape Town

sectional coefficients is calculated for each variable. Student's (1908) t-test is used to determine whether the average cross-sectional coefficient is significantly different from zero. The mean monthly information coefficient (IC) for each firm-specific attribute is calculated and presented.

### 6.2.3. Risk-adjusted returns: The multi-index model

The second risk adjustment procedure makes use of the multi-index model constructed and tested in Chapter Five. The multi-index model consists of five factors proxied by five TSE sector and sub-sector indices namely; (1) Hotels, (2) Discount, Super Stores and Warehouses, (3) Resources (4) Diversified Industrials and (5) Food Producers and Processors. The following monthly times series regression is run for each company over the period:

$$(r_{i,t} - r_{f,t}) = \alpha_i + \beta_{F_1,i}F_{1,t} + \beta_{F_2,i}F_{2,t} + \beta_{F_3,i}F_{3,t} + \beta_{F_4,i}F_{4,t} + \beta_{F_5,i}F_{5,t} + \varepsilon_{i,t} \qquad (6.8.)$$

The $r_{i,t}$ and $r_{f,t}$ terms again represent realised share return for share $i$ and the risk-free rate respectively. The $F_{n,t}$ terms represent the excess return for each index at time $t$ and the $\beta_{F_n,i}$ terms represent the payoff to each index factors one to five. Factors one to five are proxied by the HOTELS, DSCTSPRSTORES, RESOURCES, DIVERSIFIEDINDS and FOODPRDRPRCR indicies respectively.

For each company in each month the time series error term is recorded and added to the time series intercept term. This is done by rearranging equation 6.7. as follows:

$$(\alpha_i + \varepsilon_{i,t}) = (r_{i,t} - r_{f,t}) - \beta_{F_1,i}F_{1,t} - \beta_{F_2,i}F_{2,t} - \beta_{F_3,i}F_{3,t} - \beta_{F_4,i}F_{4,t} - \beta_{F_5,i}F_{5,t} \qquad (6.9.)$$

The $(\alpha_i + \varepsilon_{i,t})$ term represents the total return for stock $i$ in month $t$ that is not explained by the beta terms, $\beta_{Fi,i}$. The multi-index model adjusted univariate cross-sectional regression can now be expressed as follows:

$$(\alpha_i + \varepsilon_{i,t}) = \gamma_{0,t+1} + \gamma_{1,t+1}A_i + \varepsilon_{i,t+1} \qquad (6.10.)$$

University of Cape Town

### 6.2.2. Risk-adjusted returns: The single-index model

Only the out of sample stock return data are risk adjusted using the procedure outlined below. First, stock return data are risk-adjusted using the single-index model that is constructed and tested in Chapter Five. Risk-adjustment is performed in order to determine if the firm-specific attributes have the ability to explain returns beyond that of beta.

For each company the following time series regression is run:

$$(r_{i,t} - r_{f,t}) = \alpha_{i,t} + \beta_{i,t}(r_{m,t} - r_{f,t}) + \varepsilon_{i,t} \qquad (6.5.)$$

Where $r_{i,t}$ is the realised return of stock $i$ for month $t$ and $r_{m,t}$ represents the return on the market index for month t. The one-month Gensaki rate is used to proxy for the risk free rate of interest, $r_{f,t}$. The time series regression coefficient is represented by $\beta_{i,t}$ and the intercept by $\alpha_{i,t}$. The error term for stock $i$ in month $t$ is represented by $\varepsilon_{i,t+1}$.

For each company the abnormal return is calculated by summing the time series error term and the time series intercept term. This is done by rearranging equation 6.5. as follows:

$$(\alpha_{i,t} + \varepsilon_{i,t}) = (r_{i,t} - r_{f,t}) - \beta_{i,t}(r_{m,t} - r_{f,t}) \qquad (6.6.)$$

Here the $(\alpha_{i,t} + \varepsilon_{i,t})$ term represents the total return for stock $i$ in month $t$ that is not explained by the beta term $\beta_{i,t}$. The univariate cross-sectional regression can now be expressed as follows:

$$(\alpha_{i,t} + \varepsilon_{i,t}) = \gamma_{0,t+1} + \gamma_{1,t+1} A_{i,t} + e_{i,t+1} \qquad (6.7.)$$

As with the un-adjusted returns, the abnormal return is lagged by one month so as to ensure the tests are of a predictive nature. The time series average of the cross-

University of Cape Town

month. Lagging attributes by one month ensures that the regression is of a predictive rather than descriptive nature.

The cross-sectional regression is repeated in each month from January 1993 to December 2000 and again from January 2001 to December 2004 representing the in- and out-sample periods respectively. For each variable in each month the cross-sectional regression coefficients are recorded in time series. The time series average of the cross-sectional coefficients is calculated for each variable. The variable is defined as significant in predicting returns if, when using Student's (1908) t-test, the time series average coefficient is significantly different from zero. Student's t-test is given as:

$$t = \frac{\left(\hat{\bar{\gamma}}_1 \sqrt{N}\right)}{\hat{\sigma}_n} \qquad (6.2.)$$

Where $\hat{\bar{\gamma}}$ and $\hat{\sigma}$ represent the time series average and the standard deviation of cross-sectional coefficients respectively. The number of observations is represented by $N$.

In addition to the t-statistic, the information coefficient (IC) for each cross-sectional regression in each month is calculated. The information coefficient measures the correlation between expected and realised returns in each month. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. An IC equal to one indicates that the variables possesses perfect forecasting skill while an IC of zero indicates that the variable has no forecasting skill. Mathematically, the IC is as follows:

$$IC = \rho[E(R_{i,t}), R_{i,t}] \qquad (6.3.)$$

Where $\rho$ is the monthly Pearson correlation coefficient (see equation 5.2.), $R_{i,t}$ represents the actual return for share $i$ in month $t$ and $E(R_{i,t})$ represents the expected returns for share $i$ in month $t$ and is calculated as follows:

$$E(R_{i,t}) = \hat{\gamma}_{0,t+1} + \hat{\gamma}_{1,t+1} A_{i,t} \qquad (6.4.)$$

University of Cape Town

sample time period and risk adjustment and finally Section 6.5. summarises and concludes.

## 6.2. Data and methodology

Cross-sectional regression analysis is performed on monthly data for the period January 1993 to December 2000 (in-sample) and January 2001 to December 2004 (out of sample).

Cross-sectional regression analysis is employed to determine the relationship between individual attributes and stock returns. Stock return and firm-specific attribute data are adjusted for infrequent trading and winsorised to remove any extreme observations. The thin trade and winsorisation procedures are discussed in Section 4.2.2.1. In addition, firm-specific attribute data are standardised by subtracting the cross-sectional mean and dividing by the cross-sectional standard deviation. Standardisation of firm-specific attribute data is required in order to allow accurate comparison of the cross-sectional regression coefficients.

University of Cape Town

### 6.2.1. Un-adjusted returns

The methodology used is similar to that of Fama and MacBeth (1973) and van Rensburg and Robertson (2003). The regression equation is as follows:

$$r_{i,t+1} = \gamma_{0,t+1} + \gamma_{1,t+1} A_{i,t} + \varepsilon_{i,t+1} \qquad (6.1.)$$

Where $r_{i,t+1}$ is the realised return of stock $i$ for month $t+1$ and $A_{i,t}$ represents the attribute being tested for stock $i$ in month $t$. The cross-sectional regression coefficient is represented by $\gamma_{1,t+1}$ and the intercept by $\gamma_{0,t+1}$. The error term for stock $i$ in month $t$ is represented by $\varepsilon_{i,t+1}$.

Equation 6.1. indicates that attribute values are lagged by one month. The attribute value at the beginning of the month is regressed against the return over that same

# 6. Firm-Specific Attributes and the Cross-Section of Equity Returns

## 6.1. Introduction

This chapter investigates the cross-sectional relationship between stock returns and the firm-specific attributes for both the in-sample period which covers 1 January 1993 to 31 December 2000 and the out of sample period which covers 1 January 2001 to 31 December 2004.

The in-sample cross-sectional regression analyses results in 46 statistically significant variables at the 5% level. It is possible, however, that these results are period specific, i.e. they do not hold in different time periods. Accordingly, identical cross-sectional regressions are run over the out of sample period in order to determine if the in-sample results are robust across different time periods.

The out of sample stock return data are risk adjusted using the single-index and multi-index models which are constructed and tested in Chapter Five. The risk adjustment procedure is conducted in order to determine if the firm-specific attributes have the ability to explain variation in returns that is not explained by the regression coefficients of the two asset pricing models.

For all four datasets, the empirical results are presented and the list of significant characteristics at the 5% level is displayed. A simplification procedure is performed in order to remove variables that are highly correlated. The simplification procedure results in a final list of the most significant variables that are not highly correlated with each other. The cumulative monthly payoffs to each final significant variable are displayed graphically for the two un-adjusted datasets.

The remainder of the chapter is organised as follows. Section 6.2. outlines the data and methodology employed in the analysis, Section 6.3. presents the empirical results for the in-sample time period, Section 6.4. presents the empirical results for the out of

University of Cape Town

**Table 6.3.: Correlation matrix for the growth, crossover and change in performance, size and growth cluster**

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the cross-sectional regression analysis. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.1 Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| | RD_TA | RD_EQ | ICBT_6m | ICBT_1yr | ICBT_2yr | AccRec_6m | NCF_BP1yr | ChSalesChInv | AssTurn_6m | AssTurn_1yr | AssTurn_2yr | Crossover3_12 | Crossover6_12 | Crossover3_18 | Crossover6_18 | Reten | Reten_6m | Reten_1yr | INV_1yr | NS_6m | DIV_6m | CPS_6m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RD_TA | 1.000 | | | | | | | | | | | | | | | | | | | | | |
| RD_EQ | 0.740 | 1.000 | | | | | | | | | | | | | | | | | | | | |
| ICBT_6m | 0.278 | -0.020 | 1.000 | | | | | | | | | | | | | | | | | | | |
| ICBT_1yr | 0.540 | 0.070 | 0.597 | 1.000 | | | | | | | | | | | | | | | | | | |
| ICBT_2yr | 0.413 | -0.041 | 0.421 | 0.852 | 1.000 | | | | | | | | | | | | | | | | | |
| AccRec_6m | 0.368 | 0.061 | 0.333 | 0.396 | 0.495 | 1.000 | | | | | | | | | | | | | | | | |
| NCF_BP1yr | 0.067 | -0.067 | 0.166 | 0.191 | 0.191 | 0.167 | 1.000 | | | | | | | | | | | | | | | |
| ChSalesChInv | 0.282 | 0.199 | 0.154 | 0.326 | 0.404 | 0.338 | 0.009 | 1.000 | | | | | | | | | | | | | | |
| AssTurn_6m | -0.008 | -0.020 | -0.056 | -0.007 | 0.163 | 0.302 | -0.007 | 0.214 | 1.000 | | | | | | | | | | | | | |
| AssTurn_1yr | -0.047 | -0.043 | -0.057 | 0.052 | 0.227 | 0.261 | -0.201 | 0.307 | 0.882 | 1.000 | | | | | | | | | | | | |
| AssTurn_2yr | 0.136 | 0.046 | -0.143 | 0.053 | 0.291 | 0.309 | -0.124 | 0.198 | 0.674 | 0.796 | 1.000 | | | | | | | | | | | |
| Crossover3_12 | -0.050 | 0.067 | 0.037 | 0.055 | 0.178 | 0.161 | -0.147 | 0.224 | 0.304 | 0.440 | 0.268 | 1.000 | | | | | | | | | | |
| Crossover6_12 | -0.051 | -0.019 | 0.177 | 0.323 | 0.051 | 0.198 | 0.076 | 0.141 | 0.115 | 0.195 | 0.155 | 0.538 | 1.000 | | | | | | | | | |
| Crossover3_18 | -0.050 | 0.150 | -0.061 | -0.061 | 0.060 | 0.059 | -0.073 | 0.278 | 0.227 | 0.234 | 0.040 | 0.478 | 0.206 | 1.000 | | | | | | | | |
| Crossover6_18 | -0.067 | 0.054 | 0.012 | -0.001 | 0.118 | 0.130 | 0.191 | 0.161 | 0.221 | 0.167 | 0.099 | 0.308 | 0.386 | 0.739 | 1.000 | | | | | | | |
| Reten | 0.552 | 0.214 | 0.253 | 0.374 | 0.433 | 0.556 | 0.304 | 0.236 | 0.158 | 0.125 | 0.233 | 0.067 | 0.205 | 0.043 | 0.227 | 1.000 | | | | | | |
| Reten_6m | 0.106 | 0.159 | -0.058 | 0.045 | -0.052 | -0.178 | 0.150 | 0.108 | 0.012 | -0.021 | -0.046 | -0.066 | 0.077 | -0.047 | -0.032 | 0.060 | 1.000 | | | | | |
| Reten_1yr | 0.148 | 0.168 | -0.006 | 0.073 | -0.059 | -0.222 | 0.086 | -0.061 | -0.031 | -0.126 | -0.103 | -0.135 | -0.112 | -0.035 | -0.032 | 0.113 | 0.589 | 1.000 | | | | |
| INV_1yr | 0.420 | 0.036 | 0.348 | 0.557 | 0.517 | 0.367 | 0.022 | 0.118 | -0.058 | 0.045 | 0.023 | -0.124 | -0.092 | -0.131 | -0.101 | 0.331 | -0.145 | -0.055 | 1.000 | | | |
| NS_6m | 0.394 | 0.061 | 0.278 | 0.495 | 0.411 | 0.437 | 0.184 | 0.187 | 0.123 | 0.030 | 0.103 | -0.043 | 0.142 | -0.068 | 0.080 | 0.482 | 0.059 | 0.129 | 0.436 | 1.000 | | |
| DIV_6m | 0.222 | -0.156 | 0.005 | 0.348 | 0.444 | 0.557 | 0.164 | 0.151 | 0.159 | 0.183 | 0.352 | -0.027 | 0.118 | -0.195 | 0.001 | 0.380 | -0.271 | -0.220 | 0.400 | 0.594 | 1.000 | |
| CPS_6m | 0.392 | 0.220 | 0.356 | 0.568 | 0.452 | 0.490 | 0.301 | 0.363 | 0.256 | 0.231 | 0.288 | 0.303 | 0.216 | 0.149 | 0.137 | 0.225 | 0.010 | -0.090 | 0.170 | 0.065 | 0.220 | 1.000 |

University of Cape Town

### 6.3.2.3. Change in liquidity

The correlation matrix for the change in liquidity cluster is shown in Table 6.4. and indicates that numerous characteristics are highly correlated by construction. As a result the following characteristics are removed: VO_1m; VO_6m; TV_1m; TV_3m; TV_6m; TV_1yr; MVT_3m; MVT_MV_3m; MVT_MV_6m and MVT_MV_1yr. Accordingly, only three variables are retained, namely: VO_3m; VO_1yr and MVT_MV_1m.

**Table 6.4.: Correlation matrix for the change in liquidity cluster**

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the cross-sectional regression analysis. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.1. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| | VO_1m | VO_3m | VO_6m | VO_1yr | TV_1m | TV_3m | TV_6m | TV_1yr | MVT_3m | MVT_MV_1m | MVT_MV_3m | MVT_MV_6m | MVT_MV_1yr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VO_1m | 1.000 | | | | | | | | | | | | |
| VO_3m | 0.662 | 1.000 | | | | | | | | | | | |
| VO_6m | 0.508 | 0.729 | 1.000 | | | | | | | | | | |
| VO_1yr | 0.439 | 0.632 | 0.720 | 1.000 | | | | | | | | | |
| TV_1m | 0.988 | 0.670 | 0.508 | 0.446 | 1.000 | | | | | | | | |
| TV_3m | 0.637 | 0.991 | 0.719 | 0.627 | 0.656 | 1.000 | | | | | | | |
| TV_6m | 0.514 | 0.755 | 0.987 | 0.726 | 0.527 | 0.756 | 1.000 | | | | | | |
| TV_1yr | 0.415 | 0.619 | 0.711 | 0.988 | 0.429 | 0.620 | 0.728 | 1.000 | | | | | |
| MVT_3m | 0.336 | 0.715 | 0.600 | 0.739 | 0.337 | 0.692 | 0.625 | 0.735 | 1.000 | | | | |
| MVT_MV_1m | 1.000 | 0.662 | 0.506 | 0.438 | 0.988 | 0.637 | 0.512 | 0.413 | 0.330 | 1.000 | | | |
| MVT_MV_3m | 0.660 | 1.000 | 0.731 | 0.634 | 0.669 | 0.991 | 0.757 | 0.620 | 0.711 | 0.660 | 1.000 | | |
| MVT_MV_6m | 0.506 | 0.733 | 0.999 | 0.717 | 0.507 | 0.723 | 0.986 | 0.709 | 0.597 | 0.505 | 0.736 | 1.000 | |
| MVT_MV_1yr | 0.438 | 0.637 | 0.726 | 0.999 | 0.446 | 0.634 | 0.732 | 0.989 | 0.735 | 0.438 | 0.639 | 0.724 | 1.000 |

### 6.3.2.4. Short-term momentum

The correlation matrix for the short-term momentum cluster is shown in Table 6.5. The matrix shows that all characteristics in the cluster are highly correlated. As a result all the characteristics except MOM_1m are removed.

**Table 6.5.: Correlation matrix for the short-term momentum cluster**

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the cross-sectional regression analysis. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.1. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| | MOM_1m | P_1m | LnMV_1m |
|---|---|---|---|
| MOM_1m | 1.000 | | |
| P_1m | 0.849 | 1.000 | |
| LnMV_1m | 0.818 | 0.997 | 1.000 |

University of Cape Town

A correlation matrix is constructed using the remaining variables in order to determine if any variables, from different clusters, are highly correlated. The resulting correlation matrix is shown in Table 6.6. The matrix illustrates that only two variables are highly correlated; PEGI_6m and NCA_MV_1yr. Since PEGI_6m has a lower t-statistic, it is removed from the analysis.

The final, simplified list of characteristics is presented in Table 6.7. The table shows the most significant characteristics that are not highly correlated with each other. The characteristics are divided into ten similar styles, namely: change in size; change in liquidity; change in performance; growth; change in growth; change in momentum/ crossover; change in value; value and short-term momentum.

**Table 6.6.: Correlation matrix for simplified list of significant variables**

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the cross-sectional regression analysis. Attributes are significant at the 5% level using Student's (1908) t-statistic. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| | VO_3m | VO_1yr | MVT_MV_1m | AssTurn_6m | AssTurn_2yr | CfSalesChg1yr | INV_1yr | AccRec_6m | DIV_6m | NCF_5Fiyr | NS_6m | PC_TA | Peten | ICBT_6m | Peten_1yr | Peten_5m | ICBT_2yr | Crossover3_12 | Crossover6_12 | Crossover6_18 | PEGI | PEGI_6m | PEGI_1yr | PEGI_2yr | NCA_MV_1yr | NCA_MV_2yr | TD_TA_5m | Sales_Emp | MOM_1m | CPS_6m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VO_3m | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VO_1yr | 0.632 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MVT_MV_1m | 0.692 | 0.438 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AssTurn_6m | 0.317 | 0.191 | 0.151 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AssTurn_2yr | 0.311 | 0.275 | 0.257 | 0.674 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| CfSalesChg1yr | 0.257 | 0.157 | 0.358 | 0.214 | 0.198 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | |
| INV_1yr | 0.030 | 0.094 | 0.035 | 0.058 | 0.073 | 0.018 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | |
| AccRec_6m | 0.164 | 0.371 | 0.045 | 0.202 | 0.309 | 0.338 | 0.367 | 1.000 | | | | | | | | | | | | | | | | | | | | | | |
| DIV_6m | 0.07 | 0.260 | 0.055 | 0.393 | 0.362 | 0.161 | 0.400 | 0.557 | 1.000 | | | | | | | | | | | | | | | | | | | | | |
| NCF_5Fiyr | 0.05 | 0.269 | 0.112 | 0.007 | 0.124 | 0.005 | 0.022 | 0.167 | 0.164 | 1.000 | | | | | | | | | | | | | | | | | | | | |
| NS_6m | 0.558 | 0.358 | 0.222 | 0.123 | 0.108 | 0.67 | 0.436 | 0.437 | 0.594 | 0.184 | 1.000 | | | | | | | | | | | | | | | | | | | |
| PC_TA | 0.069 | 0.222 | 0.021 | 0.003 | 0.136 | 0.282 | 0.420 | 0.363 | 0.222 | 0.057 | 0.394 | 1.000 | | | | | | | | | | | | | | | | | | |
| Peten | 0.332 | 0.548 | 0.193 | 0.168 | 0.233 | 0.298 | 0.331 | 0.506 | 0.350 | 0.304 | 0.492 | 0.353 | 1.000 | | | | | | | | | | | | | | | | | |
| ICBT_6m | 0.09 | 0.069 | 0.233 | 0.056 | 0.143 | 0.154 | 0.048 | 0.333 | 0.205 | 0.188 | 0.278 | 0.275 | 0.253 | 1.000 | | | | | | | | | | | | | | | | |
| Peten_1yr | 0.038 | 0.217 | 0.052 | 0.03 | 0.103 | 0.06 | 0.055 | 0.022 | 0.220 | 0.096 | 0.129 | 0.148 | 0.113 | 0.026 | 1.000 | | | | | | | | | | | | | | | |
| Peten_5m | 0.130 | 0.291 | 0.226 | 0.213 | 0.046 | 0.09 | 0.145 | 0.178 | 0.271 | 0.132 | 0.059 | 0.126 | 0.060 | 0.055 | 0.588 | 1.000 | | | | | | | | | | | | | | |
| ICBT_2yr | 0.014 | 0.186 | 0.152 | 0.163 | 0.291 | 0.404 | 0.517 | 0.495 | 0.444 | 0.19 | 0.411 | 0.413 | 0.438 | 0.421 | 0.059 | 0.362 | 1.000 | | | | | | | | | | | | | |
| Crossover3_12 | 0.135 | 0.042 | 0.159 | 0.004 | 0.266 | 0.224 | 0.124 | 0.181 | 0.027 | 0.147 | 0.043 | 0.035 | 0.067 | 0.037 | 0.135 | 0.066 | 0.178 | 1.000 | | | | | | | | | | | | |
| Crossover6_12 | 0.163 | 0.196 | 0.155 | 0.113 | 0.166 | 0.14 | 0.092 | 0.198 | 0.115 | 0.078 | 0.142 | 0.161 | 0.206 | 0.177 | 0.112 | 0.077 | 0.051 | 0.535 | 1.000 | | | | | | | | | | | |
| Crossover6_18 | 0.155 | 0.173 | 0.131 | 0.221 | 0.099 | 0.16 | 0.161 | 0.130 | 0.001 | 0.191 | 0.080 | 0.067 | 0.227 | 0.212 | 0.032 | 0.553 | 0.110 | 0.382 | 0.386 | 1.000 | | | | | | | | | | |
| PEGI | 0.109 | 0.263 | 0.075 | 0.017 | 0.360 | 0.273 | 0.467 | 0.421 | 0.037 | 0.225 | 0.439 | 0.415 | 0.42 | 0.243 | 0.035 | 0.095 | 0.611 | 0.052 | 0.097 | 0.034 | 1.000 | | | | | | | | | |
| PEGI_6m | 0.264 | 0.049 | 0.257 | 0.289 | 0.131 | 0.062 | 0.255 | 0.022 | 0.057 | 0.021 | 0.250 | 0.148 | 0.128 | 0.107 | 0.185 | 0.062 | 0.193 | 0.157 | 0.268 | 0.318 | 0.135 | 1.000 | | | | | | | | |
| PEGI_1yr | 0.179 | 0.001 | 0.229 | 0.399 | 0.369 | 0.032 | 0.015 | 0.073 | 0.060 | 0.035 | 0.100 | 0.170 | 0.203 | 0.213 | 0.032 | 0.065 | 0.205 | 0.457 | 0.240 | 0.266 | 0.142 | 0.697 | 1.000 | | | | | | | |
| PEGI_2yr | 0.078 | 0.169 | 0.057 | 0.173 | 0.434 | 0.047 | 0.234 | 0.253 | 0.553 | 0.182 | 0.243 | 0.125 | 0.183 | 0.225 | 0.030 | 0.214 | 0.499 | 0.153 | 0.170 | 0.206 | 0.672 | 0.232 | 0.545 | 1.000 | | | | | | |
| NCA_MV_1m | 0.205 | 0.179 | 0.195 | 0.128 | 0.040 | 0.15 | 0.361 | 0.156 | 0.064 | 0.164 | 0.349 | 0.584 | 0.208 | 0.325 | 0.402 | 0.169 | 0.437 | 0.251 | 0.161 | 0.171 | 0.315 | 0.722 | 0.431 | 0.042 | 1.000 | | | | | |
| NCA_MV_2yr | 0.101 | 0.097 | 0.133 | 0.118 | 0.201 | 0.235 | 0.492 | 0.052 | 0.001 | 0.092 | 0.316 | 0.522 | 0.224 | 0.414 | 0.300 | 0.137 | 0.477 | 0.230 | 0.179 | 0.207 | 0.157 | 0.432 | 0.175 | 0.116 | 0.684 | 1.000 | | | | |
| TD_TA_5m | 0.149 | 0.031 | 0.265 | 0.083 | 0.036 | 0.085 | 0.254 | 0.376 | 0.477 | 0.185 | 0.452 | 0.328 | 0.302 | 0.253 | 0.025 | 0.156 | 0.264 | 0.144 | 0.058 | 0.025 | 0.235 | 0.259 | 0.210 | 0.087 | 0.303 | 0.192 | 1.000 | | | |
| Sales_Emp | 0.012 | 0.126 | 0.114 | 0.127 | 0.210 | 0.039 | 0.300 | 0.124 | 0.125 | 0.219 | 0.265 | 0.458 | 0.315 | 0.432 | 0.265 | 0.231 | 0.268 | 0.100 | 0.054 | 0.069 | 0.263 | 0.286 | 0.271 | 0.145 | 0.535 | 0.473 | 0.166 | 1.000 | | |
| MOM_1m | 0.232 | 0.455 | 0.135 | 0.078 | 0.178 | 0.292 | 0.145 | 0.197 | 0.029 | 0.128 | 0.149 | 0.321 | 0.187 | 0.242 | 0.060 | 0.166 | 0.297 | 0.023 | 0.064 | 0.028 | 0.274 | 0.401 | 0.151 | 0.12 | 0.349 | 0.224 | 0.006 | 0.138 | 1.000 | |
| CPS_6m | 0.101 | 0.155 | 0.033 | 0.236 | 0.256 | 0.363 | 0.170 | 0.490 | 0.265 | 0.327 | 0.065 | 0.358 | 0.225 | 0.356 | 0.090 | 0.215 | 0.452 | 0.353 | 0.216 | 0.137 | 0.401 | 0.187 | 0.237 | 0.01 | 0.227 | 0.175 | 0.042 | 0.176 | 0.139 | 1.000 |

University of Cape Town

**Table 6.7.: List of final significant characteristics**

The table shows the final list of all significant variables. The mean coefficient and the t-statistic for each variable are also displayed. All variables are significant at the 5% level using Student's (1908) t-statistic and have correlation coefficients between 0.7 and -0.7. The mean information coefficient measures the average monthly correlation between expected and realised returns. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. Significant variables are divided into ten style groups: change in size; change in liquidity; performance; change in performance; growth; change in growth; change in momentum/ crossover; change in value; value and short-term momentum. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| | Characteristic | Mean Coefficient | T-Statistic | Mean Information Coefficient |
|---|---|---|---|---|
| Change in Size | CPS_6m | 0.001 | 2.351 | 0.054 |
| | NS_6m | 0.001 | 1.985 | 0.049 |
| Change in Liquidity | VO_1yr | 0.004 | 3.940 | 0.088 |
| | VO_3m | 0.003 | 3.552 | 0.076 |
| | MVT_MV_1m | 0.002 | 2.560 | 0.065 |
| Performance | NCF_BP1yr | 0.002 | 2.056 | 0.092 |
| Change in Performance | AssTurn_6m | 0.002 | 4.451 | 0.050 |
| | ICBT_6m | 0.003 | 4.169 | 0.058 |
| | AssTurn_2yr | 0.002 | 3.886 | 0.058 |
| | ICBT_2yr | 0.003 | 2.815 | 0.086 |
| | ChSalelsChInv | 0.001 | 2.800 | 0.041 |
| | INV_1yr | -0.001 | -2.754 | 0.059 |
| | AccRec_6m | 0.002 | 2.664 | 0.064 |
| | DIV_6m | 0.002 | 2.088 | 0.072 |
| Growth | Reten | 0.003 | 3.285 | 0.081 |
| | RD_TA | 0.003 | 2.692 | 0.078 |
| Change in Growth | Reten_1yr | 0.002 | 3.157 | 0.050 |
| | Reten_6m | 0.001 | 2.577 | 0.045 |
| Change in Momentum / Crossover | Crossover6_18 | 0.001 | 3.454 | 0.041 |
| | Crossover6_12 | 0.001 | 2.741 | 0.045 |
| | Crossover3_12 | 0.001 | 2.631 | 0.042 |
| Change in Value | PEGI_2yr | -0.002 | -4.441 | 0.061 |
| | PEGI_1yr | -0.002 | -3.906 | 0.049 |
| | NCA_MV_2yr | 0.003 | 3.599 | 0.064 |
| | TD_TA_6m | -0.001 | -2.110 | 0.041 |
| | NCA_MV_1yr | 0.002 | 2.066 | 0.073 |
| Value | PEGI | -0.002 | -3.408 | 0.057 |
| | Sales_Emp | -0.001 | -2.195 | 0.056 |
| Short-Term Momentum | MOM_1m | -0.004 | -2.999 | 0.127 |

University of Cape Town

### 6.3.3. Cumulative monthly payoffs to attributes

The cumulative monthly payoffs for each significant variable within each style group are displayed in Figure 6.2. to 6.11.

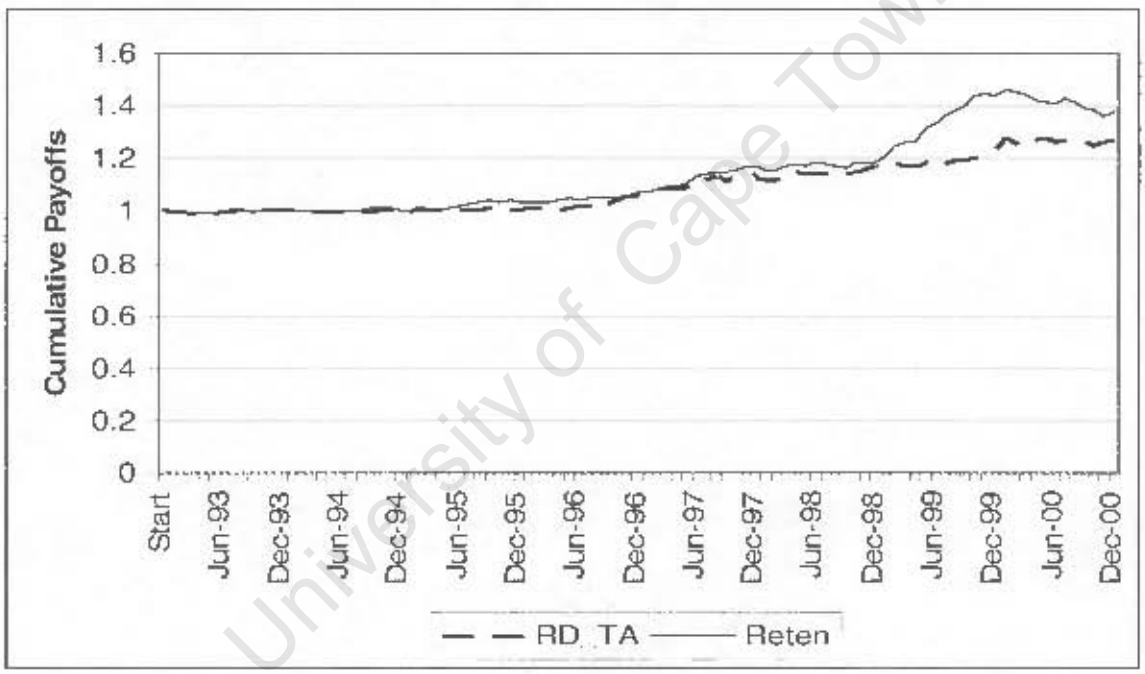
#### 6.3.3.1. Growth

Both growth ratios exhibit expected positive payoffs over the period. The retention ratio (Reten) has a cumulative payoff of 38% compared with 27% for research and development to total assets (RD_TA).

The significance of RD_TA supports the findings of Xu and Zhang (2004) who find research and development (R&D) intensity (measured as R&D to total assets) to be significant in explaining the cross-section of equity returns over the same period, 1993-2000. In addition, Xu and Zhang (2004) also find R&D intensity to have a positive payoff over the period.

**Figure 6.2.: In-sample cumulative monthly payoffs: Growth**

The graph displays cumulative monthly payoffs of the significant variables that encompass the growth style group. The two significant attributes are the retention ratio (Reten) and research and development to total assets (RD_TA). The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

### 6.3.3.2. Value

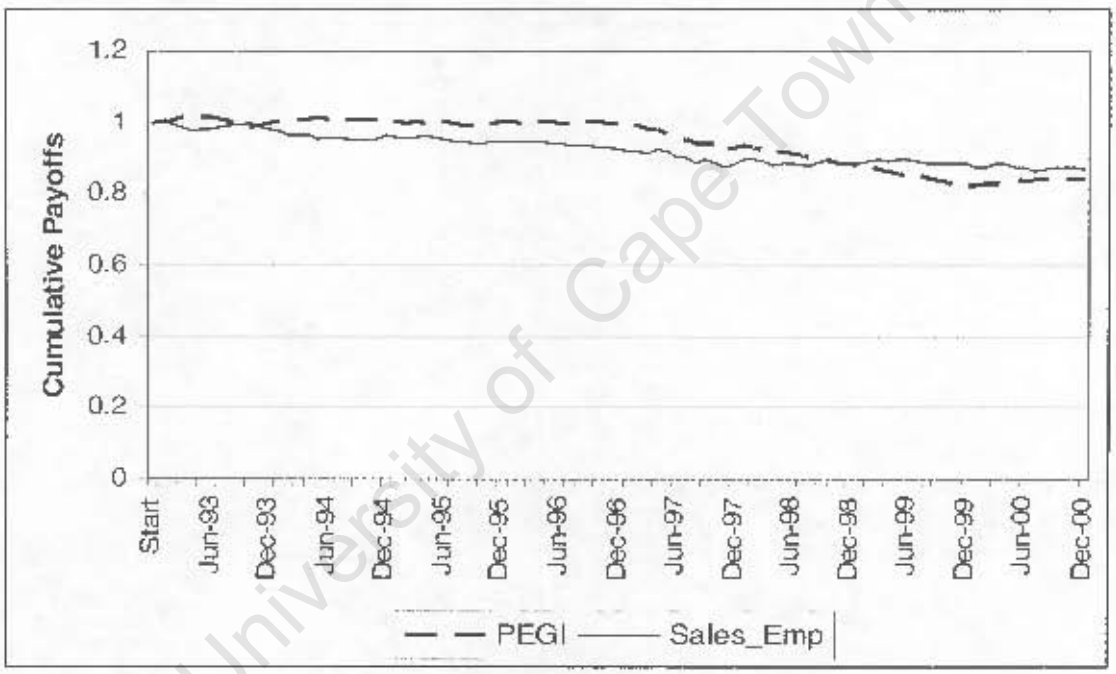
Both value characteristics exhibit negative payoffs over the period. While the price/earnings to sustainable growth (PEGI) ratio has small positive payoffs in the first two years, the payoffs become strongly negative in the following years.

Of particular interest is the failure of well documented characteristics such as the earnings yield (EY), cash earnings yield (CEY) and book-to-market value (BTMV) to show significance at the 95% level of confidence. The latter three variables are weakly significant with CEY showing significance at the 90% level of confidence and

EY and BTMV showing significance at the 80% level of confidence (see Appendix C.1.). The insignificance of EY supports the findings of Cai (1997), Chan, Hamao and Lakonishok (1993) while the insignificance of BTMV supports the findings of Hodoshima, Gorza-Gomez and Kunimura (2000).

**Figure 6.3.: In-sample cumulative monthly payoffs: Value**

The graph displays cumulative monthly payoffs of the significant variables that encompass the value style group. The significant attributes are the price/earnings to sustainable growth (PEGI) ratio and the sales per employee (Sales_Emp) ratio. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.



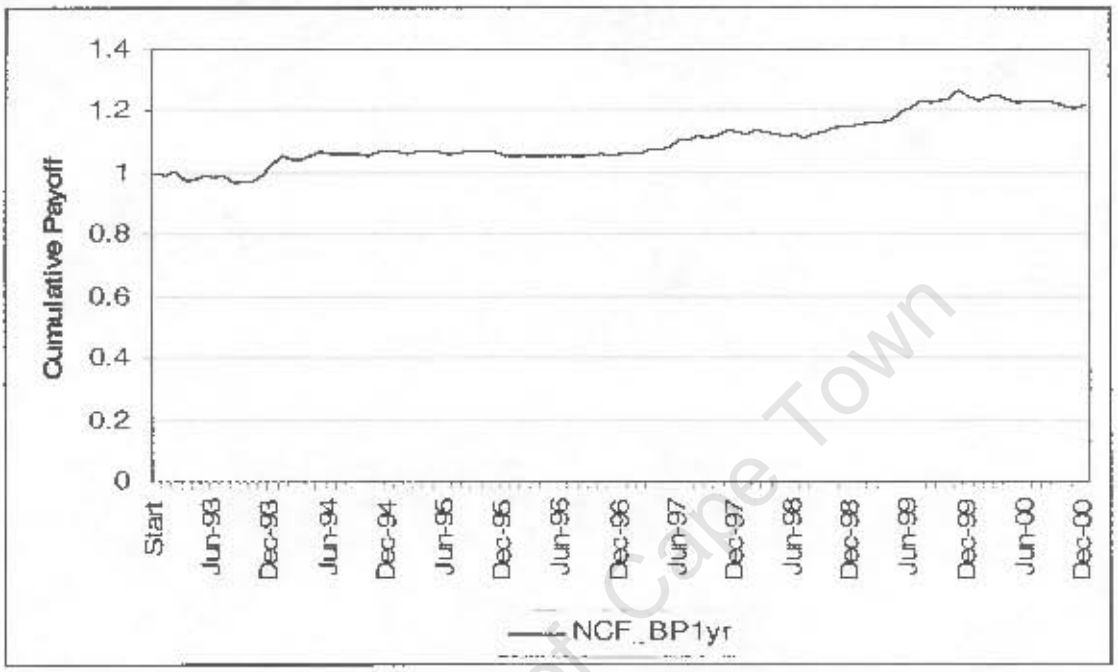

University of Cape Town

### 6.3.3.3. Performance

The net cash flow to borrowings payable in one year (NCF_BP1yr) variable is the only final significant performance variable. The variable shows a steady positive cumulative payoff over the sample period. The total cumulative payoff for the period is 22%.

**Figure 6.4.: In-sample cumulative monthly payoffs: Performance**

The graph displays cumulative monthly payoffs of the significant variables that encompass the performance style group. The significant attribute is net cash flow to borrowings repayable in one year (NCF_BP1yr). The attribute is significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.



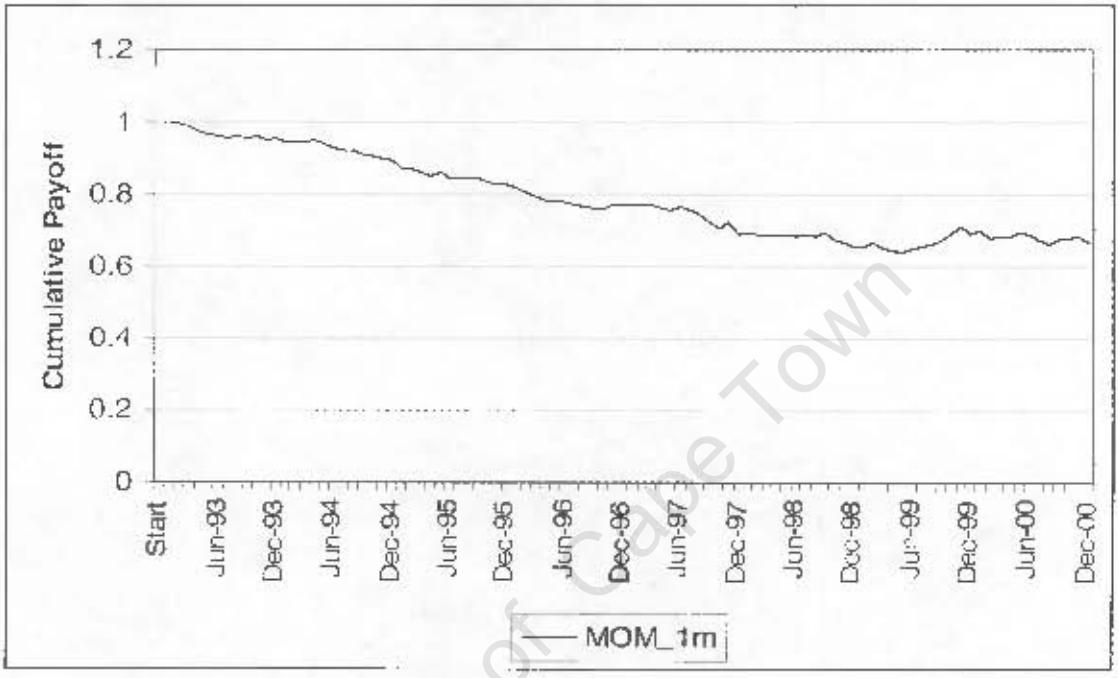

University of Cape Town

### 6.3.3.4. Short-term momentum

The one-month momentum in returns (MOM_1m) characteristic has the greatest negative cumulative payoff of all the final significant variables. This characteristic has a negative payoff of -33% over the sample period.

Figure 6.5.: **In-sample cumulative monthly payoffs: Short-term Momentum**

The graph displays cumulative monthly payoffs of the significant variables that encompass the short-term momentum style group. The significant attribute is the one-month momentum in returns (MOM_1m). The attribute is significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

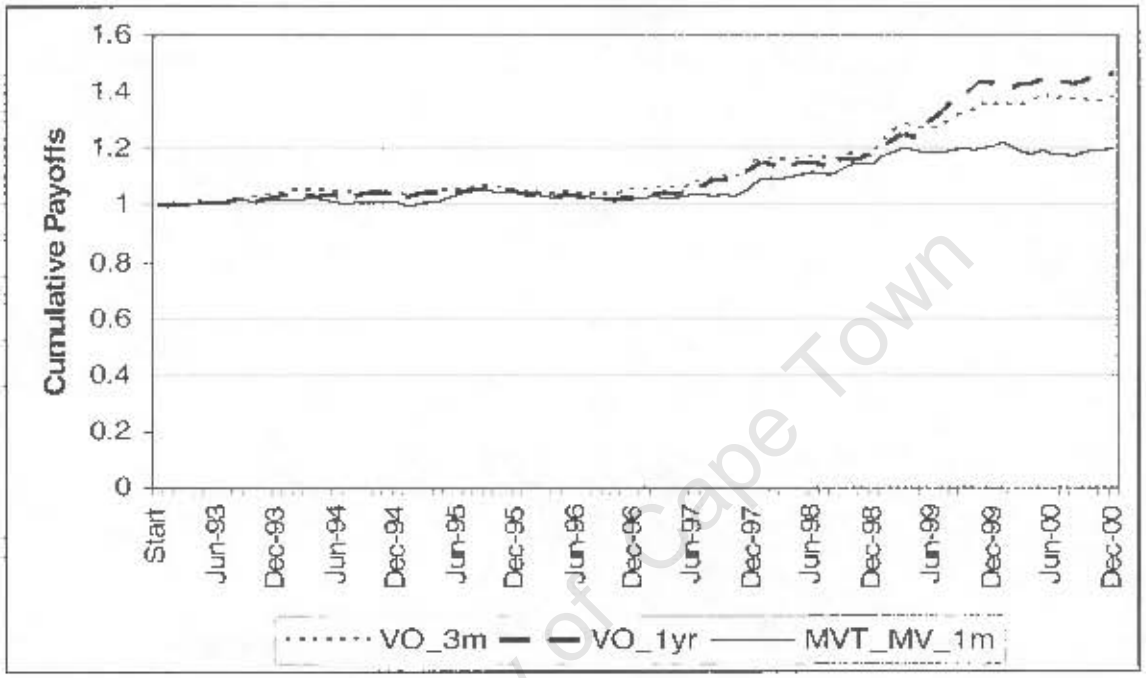
### 6.3.3.5. Change in liquidity

All change in liquidity variables have positive payoffs over the period. The cumulative payoffs increase substantially from the beginning of 1998. The change in absolute trading volume ratios, VO_3m and VO_1yr, have greater payoffs than the one-month change in market value traded to market value (MVT_MV_1m) ratio.

While Bremer and Hiraki (1999) find lagged trading volume to be a useful predictor of subsequent stock returns on the TSE, it is useful to note that the short- to medium-term change in trading volume is found to be more significant here.

**Figure 6.6.: In-sample cumulative monthly payoffs: Change in liquidity**

The graph displays cumulative monthly payoffs of the significant variables that encompass the change in liquidity style group. The significant variables are the percentage change in absolute trading volume ratios, VO_3m and VO_1yr and the one-month change in market value traded to market value (MVT_MV_1m). The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.



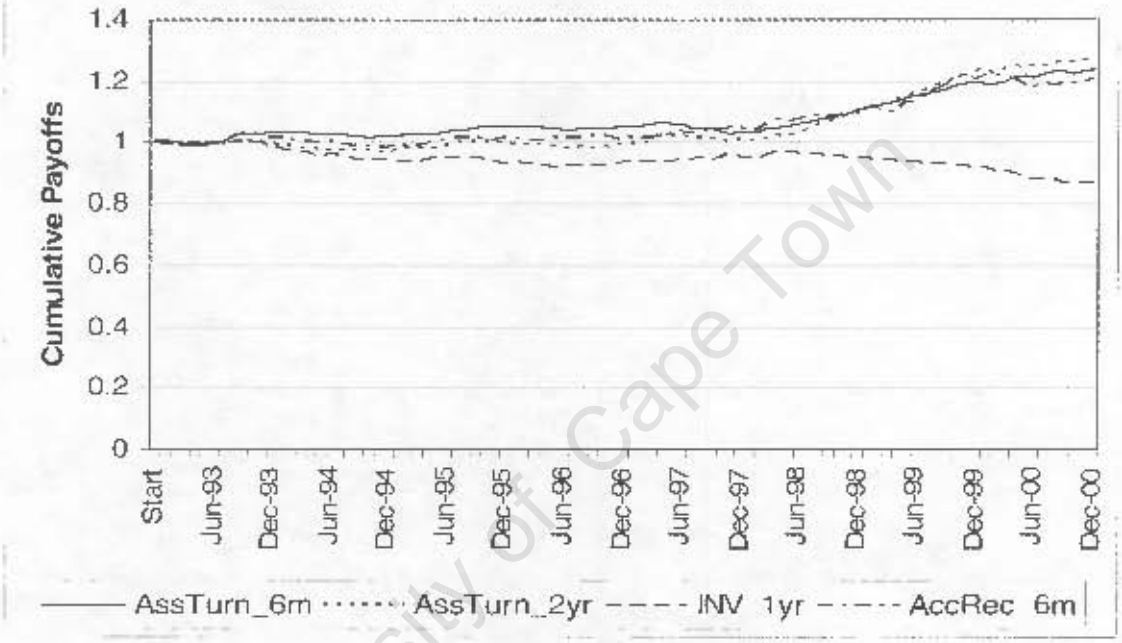

University of Cape Town

### 6.3.3.6. Change in performance

Seven of the eight characteristics show a modest positive cumulative payoff over the period. The only characteristic to show a negative payoff is the one-year change in inventory (INV_1yr). The characteristic offering the greatest cumulative payoff is the two-year change in the interest cover before tax ratio (ICBT_2yr), followed closely by the two-year change in the asset turnover ratio (AssTurn_2yr). As with the change in liquidity variables, the payoffs appear to become more substantial from the beginning of 1998.

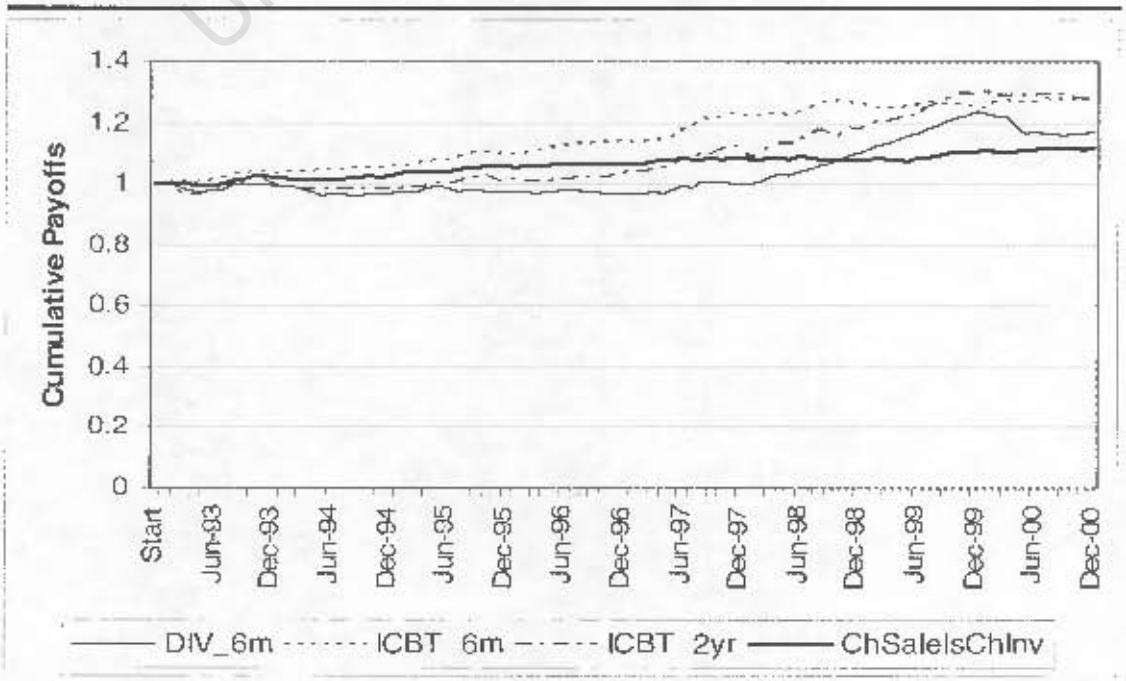
**Figure 6.7.: In-sample cumulative monthly payoffs: Change in performance**

The graph displays cumulative monthly payoffs of the significant variables that encompass the change in performance style group. The significant attributes are: the six-month and two-year change in asset turnover (AssTurn 6m and AssTurn 2yr); the one-year change in sales to the one-year change in inventory (ChSalelsChInv); the one-year change in inventory (INV_1yr); the six-month change in accounts receivable (AccRec_6m); the six-month change in total dividends (DIV_6m) and the six-month and two-year change in the interest cover before tax ratio (ICBT_6m and ICBT_2yr). The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

**Figure 6.7.: In-sample cumulative monthly payoffs: Change in performance**
-continued

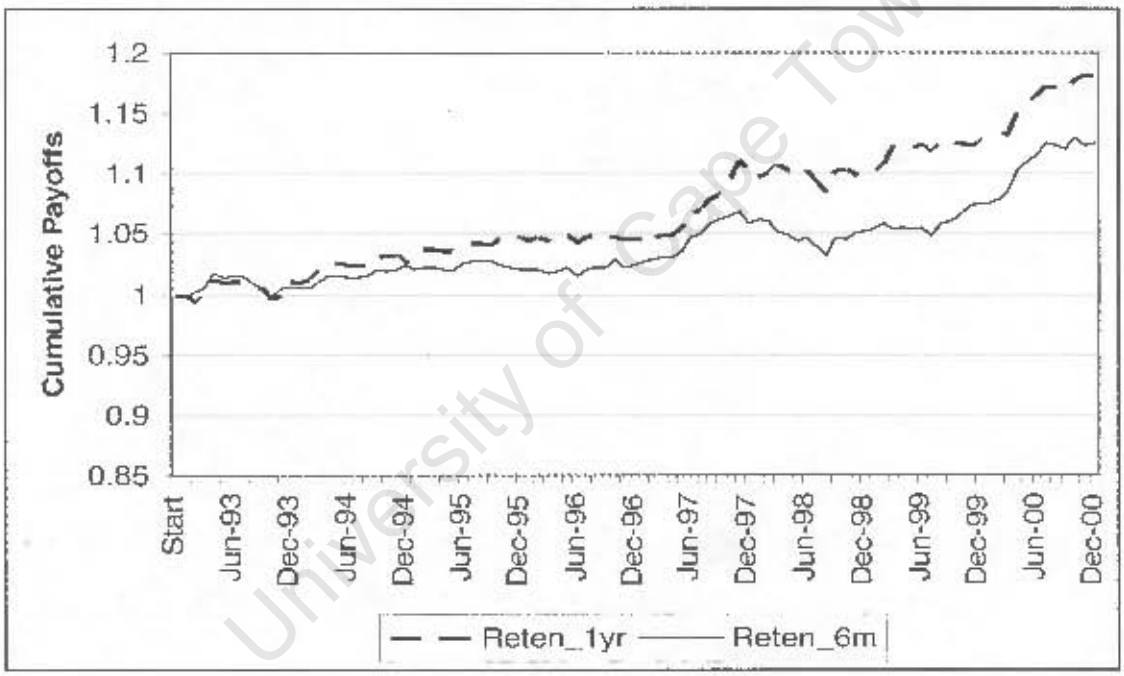


### 6.3.3.7. Change in growth

The change in growth characteristics, while being slightly volatile, exhibit an upward tend. The cumulative payoff, however, is not particularly substantial. This is indicated by the one-year change and six-month change in the retention ratio (Reten_1yr and Reten_6m) having cumulative payoffs of 18% and 13% respectively.

**Figure 6.8.: In-sample cumulative monthly payoffs: Change in growth**

The graph displays cumulative monthly payoffs of the significant variables that encompass the change in growth style group. The significant variables are the one-year change and six-month change in the retention ratio (Reten_1yr and Reten_6m). The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

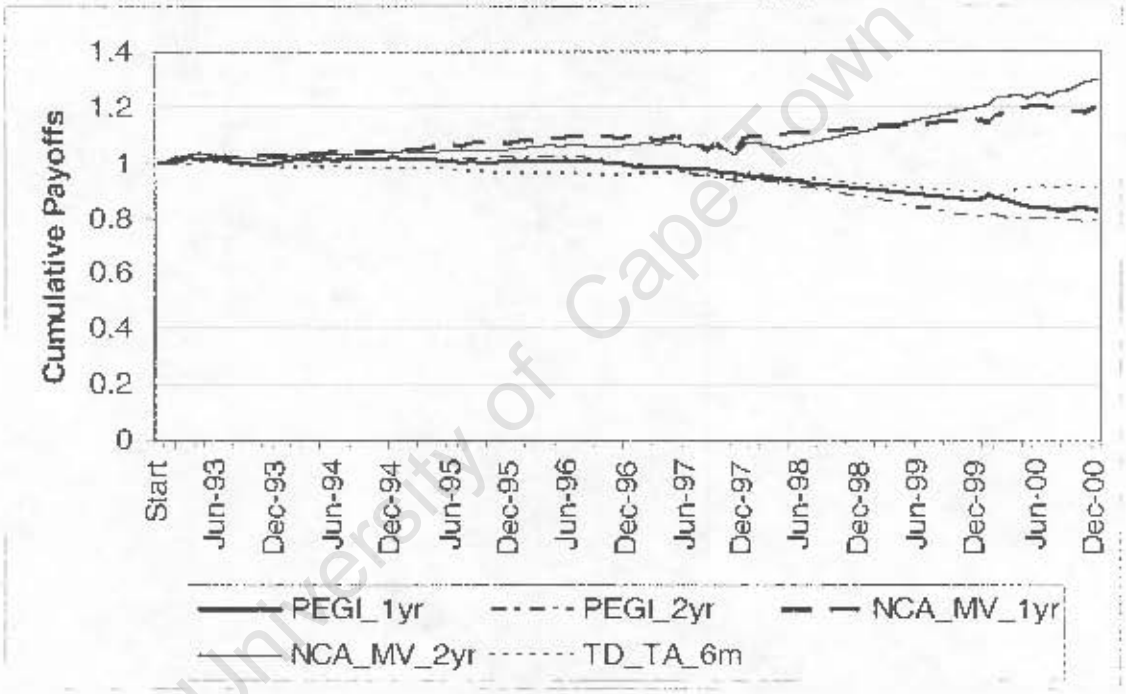
### 6.3.3.8. Change in value

Two characteristics, namely the one-year change and two-year change in net current assets to market value (NCA_MV_1yr and NCA_MV_2yr), show positive cumulative payoffs over the time period while the one-year change and two-year change in the price/earnings to sustainable growth ratio (PEGI_1yr and PEGI_2yr) and the six-month change in total debt to total assets (TD_TA_6m) exhibit negative payoffs. NCA_MV_2yr has the greatest positive cumulative payoff (30%) while PEGI_2yr exhibits the lowest (-21%).

While Bildersee, Cheh and Zutshi (1993) find NCA/MV to be significant in explaining the cross-section of returns on the TSE, the long-term change in NCA/MV is found to be more significant here.

**Figure 6.9.: In-sample cumulative monthly payoffs: Change in Value**

The graph displays cumulative monthly payoffs of the significant variables that encompass the change in value style group. The significant attributes are the one-year change and two-year change in net current assets to market value (NCA_MV_1yr and NCA_MV_2yr), the one-year change and two-year change in the price/earnings to sustainable growth ratio (PEGI_1yr and PEGI_2yr) and the six-month change in total debt to total assets (TD_TA_6m). The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.



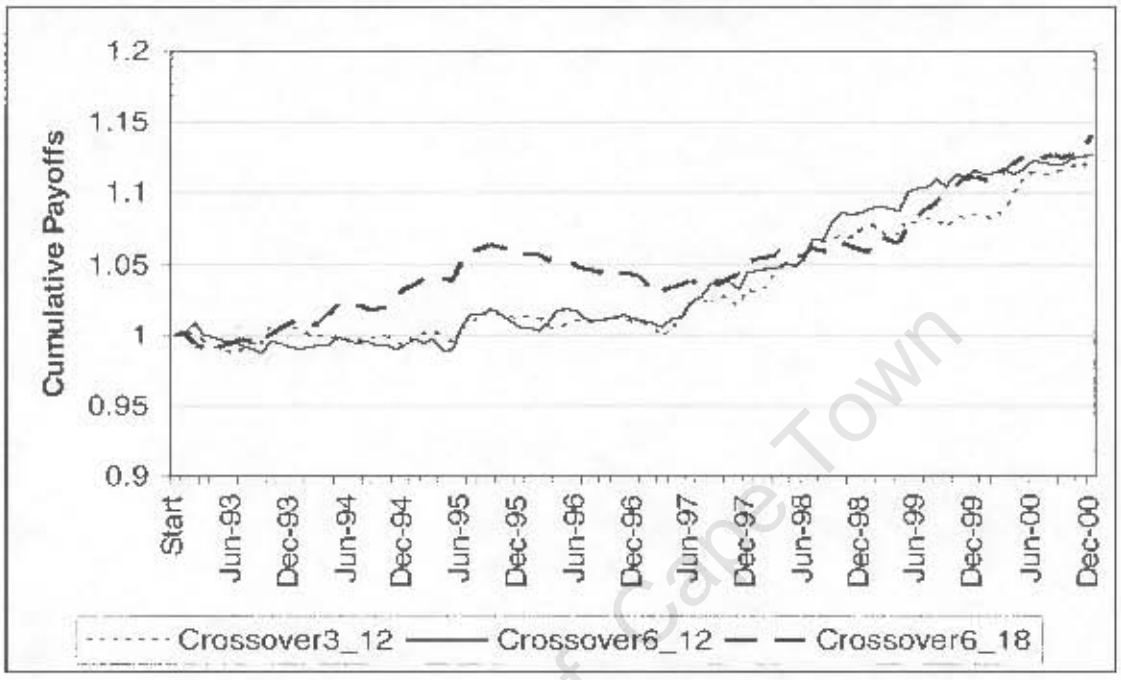

University of Cape Town

### 6.3.3.9. Change in momentum/ crossover

The change in momentum or crossover characteristics all show positive cumulative payoffs over the period. The payoffs also appear to increase substantially from the beginning of 1998.

**Figure 6.10.: In-sample cumulative monthly payoffs: Change in momentum/ crossover**

The graph displays cumulative monthly payoffs of the significant variables that encompass the change in momentum/ crossover style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.



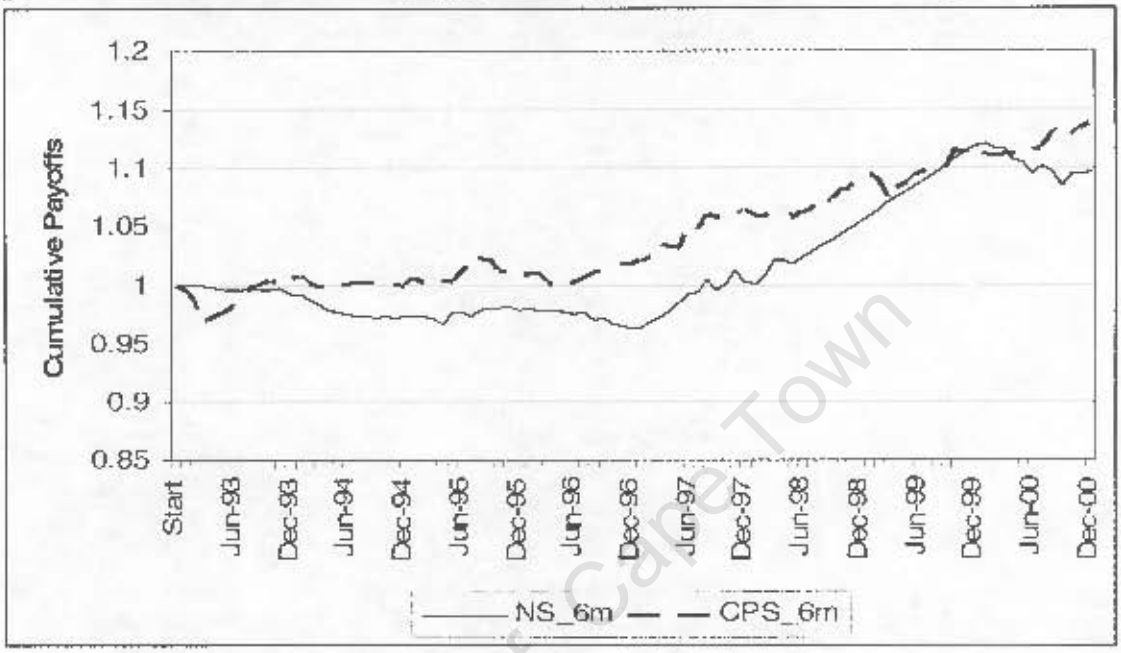

University of Cape Town

### 6.3.3.10. Change in size

The six-month change in the number of shares in issue (NS_6m) shows a modest cumulative negative payoff over the first three years and then exhibits a strong positive cumulative payoff for the remainder of the sample period. The six-month change in cash flow per share (CPS_6m) displays a slightly larger cumulative payoff over the period relative to the NS_6m.

**Figure 6.11.: In-sample cumulative monthly payoffs: Change in size**

The graph displays cumulative monthly payoffs of the significant variables that encompass the change in size style group. The significant attributes are the six-month change in the number of shares in issue (NS_6m) and the six-month change in cash flow per share (CPS_6m) The attribute is significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

## 6.4. Empirical results: Out-sample

### 6.4.1. Un-adjusted and risk adjusted results

The results of the univariate cross-sectional regressions for the un-adjusted and risk adjusted datasets are displayed in Tables 6.8. to 6.10. The tables only present the firm-specific attributes that are significant at the 95% level of confidence ($p < 0.05$). Each table displays the mean t-statistic; mean coefficient, mean information coefficient and the number of observations in the final month of analysis. The variables are arranged in descending order of the absolute value of the t-statistic. The full set of un-adjusted, single-index adjusted and multi-index adjusted results are displayed, in the same format, in Appendices C.4., C.5. and C.6. respectively. Appendices C.7., C.8. and C.9. display the correlation matrix of significant variables for the un-adjusted, single-index adjusted and multi-index adjusted returns respectively.

The results show the identification of several significant risk factors. Furthermore the majority of significant attributes remain significant after risk adjustment. The direction of payoffs appears to be consistent across un-adjusted and risk adjusted samples, however the magnitude of payoffs does exhibit slight variation across the three samples.

**Table 6.8.: List of significant variables for un-adjusted returns**

The table shows the t-statistic, mean coefficient, information coefficient and the number of observations in the final month of the analysis for each significant variable obtained from the cross-sectional regression analysis using un-adjusted returns. Results are obtained from monthly univariate cross-sectional regressions and the data are standardised and adjusted for thin-trading and outliers. Variables are significant at the 5% level using Student's (1908) t-statistic. The mean information coefficient measures the average monthly correlation between expected and realised returns. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. The variables are arranged in descending order of the absolute value of the t-statistic. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| BTMV | 6.0038 | 0.0088 | 0.1286 | 651 |
| MTBV | -5.8912 | -0.0080 | 0.1222 | 632 |
| CEY | 4.3159 | 0.0045 | 0.0814 | 651 |
| OPMtP | 3.7236 | 0.0048 | 0.0900 | 606 |
| P | -3.5592 | -0.0036 | 0.0671 | 562 |
| ICBT_6m | 3.4801 | 0.0025 | 0.0485 | 649 |
| CPMtP | 3.4010 | 0.0038 | 0.0811 | 649 |
| LnMV | -3.3328 | -0.0066 | 0.1363 | 649 |
| TV_3m | 3.1681 | 0.0031 | 0.0739 | 651 |
| MVT_MV_3m | 3.1473 | 0.0031 | 0.0733 | 651 |
| VO_3m | 3.0497 | 0.0030 | 0.0733 | 646 |
| Sales_P | 2.9318 | 0.0063 | 0.1419 | 649 |
| MVT | -2.9077 | -0.0037 | 0.0908 | 645 |
| DY | 2.8517 | 0.0049 | 0.1244 | 641 |
| Sales_Emp_1yr | 2.8369 | 0.0024 | 0.0578 | 590 |
| EY | 2.7147 | 0.0030 | 0.0792 | 649 |
| MVT_MV_6m | 2.5990 | 0.0030 | 0.0729 | 602 |
| NCF_BP1yrDiv_6m | -2.5877 | -0.0013 | 0.0335 | 557 |
| NCF_6m | -2.5746 | -0.0013 | 0.0348 | 594 |
| Reten_2yr | 2.5412 | 0.0015 | 0.0428 | 640 |
| NCF_TD_6m | -2.5037 | -0.0015 | 0.0395 | 649 |
| VO_6m | 2.4967 | 0.0029 | 0.0723 | 651 |
| TV_6m | 2.4776 | 0.0029 | 0.0744 | 651 |
| DPS | -2.4602 | -0.0025 | 0.0639 | 641 |
| NCF_BP1yr_6m | -2.4478 | -0.0014 | 0.0398 | 649 |
| NAVpS | -2.4368 | -0.0022 | 0.0597 | 572 |
| EPS_2yrAV | -2.4240 | -0.0024 | 0.0657 | 646 |
| MVT_3m | 2.3235 | 0.0024 | 0.0713 | 614 |
| EPS | -2.3212 | -0.0024 | 0.0670 | 444 |
| Intan_MV | 2.3056 | 0.0029 | 0.0730 | 649 |
| ICBT_2yr | 2.2304 | 0.0018 | 0.0533 | 588 |
| AssTurn_1yr | 2.2185 | 0.0020 | 0.0629 | 651 |
| DepAmort_TA_6m | 2.2132 | 0.0042 | 0.1308 | 572 |
| Borrow_1yr | -2.1754 | -0.0017 | 0.0540 | 651 |
| MTBV_2yr | -2.1695 | -0.0038 | 0.1149 | 649 |
| AssTurn_6m | 2.0980 | 0.0014 | 0.0442 | 651 |
| RD_EQ_2yr | -2.0694 | -0.0016 | 0.0573 | 476 |
| MTBV_1yr | -2.0694 | -0.0036 | 0.1154 | 630 |
| Quick_6m | 2.0558 | 0.0011 | 0.0374 | 488 |
| ICBT_1yr | 2.0205 | 0.0017 | 0.0548 | 591 |

University of Cape Town

**Table 6.9.: List of significant variables for single-index model adjusted returns**

The table shows the t-statistic, mean coefficient, information coefficient and the number of observations in the final month of the analysis for each significant variable obtained from the cross-sectional regression analysis using single-index model adjusted returns. Results are obtained from monthly univariate cross-sectional regressions and the data are standardised and adjusted for thin-trading and outliers. Variables are significant at the 5% level using Student's (1908) t-statistic. The mean information coefficient measures the average monthly correlation between expected and realised returns. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. The variables are arranged in descending order of the absolute value of the t-statistic. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| BTMV | 5.7574 | 0.0075 | 0.1139 | 651 |
| MTBV | -5.5367 | -0.0069 | 0.1092 | 632 |
| CEY | 4.9268 | 0.0040 | 0.0706 | 651 |
| CFMtP | 3.5767 | 0.0035 | 0.0768 | 649 |
| OPMtP | 3.3823 | 0.0041 | 0.0845 | 606 |
| DY | 3.3365 | 0.0039 | 0.0851 | 641 |
| DepAmort_TA_6m | 3.3094 | 0.0056 | 0.1320 | 572 |
| P | -3.2765 | -0.0036 | 0.0727 | 562 |
| LnMV | -3.2188 | -0.0058 | 0.1276 | 649 |
| Sales_P | 3.0653 | 0.0060 | 0.1367 | 649 |
| NS | -2.9867 | -0.0067 | 0.1525 | 640 |
| MTBV_1yr | -2.8840 | -0.0034 | 0.0819 | 630 |
| MVT | -2.7981 | -0.0038 | 0.0940 | 645 |
| MVT_MV_6m | 2.7629 | 0.0030 | 0.0750 | 602 |
| Reten_2yr | 2.7495 | 0.0016 | 0.0410 | 640 |
| DPS | -2.7365 | -0.0024 | 0.0596 | 641 |
| MTBV_2yr | -2.7347 | -0.0035 | 0.0862 | 649 |
| EY | 2.6057 | 0.0021 | 0.0542 | 649 |
| VO_6m | 2.5631 | 0.0028 | 0.0738 | 651 |
| Sales_Emp_1yr | 2.5596 | 0.0017 | 0.0447 | 590 |
| TV_6m | 2.5458 | 0.0029 | 0.0756 | 651 |
| Intan_MV | 2.5035 | 0.0026 | 0.0655 | 649 |
| EPS_1yr | -2.4936 | -0.0018 | 0.0487 | 649 |
| EPS_2yrAV | -2.4788 | -0.0022 | 0.0617 | 646 |
| EPS | -2.4575 | -0.0023 | 0.0645 | 444 |
| TV_3m | 2.4395 | 0.0026 | 0.0799 | 651 |
| MTBV_6m | -2.4367 | -0.0035 | 0.0947 | 649 |
| NAVpS | -2.4084 | -0.0018 | 0.0539 | 572 |
| NS_1yr | -2.3760 | -0.0037 | 0.1098 | 645 |
| NCA_MV_6m | 2.3462 | 0.0028 | 0.0688 | 609 |
| MOM_18m | -2.3163 | -0.0032 | 0.0887 | 645 |
| MVT_MV_3m | 2.3127 | 0.0025 | 0.0805 | 651 |
| RD_EQ_2yr | -2.2880 | -0.0017 | 0.0549 | 476 |
| RD_EQ_1yr | -2.2879 | -0.0016 | 0.0512 | 479 |
| Borrow_1yr | -2.2510 | -0.0014 | 0.0423 | 651 |
| OPMtP_6m | 2.2507 | 0.0028 | 0.0778 | 564 |
| LnMV_2yr | -2.2506 | -0.0035 | 0.1083 | 649 |
| VO_3m | 2.2330 | 0.0024 | 0.0796 | 646 |
| OPMtP_2yr | 2.2034 | 0.0014 | 0.0437 | 649 |
| CFMtP_6m | 2.1805 | 0.0027 | 0.0761 | 644 |
| BTMV_6m | 2.1306 | 0.0035 | 0.1022 | 651 |
| P_2yr | -2.0755 | -0.0031 | 0.1026 | 651 |
| ICBT_6m | 2.0687 | 0.0012 | 0.0425 | 649 |
| MOM_3m | -2.0672 | -0.0028 | 0.0871 | 638 |
| Sales_Emp_6m | 2.0542 | 0.0014 | 0.0471 | 584 |
| DIV | -2.0465 | -0.0025 | 0.0880 | 560 |
| CEY_6m | 2.0289 | 0.0025 | 0.0775 | 649 |
| Borrow_6m | -2.0159 | -0.0012 | 0.0422 | 651 |

University of Cape Town

**Table 6.10.: List of significant variables for multi-index model adjusted returns**

The table shows the t-statistic, mean coefficient, information coefficient and the number of observations in the final month of the analysis for each significant variable obtained from the cross-sectional regression analysis using multi-index model adjusted returns. Results are obtained from monthly univariate cross-sectional regressions and the data are standardised and adjusted for thin-trading and outliers. Variables are significant at the 5% level using Student's (1908) t-statistic. The mean information coefficient measures the average monthly correlation between expected and realised returns. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. The variables are arranged in descending order of the absolute value of the t-statistic. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| BTMV | 6.1704 | 0.0070 | 0.1078 | 651 |
| MTBV | -5.5676 | -0.0062 | 0.1045 | 632 |
| CEY | 4.8844 | 0.0034 | 0.0608 | 651 |
| DY | 3.3881 | 0.0038 | 0.0913 | 641 |
| LnMV | -3.1310 | -0.0047 | 0.1081 | 649 |
| P | -3.0053 | -0.0027 | 0.0660 | 562 |
| DepAmort_TA_6m | 2.9970 | 0.0056 | 0.1455 | 572 |
| MVT | -2.9751 | -0.0030 | 0.0760 | 645 |
| CFMtP | 2.9602 | 0.0027 | 0.0718 | 649 |
| EY | 2.8170 | 0.0021 | 0.0564 | 649 |
| Sales_P | 2.7579 | 0.0044 | 0.1091 | 649 |
| OPMtP | 2.6901 | 0.0030 | 0.0816 | 606 |
| Crossover1_18 | -2.5356 | -0.0009 | 0.0275 | 651 |
| AssTurn_6m | 2.5328 | 0.0013 | 0.0359 | 651 |
| NS | -2.5176 | -0.0050 | 0.1405 | 640 |
| MVT_MV_6m | 2.4503 | 0.0027 | 0.0754 | 602 |
| Sales_Emp_1yr | 2.4410 | 0.0015 | 0.0474 | 590 |
| TV_3m | 2.4170 | 0.0026 | 0.0766 | 651 |
| Reten_2yr | 2.3607 | 0.0012 | 0.0374 | 640 |
| TV_6m | 2.3247 | 0.0026 | 0.0759 | 651 |
| MTBV_2yr | -2.3010 | -0.0030 | 0.0918 | 649 |
| VO_6m | 2.2891 | 0.0025 | 0.0736 | 651 |
| MVT_MV_3m | 2.2752 | 0.0025 | 0.0783 | 651 |
| DPS | -2.2264 | -0.0018 | 0.0587 | 641 |
| MTBV_1yr | -2.2217 | -0.0026 | 0.0842 | 630 |
| VO_3m | 2.1964 | 0.0024 | 0.0773 | 646 |
| RD_EQ_1yr | -2.1404 | -0.0015 | 0.0529 | 479 |
| ICBT_6m | 2.1257 | 0.0012 | 0.0404 | 649 |
| EPS_1yr | -2.0866 | -0.0015 | 0.0541 | 649 |
| RD_TA_1yr | -2.0841 | -0.0011 | 0.0391 | 590 |
| AccRec | -2.0555 | -0.0017 | 0.0580 | 651 |

University of Cape Town

### 6.4.2. Simplification of significant characteristics

Figures 6.12., 6.13. and 6.14. present the cluster analyses of significant variables for the un-adjusted, single-index adjusted and multi-index adjusted returns respectively. The un-adjusted returns cluster analysis in Figure 6.12. indicates the presence of four clusters, namely: (1) performance and value; (2) change in value; (3) value and change in performance, liquidity and growth and; (4) size, performance and value.

Similarly, the single-index adjusted cluster analysis in Figure 6.13. shows the existence of four clusters, namely: (1) change in value and performance; (2) value, performance and change in growth; (3) size and; (4) momentum, value, size, growth and change in size, growth liquidity and value. Finally, Figure 6.14. displaying the multi-index adjusted cluster, indicates the presence of three clusters, namely: (1) performance, value and change in liquidity and performance; (2) value, crossover, liquidity and change in value, performance and growth and; (3) size and value.

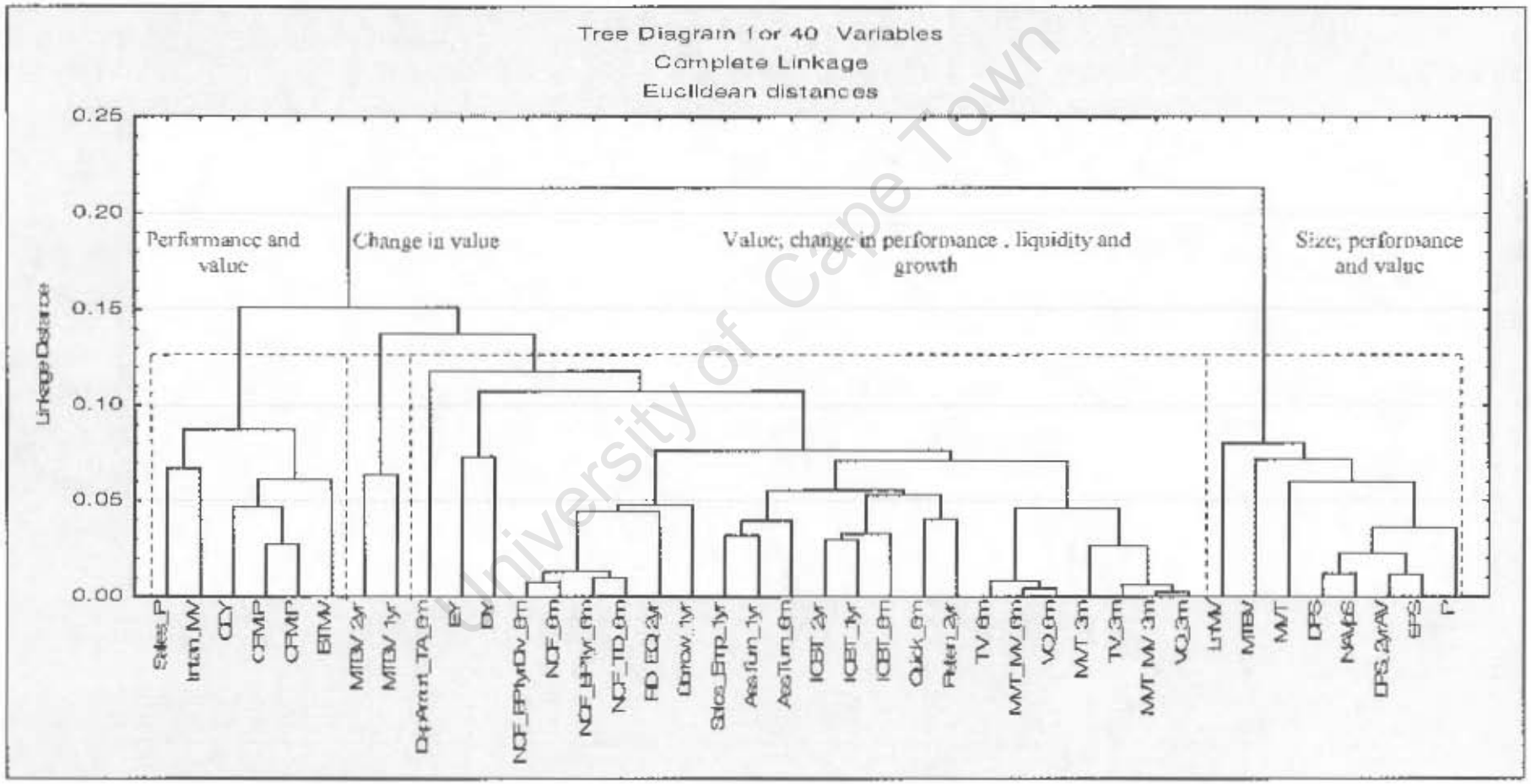
As previously mentioned, the simplification procedure outlined in Section 6.2.1. is followed. The intra-cluster and reduced inter-cluster correlation matrices for the un-adjusted, single-index adjusted and multi-index adjusted returns are presented in Appendices C.10., C.11. and C.12. respectively. The final list of simplified attributes is displayed in Tables 6.11., 6.12. and 6.13. The tables show the most significant characteristics that are not highly correlated with each other.

The un-adjusted returns are divided into seven style groups, namely: (1) size; (2) value; (3) performance; (4) change in growth; (5) change in value; (6) change in liquidity and; (7) change in performance. Similarly, the single-index adjusted returns are divided into eight style groups, namely: (1) size; (2) value; (3) momentum; (4) change in growth; (5) change in value; (6) change in liquidity; (7) change in size and; (8) change in performance. Finally, the multi-index adjusted returns results are divided in to nine style groups, namely: (1) size; (2) value; (3) performance; (4) change in growth; (5) change in momentum/ crossover; (6) change in value; (7) change in liquidity; (8) change in size and; (9) change in performance.

University of Cape Town

**Figure 6.12.: Tree diagram of monthly payoffs for un-adjusted returns**

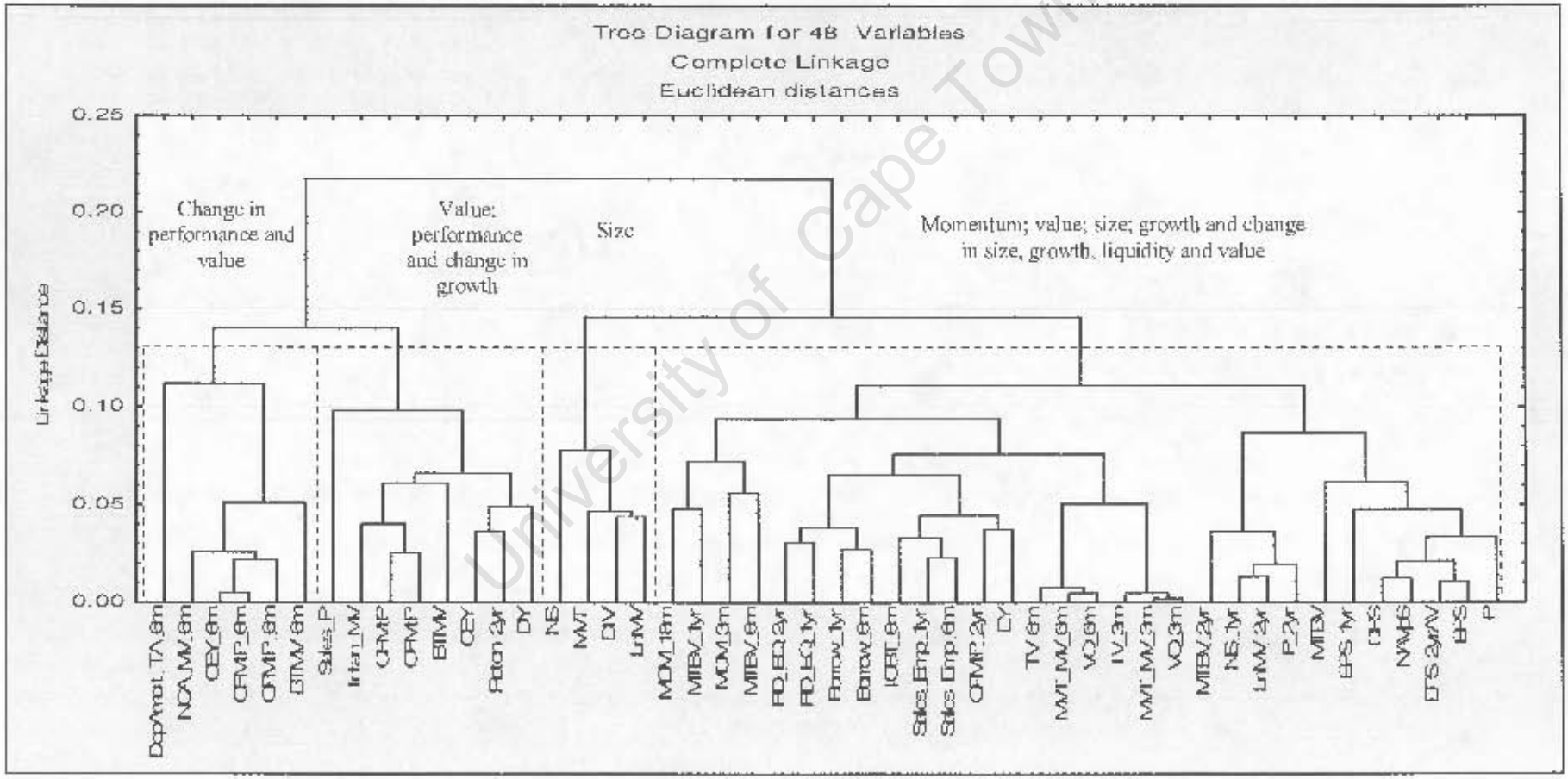
The vertical tree diagram displays the results of the cluster analysis using all the significant variables listed in Table 6.8. These variables are significant at the 5% level using Students (1908) t-statistic. The cluster analysis is constructed from monthly cross-sectional coefficients obtained from the cross-sectional regression analysis using un-adjusted returns. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

**Figure 6.13.: Tree diagram of monthly payoffs for single-index adjusted returns**

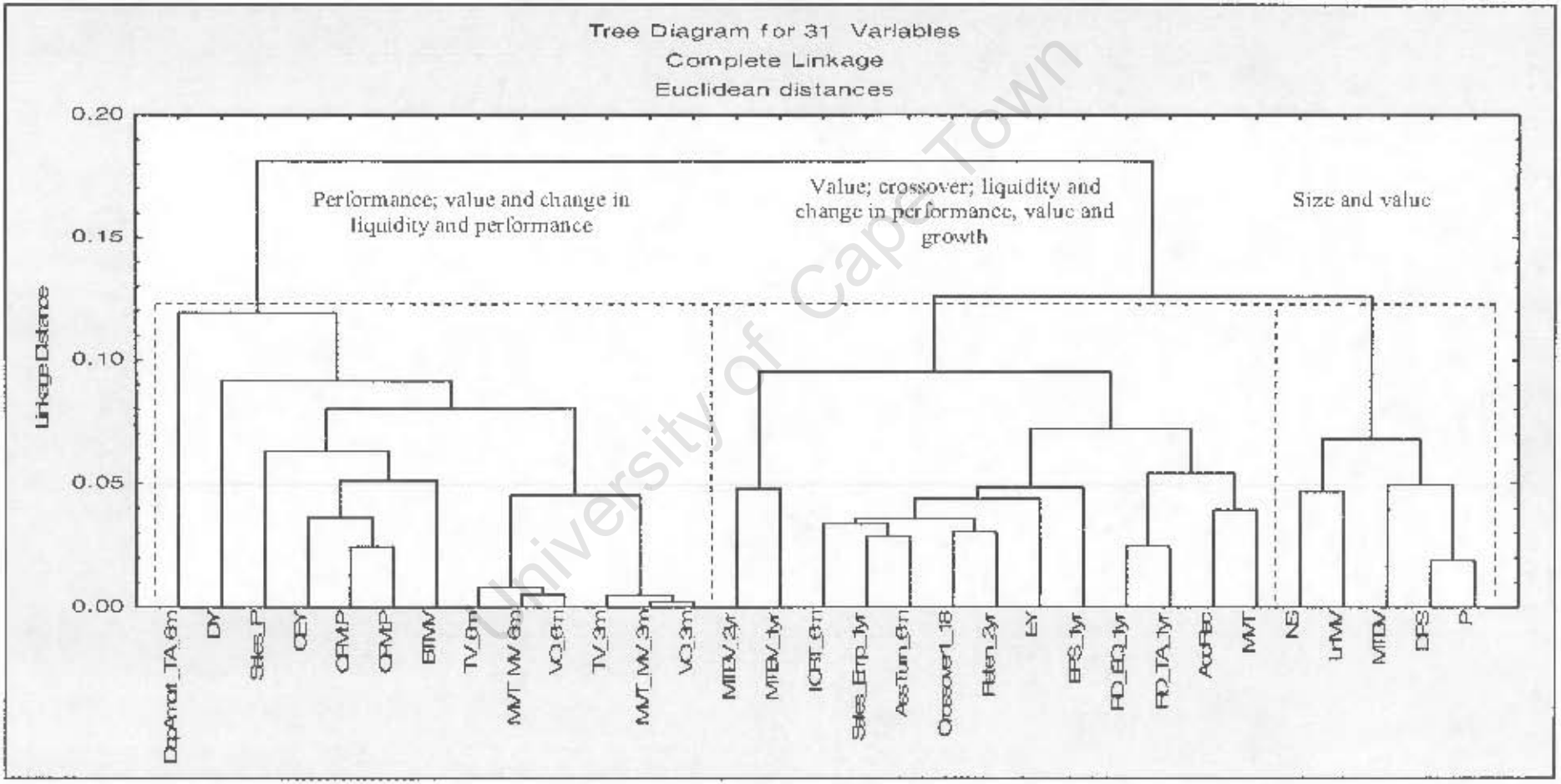
The vertical tree diagram displays the results of the cluster analysis using all the significant variables listed in Table 6.9. These variables are significant at the 5% level using Students (1908) t-statistic. The cluster analysis is constructed from monthly cross-sectional coefficients obtained from the cross-sectional regression analysis using single-index adjusted returns. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

**Figure 6.14.: Tree diagram of monthly payoffs for multi-index adjusted returns**

The vertical tree diagram displays the results of the cluster analysis using all the significant variables listed in Table 6.10. These variables are significant at the 5% level using Students (1908) t-statistic. The cluster analysis is constructed from monthly cross-sectional coefficients obtained from the cross-sectional regression analysis using multi-index adjusted returns. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town




University of Cape Town

**Table 6.11.: List of final, uncorrelated, significant characteristics for un-adjusted returns**

The table shows the final list of all significant variables that are uncorrelated with each other. The mean coefficient, t-statistic and the mean information coefficient for each variable is also displayed. All variables are significant at the 5% level using Student's (1908) t-statistic and have correlation coefficients between 0.7 and -0.7. The mean information coefficient measures the average monthly correlation between expected and realised returns. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. Significant variables are divided into seven style groups, namely: (1) size; (2) value; (3) performance; (4) change in growth; (5) change in value; (6) change in liquidity and; (7) change in performance. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| | Characteristic | Mean Coefficient | T-Statistic | Mean Information Coefficient |
|---|---|---|---|---|
| Size | LnMV | -0.007 | -3.333 | 0.136 |
| | NAVpS | -0.0022 | -2.4368 | 0.060 |
| Value | BTMV | 0.009 | 6.004 | 0.129 |
| | CEY | 0.004 | 4.316 | 0.081 |
| | DY | 0.005 | 2.852 | 0.124 |
| | EY | 0.003 | 2.715 | 0.079 |
| Performance | OPMtP | 0.005 | 3.724 | 0.090 |
| Change in Growth | RD_EQ_2yr | -0.002 | -2.069 | 0.057 |
| Change in Value | MTBV_2yr | -0.004 | -2.170 | 0.115 |
| Change in Liquidity | TV_3m | 0.003 | 3.168 | 0.074 |
| | MVT_MV_6m | 0.003 | 2.599 | 0.073 |
| Change in Performance | ICBT_6m | 0.002 | 3.480 | 0.048 |
| | Sales_Emp_1yr | 0.002 | 2.837 | 0.058 |
| | NCF_BP1yrDiv_6m | -0.001 | -2.588 | 0.034 |
| | ICBT_2yr | 0.002 | 2.230 | 0.053 |
| | DepAmort_TA_6m | 0.004 | 2.213 | 0.131 |
| | Borrow_1yr | -0.002 | -2.175 | 0.054 |
| | AssTurn_6m | 0.001 | 2.098 | 0.044 |
| | Quick_6m | 0.001 | 2.056 | 0.037 |

University of Cape Town

**Table 6.12.: List of final, uncorrelated, significant characteristics for single-index model adjusted returns**

The table shows the final list of all significant variables that are uncorrelated with each other. The mean coefficient, t-statistic and the mean information coefficient for each variable is also displayed. All variables are significant at the 5% level using Student's (1908) t-statistic and have correlation coefficients between 0.7 and -0.7. The mean information coefficient measures the average monthly correlation between expected and realised returns. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. Significant variables are divided into seven style groups, namely: (1) size; (2) value; (3) momentum; (4) change in growth; (5) change in value; (6) change in liquidity and; (7) change in performance. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| | Characteristic | Mean Coefficient | T-Statistic | Mean Information Coefficient |
|---|---|---|---|---|
| Size | LnMV | -0.006 | -3.219 | 0.128 |
| Value | BTMV | 0.007 | 5.757 | 0.114 |
| | DY | 0.004 | 3.336 | 0.085 |
| | EY | 0.002 | 2.606 | 0.054 |
| | Intan_MV | 0.0026 | 2.504 | 0.065 |
| Momentum | MOM_18m | -0.003 | -2.316 | 0.089 |
| | MOM_3m | -0.003 | -2.067 | 0.087 |
| Change in Growth | RD_EQ_1yr | -0.002 | -2.288 | 0.051 |
| | RD_EQ_2yr | -0.002 | -2.288 | 0.055 |
| Change in Value | MTBV_1yr | -0.003 | -2.884 | 0.082 |
| | MTBV_2yr | -0.003 | -2.735 | 0.086 |
| | MTBV_6m | -0.003 | -2.437 | 0.095 |
| Change in Liquidity | MVT_MV_6m | 0.003 | 2.763 | 0.075 |
| | TV_3m | 0.003 | 2.440 | 0.080 |
| Change in Size | EPS_1yr | -0.002 | -2.494 | 0.049 |
| Change in Performance | DepAmort_TA_6m | 0.006 | 3.309 | 0.132 |
| | Sales_Emp_1yr | 0.002 | 2.560 | 0.045 |
| | Borrow_1yr | -0.001 | -2.251 | 0.042 |
| | OPMtP_2yr | 0.001 | 2.203 | 0.044 |
| | ICBT_6m | 0.001 | 2.069 | 0.043 |
| | Borrow_6m | -0.001 | -2.016 | 0.042 |

University of Cape Town

**Table 6.13.: List of final, uncorrelated, significant characteristics for multi-index model adjusted returns**

The table shows the final list of all significant variables that are uncorrelated with each other. The mean coefficient, t-statistic and the mean information coefficient for each variable is also displayed. All variables are significant at the 5% level using Student's (1908) t-statistic and have correlation coefficients between 0.7 and -0.7. The mean information coefficient measures the average monthly correlation between expected and realised returns. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. Significant variables are divided into eight style groups, namely: (1) size; (2) value; (3) performance; (4) change in growth; (5) change in momentum/ crossover; (6) change in value; (7) change in liquidity and; (8) change in performance. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| | Characteristic | Mean Coefficient | T-Statistic | Mean Information Coefficient |
|---|---|---|---|---|
| Size | LnMV | -0.005 | -3.131 | 0.108 |
| | DPS | -0.002 | -2.226 | 0.059 |
| Value | BTMV | 0.007 | 6.170 | 0.108 |
| | CEY | 0.003 | 4.884 | 0.061 |
| | DY | 0.004 | 3.388 | 0.091 |
| | FY | 0.002 | 2.817 | 0.056 |
| Performance | AccRec | -0.002 | -2.056 | 0.058 |
| Change in Growth | Roton_2yr | 0.001 | 2.361 | 0.037 |
| | RD_EQ_1yr | -0.002 | -2.140 | 0.053 |
| | RD_TA_1yr | -0.001 | -2.084 | 0.039 |
| Change in Momentum / Crossover | Crossover1_18 | -0.001 | -2.536 | 0.028 |
| Change in Value | MTBV_2yr | -0.003 | -2.301 | 0.092 |
| | MTBV_1yr | -0.003 | -2.222 | 0.084 |
| Change in Liquidity | MVT_MV_6m | 0.003 | 2.450 | 0.075 |
| | TV_3m | 0.003 | 2.417 | 0.077 |
| Change in Size | EPS_1yr | -0.002 | -2.087 | 0.054 |
| Change in Performance | DepAmort_TA_6m | 0.006 | 2.997 | 0.146 |
| | AssTurn_6m | 0.001 | 2.533 | 0.036 |
| | Sales_Emp_1yr | 0.002 | 2.441 | 0.047 |
| | ICBT_6m | 0.001 | 2.126 | 0.040 |

University of Cape Town

### 6.4.3. Cumulative monthly payoffs

The cumulative monthly payoffs for each significant variable within each style group are displayed in Figure 6.15. to 6.21. The cumulative payoff graphs are only shown for the un-adjusted returns. The cumulative monthly payoff graphs for the single-index and multi-index adjusted returns are displayed in Appendix C.13. and C.14. respectively.

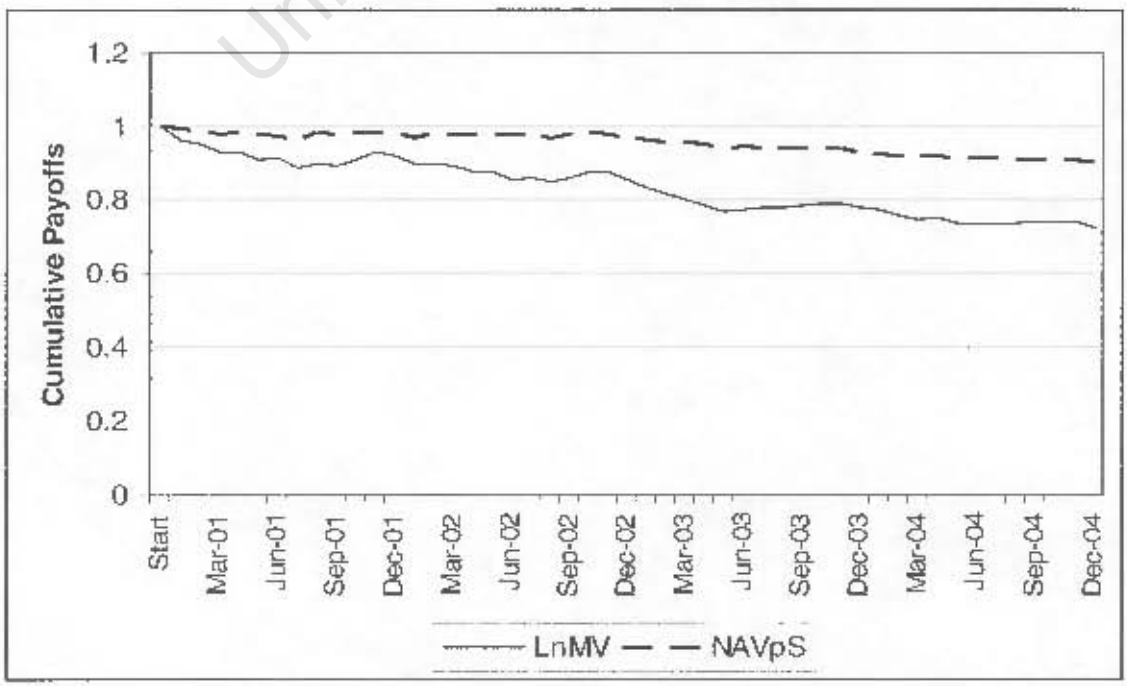
#### 6.4.3.1. Size

As expected, the size variables provide cumulative negative payoffs over the sample period, thus supporting the small firm effect. The significance of the log of market value (LnMV) variable supports the findings of Kato and Schallheim (1985), Cai (1997), Bae and Kim (1998) and Hodoshima, Gorza-Gomez and Kunimura (2000) and the expected negative coefficient indicates that small firms outperform large firms on the TSE. Only the LnMV variable remains significant after adjusting returns for risk using both the single-index and multi-index models.

University of Cape Town

**Figure 6.15.: Out-sample cumulative monthly payoffs: Size**

The graph displays cumulative monthly payoffs for the significant variables that encompass the size style group. The significant attributes are log of market value (LnMV) and net asset value per share (NAVpS). The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using un-adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.



### 6.4.3.2. Value

Figure 6.15. displays the cumulative payoffs for the four significant value variables. All the value variables exhibit positive cumulative payoffs. The book to market value (BTMV) variable provides the greatest cumulative payoff and its significance supports the findings of Chan, Hamao and Lakonishok (1991), Cai (1997) and Bae and Kim (1998).

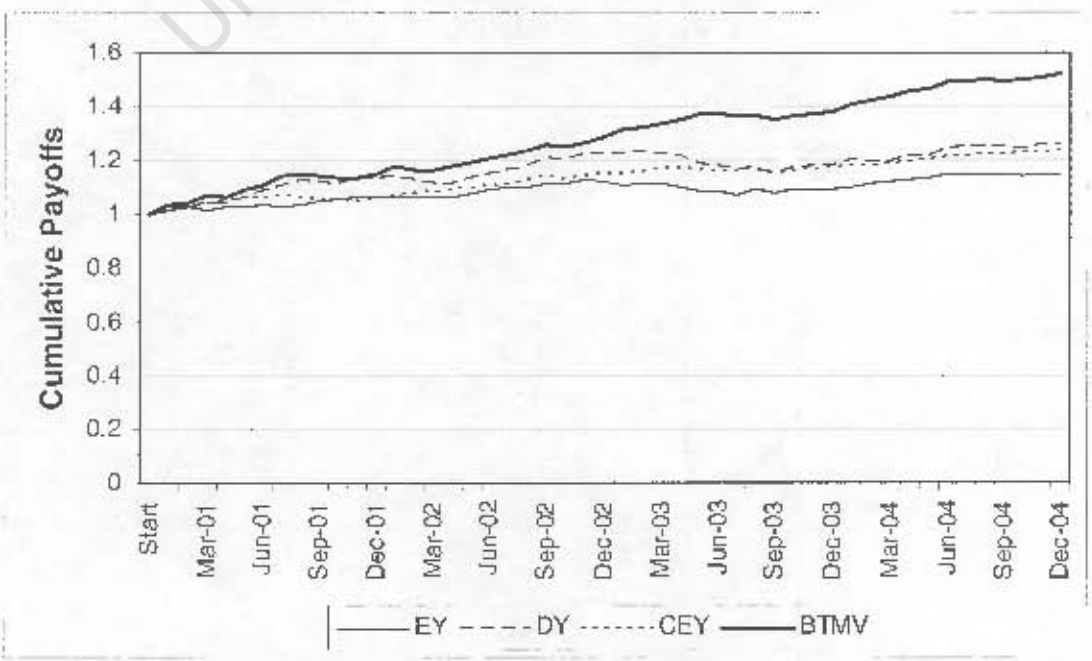
Both the cash earnings yield (CEY) and the earnings yield (EY) are significant and not highly correlated. The CEY is more significant than the EY supporting the argument by Chan, Hamao and Lakonishok (1991) that the CEY is more useful in explaining returns on the TSE because it eliminates the effect of depreciation policy inherent in the EY. The significance of the dividend yield (DY) is documented by Michaud (1999) who also finds a positive payoff to the attribute.

All value attributes remain significant after risk adjustment using both the single-index and multi-index models.

University of Cape Town

**Figure 6.16.: Out-sample cumulative monthly payoffs: Value**

The graph displays cumulative monthly payoffs for significant variables that encompass the value style group. The significant attributes are book to market value (BTMV), cash earnings yield (CEY), earnings yield (EY) and the dividend yield (DY). The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using un-adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

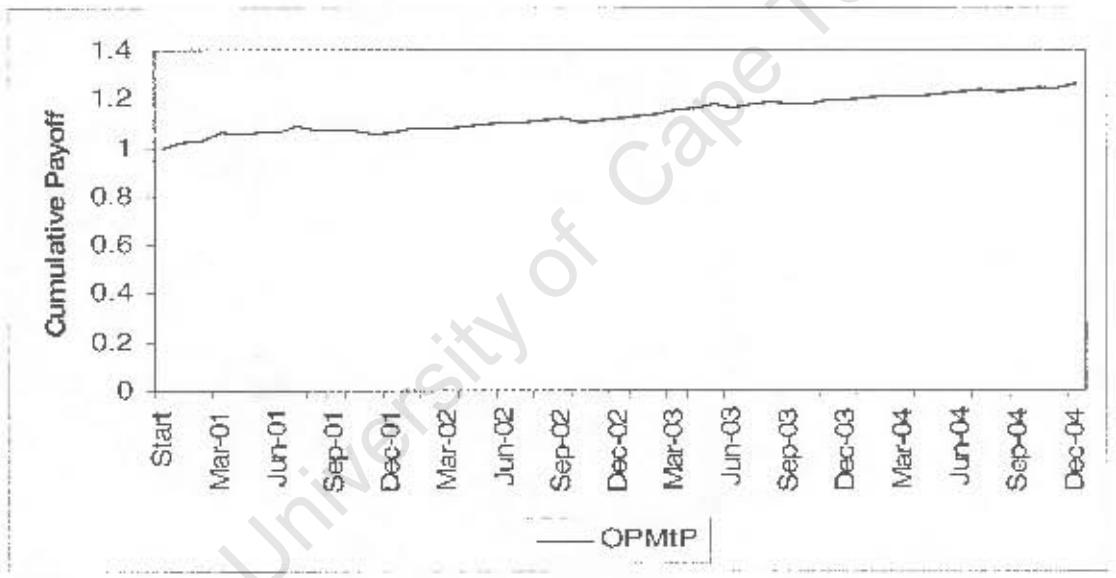


### 6.4.3.3. Performance

The only significant performance attribute is operating margin to price (OPMtP). The attribute has a cumulative positive payoff of 26% over the four year period. The variable remains significant with a positive payoff after both single-index model and multi-index model risk adjustments however, it is not included in the final list due to a high correlation with other, more significant, variables.

**Figure 6.17.: Out-sample cumulative monthly payoffs: Performance**

The graph displays cumulative monthly payoffs for the significant variable that encompass the performance style group. The significant attribute is operating margin to price (OPMtP). The attribute is significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using un-adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.



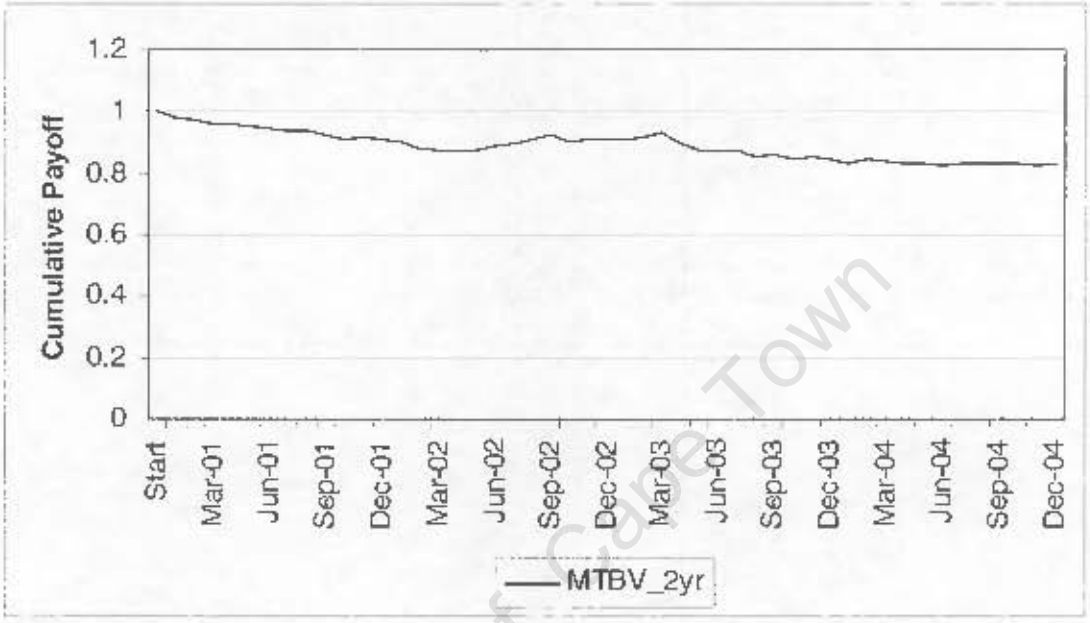

University of Cape Town

### 6.4.3.4. Change in value

The only significant performance attribute is two year change in market to book value (MTBV_2yr). The attribute has a cumulative negative payoff over the sample period. The MTBV_2yr variable remains significant with a negative payoff and is included in the final lists of both the single-index model and multi-index model risk adjusted results.

**Figure 6.18.: Out-sample cumulative monthly payoffs: Change in value**

The graph displays cumulative monthly payoffs for the significant variable that encompass the change in value style group. The significant attribute is the two year change in market to book value (MTBV_2yr). The attribute is significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using un-adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

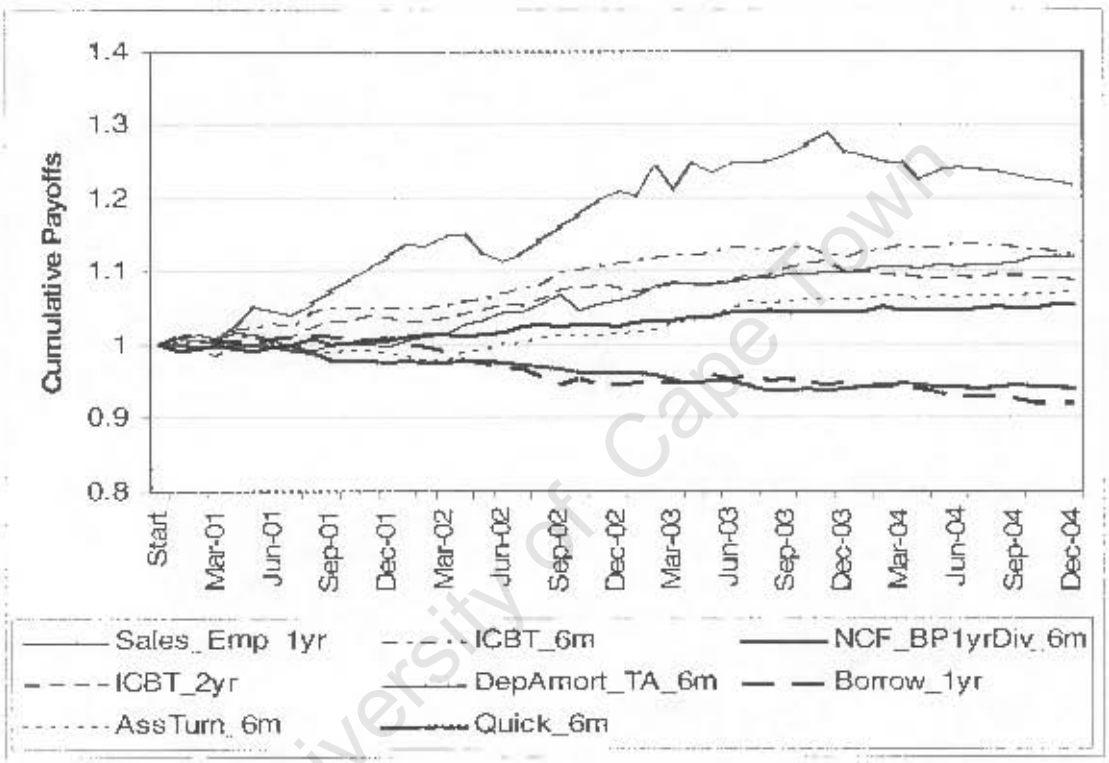
### 6.4.3.5. Change in performance

The majority of the performance attributes show positive payoffs over the period however, the two change in debt ratios, namely: the six-month change in net cash flow to borrowings payable in one year plus dividends (NCF_BP1yrDIV_6m) and the one year change in the borrowing ratio (Borrow_1yr) show negative cumulative payoffs. The greatest cumulative payoff is given by the six-month change in the depreciation and amortisation to total assets ratio (DepAmort_TA_6m) variable. This variable provides a cumulative return of 22% over the period.

The DepAmort_TA_6m, Sales_Emp_1yr, Borrow_1yr and ICBT_6m attributes remain significant with the same sign after risk adjustment using the single-index model. The DepAmort_TA_6m, Sales_Emp_1yr, AssTurn_6m and ICBT_6m attributes are significant with the same signs after risk adjustment using the multi-index model.

**Figure 6.19.: Out-sample cumulative monthly payoffs: Change in performance**

The graph displays cumulative monthly payoffs for the significant variables that encompass the change in performance style group. The significant attributes are the one-year change in sales per employee (Sales_Emp_1yr), the six-month and two-year change in interest cover before tax ratios, the six-month change in net cash flow to borrowings payable in one year plus dividends (NCF_BP1yrDIV_6m), the six-month change in the depreciation and amortisation to total assets ratio (DepAmort_TA_6m), the six-month change in asset turnover, the six-month change in the quick ratio and the one year change in the borrowing ratio (Borrow_1yr) The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using un-adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.



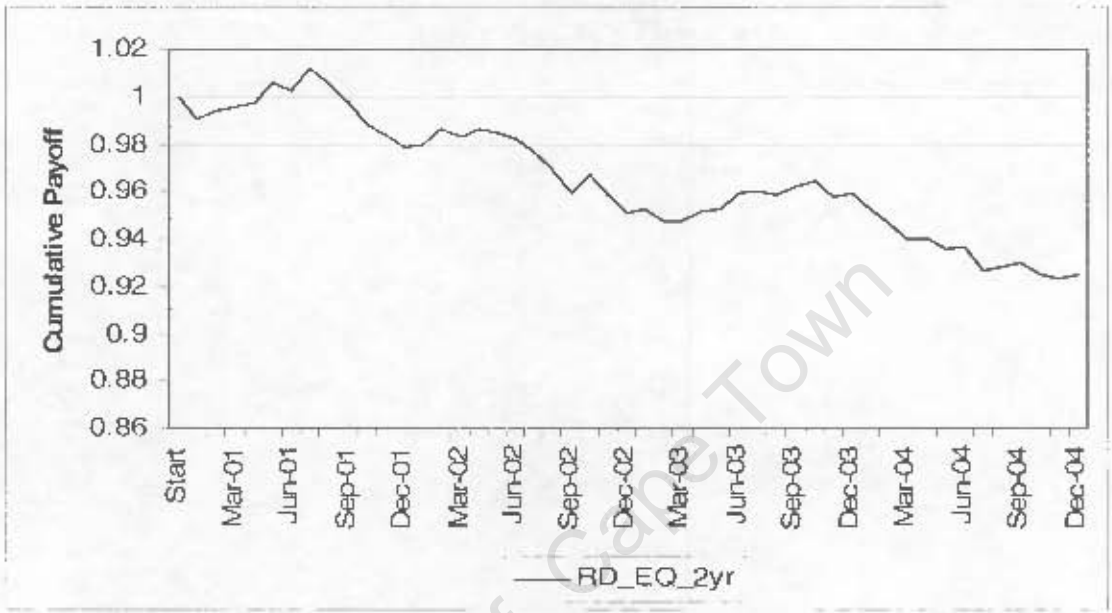

University of Cape Town

### 6.4.3.6. Change in growth

The two-year change in research and development to total equity (RD_EQ_2yr), exhibits a cumulative negative payoff over the period. The characteristic is significant after risk adjustment using the single-index model but not the multi-index model.

**Figure 6.20.: Out-sample cumulative monthly payoffs: Change in growth**

The graph displays cumulative monthly payoffs for the significant variable that encompass the change in growth style group. The significant attribute is the two-year change in research and development to total equity (RD_EQ_2yr). The attribute is significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using un-adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.



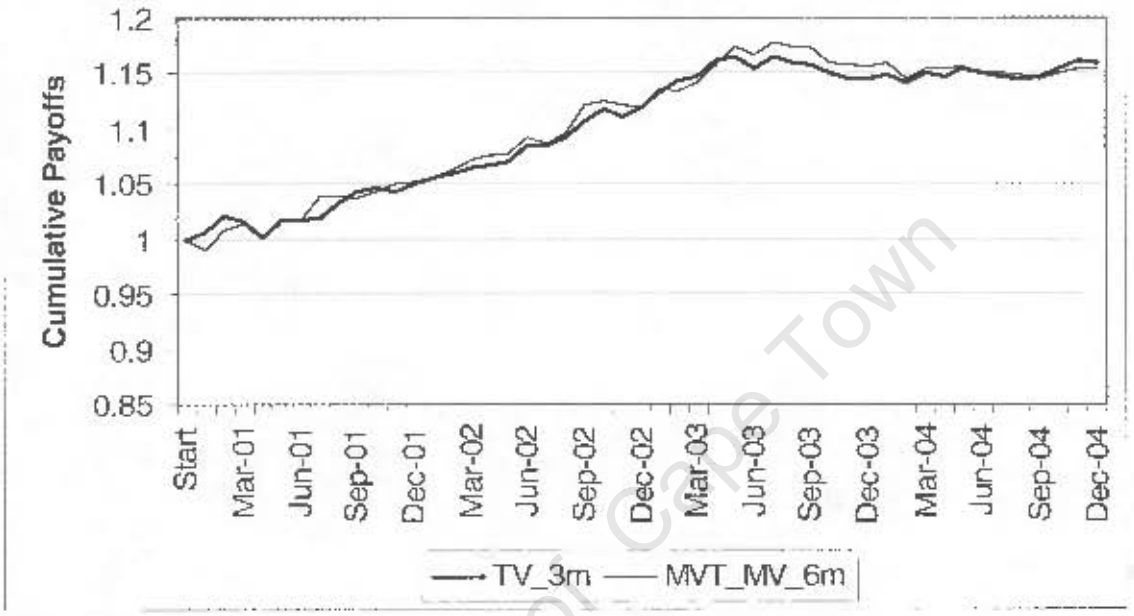

University of Cape Town

### 6.4.3.7. Change in liquidity

Both the change in liquidity variables have highly similar, positive cumulative payoffs over the period. Furthermore, both characteristics remain significant with a cumulative negative payoff and are included in the final lists of both the single-index model and multi-index model risk adjusted samples.

**Figure 6.21.: Out-sample cumulative monthly payoffs: Change in liquidity**

The graph displays cumulative monthly payoffs for the significant variables that encompass the change in liquidity style group. The significant variables are the three-month change in the trading volume ratio (TV 3m) and the six-month change in the market value traded to market value ratio (MVT_MV 6m). The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using un-adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

### 6.4.4. Comparison of in- and out-sample results

Table 6.14. displays the mean t-statistic and mean coefficient for all significant variables from the in-sample regressions and the corresponding out sample mean t-statistic and mean coefficient. All in-sample variables displayed are significant at the 5% level using Student's (1908) t-statistic. Out-sample variables that are significant at the 5% level are displayed with their mean t-statistics in bold font.

A comparison of means (assuming unequal variances) t-statistic is displayed in the right-hand column. Comparison of means t-statistics significant at the 5% level of significance ($p < 0.05$) are displayed in bold italic and indicate that the means of the in- and out-sample coefficients are not equal. Appendix C.15. displays the same information for all firm-specific characteristics included in the analysis.

**Table 6.14.: Comparison of in- and out-sample results**

The table displays the mean monthly cross-sectional coefficients for each factor for the in-sample period from 1 January 1993 to 31 December 2000 and the out-sample period from 1 January 2001 to 31 December 2004. Results are obtained from monthly univariate cross-sectional regressions and the data are standardised and adjusted for thin-trading and outliers. All in-sample variables displayed are significant at the 5% level using Student's (1908) t-statistic. All variables that are significant at the 5% level of significance are displayed with their mean t-statistics in bold font. A comparison of means (assuming unequal variances) t-statistic is displayed in the right-hand column. Comparison of means t-statistics significant at the 5% level of significance ($p < 0.05$) are displayed in bold italic and indicate that the means of the in- and out-sample coefficients are not equal. The variables are arranged in descending order if the absolute value of the in-sample t-statistic. The data are obtained from Datastream International at the University of Cape Town.

| | In Sample | | Out Sample | | |
|---|---|---|---|---|---|
| Characteristic | MeanT-Statistic | Mean Coefficient | Mean T-Statistic | Mean Coefficient | Comparison of Means T-Statistic |
| AssTurn_6m | **4.4507** | 0.0022 | **2.5328** | 0.0014 | 0.9241 |
| PEGI_2yr | **-4.4409** | -0.0025 | -1.2231 | -0.0011 | -1.5503 |
| ICBT_6m | **4.1690** | 0.0026 | **2.1257** | 0.0025 | 0.1120 |
| VO_1yr | **3.9401** | 0.0040 | 1.1515 | 0.0012 | ***1.8977*** |
| MVT_MV_1yr | **3.9228** | 0.0040 | 1.5005 | 0.0015 | ***1.6775*** |
| PEGI_1yr | **-3.9059** | -0.0020 | -0.5844 | -0.0007 | ***-1.7464*** |
| AssTurn_2yr | **3.8863** | 0.0024 | 1.4898 | 0.0013 | 1.0531 |
| NCA_MV_2yr | **3.5994** | 0.0027 | 0.2885 | 0.0007 | ***1.9920*** |
| MVT_MV_6m | **3.5674** | 0.0037 | **2.4503** | 0.0030 | 0.4197 |
| VO_3m | **3.5523** | 0.0034 | **2.1964** | 0.0030 | 0.2824 |
| MVT_MV_3m | **3.5462** | 0.0034 | **2.2752** | 0.0031 | 0.2090 |
| TV_1yr | **3.5173** | 0.0036 | 1.5631 | 0.0017 | 1.2489 |
| VO_6m | **3.5125** | 0.0036 | **2.2891** | 0.0029 | 0.4745 |
| Crossover6_18 | **3.4541** | 0.0014 | 1.1973 | 0.0007 | 1.0611 |
| TV_6m | **3.4511** | 0.0036 | **2.3247** | 0.0029 | 0.4158 |
| PEGI | **-3.4078** | -0.0018 | -0.0728 | -0.0005 | -1.5793 |
| TV_3m | **3.4025** | 0.0034 | **2.4170** | 0.0031 | 0.1837 |
| Reten | **3.2851** | 0.0034 | 0.0110 | 0.0002 | ***1.7891*** |
| Reten_1yr | **3.1569** | 0.0017 | 1.4528 | 0.0009 | 1.2421 |
| MOM_1m | **-2.9986** | -0.0041 | -0.3400 | -0.0021 | -1.0085 |
| ICBT_2yr | **2.8150** | 0.0026 | 1.5316 | 0.0018 | 0.6882 |
| ChSalelsChInv | **2.8000** | 0.0012 | 1.0008 | 0.0009 | 0.4492 |
| INV_1yr | **-2.7538** | -0.0015 | -0.4455 | -0.0005 | -1.1670 |
| Crossover6_12 | **2.7409** | 0.0013 | 1.3701 | 0.0005 | 0.9723 |
| AssTurn_1yr | **2.7262** | 0.0015 | 1.4527 | 0.0020 | -0.4240 |
| RD_TA | **2.6915** | 0.0025 | -0.6645 | -0.0016 | ***2.3315*** |
| ICBT_1yr | **2.6752** | 0.0024 | 1.7486 | 0.0017 | 0.5526 |
| AccRec_6m | **2.6640** | 0.0020 | 0.0554 | 0.0003 | 1.6254 |
| Crossover3_12 | **2.6314** | 0.0012 | 0.8463 | -0.0001 | ***1.8140*** |
| Reten_6m | **2.5772** | 0.0012 | 1.7390 | 0.0006 | 0.9459 |
| MVT_MV_1m | **2.5596** | 0.0019 | 1.2725 | 0.0014 | 0.3793 |
| VO_1m | **2.5503** | 0.0019 | 1.2714 | 0.0014 | 0.4043 |
| P_1m | **-2.4335** | -0.0046 | -0.6155 | -0.0014 | -1.3379 |
| TV_1m | **2.4184** | 0.0019 | 1.2485 | 0.0013 | 0.3992 |
| MVT_3m | **2.3693** | 0.0028 | 1.5493 | 0.0024 | 0.2200 |
| CPS_6m | **2.3508** | 0.0014 | 1.2192 | 0.0009 | 0.5558 |
| LnMV_1m | **-2.3361** | -0.0045 | -0.5083 | -0.0015 | -1.2243 |
| Crossover3_18 | **2.2283** | 0.0010 | 0.1660 | 0.0005 | 0.6396 |
| RD_EQ | **2.2146** | 0.0016 | -0.6269 | -0.0007 | 1.4671 |
| Sales_Emp | **-2.1948** | -0.0014 | 1.3274 | 0.0015 | ***-2.6557*** |
| NCA_MV_1yr | **2.0652** | 0.0019 | 0.3105 | 0.0002 | 1.4748 |
| TD_TA_6m | **-2.1102** | -0.0010 | -0.8303 | -0.0007 | -0.3327 |
| PEGI_6m | **-2.1052** | -0.0022 | -0.4463 | -0.0005 | -1.3983 |
| DIV_6m | **2.0384** | 0.0017 | -0.0953 | -0.0005 | ***1.9027*** |
| NCF_BP1yr | **2.0560** | 0.0021 | -1.5903 | -0.0007 | ***2.3925*** |
| NS_6m | **1.9853** | 0.0010 | -1.4732 | -0.0013 | ***2.3208*** |

University of Cape Town

Table 6.14. indicates that there are only eight characteristics that are significant in both the in- and out-sample periods, namely: AssTurn_6m; ICBT_6m; MVT_MV_6m; VO_3m; MVT_MV_3m; VO_6m; TV_6m and; TV_3m. The comparison of means (assuming unequal variances) shows that, for the majority of characteristics, the difference between the in- and out sample means is not significant at the 5% level of significance. There are a few characteristics whose coefficients are statistically different between samples. These characteristics are not significant in the out of sample period.

## 6.5. Summary and conclusion

This chapter investigates the relationship between stock returns and firm-specific attributes on the TSE using cross-sectional regression analysis run over two separate time periods. The in-sample period covers 1 January 1993 to 31 December 2000 and the out of sample period covers 1 January 2001 to 31 December 2004. The out of sample testing aims to determine if the results obtained from the in-sample regressions are robust across differing time periods. Furthermore, the stock return data are adjusted to determine in the firm-specific attributes have the ability to explain returns beyond that of the single-index and multi-index models constructed in Chapter Five.

The empirical results for the in-sample period show that there are 46 significant firm-specific attributes at the 5% level. The list of significant characteristics is then simplified in order to obtain a final list of characteristics that are not highly correlated with one another. The final list contains 29 of the most significant variables. These variables are separated into ten style groups: (1) change in size; (2) change in liquidity; (3) performance; (4) change in performance; (5) growth; (6) change in growth; (7) change in momentum/ crossover; (8) change in value; (9) value and (10) short-term momentum.

The in-sample results support previous findings on the TSE and present several new variables useful in predicting returns. The significance of research and development intensity supports the findings of Xu and Zhang (2004). While Bildersee, Cheh and

University of Cape Town

Zutshi (1993) and Bremer and Hiraki (1999) find NCAV/MV and lagged trading volume to be significant in predicting returns respectively, it is shown that the long-term change in NCAV/MV and the short- to medium-term change in trading volume is more significant here.

The insignificance of size (LnMV) in predicting returns supports the findings of Hawawini (1991), Daniel Titman and Wei (2001) and Bauer, Derwall and Molenaar (2003) albeit using a different methodology. Using only Section One data and a stringent thin trade filter may be a possible explanation for the insignificance of the size variable.

Some of the more renowned value attributes are found to be weakly significant. The CEY effect is significant at the 90% level of confidence and EY and BTMV are significant at the 80% level of confidence. The finding that the CEY is more significant than the EY supports Chan, Hamao and Lakonishok (1991) and Cai (1997) and is most likely a result of Japanese depreciation policies (see Chapter 3, Section 3.8.2.).

Finally, the cumulative monthly payoffs to each significant variable in presented. The retention ratio (Reten) has the greatest positive cumulative payoff at 38% and MOM_1m has the greatest negative cumulative payoff of -33% over the sample period.

The out of sample results are decidedly different from the in-sample results. The un-adjusted results show the significance of 40 firm-specific attributes at the 5% level. The simplified list of significant attributes contains 19 attributes and is divided into seven style groups, namely: (1) size; (2) value; (3) performance; (4) change in growth; (5) change in value; (6) change in liquidity and (7) change in performance.

The single-index model adjusted results indicate that 48 attributes are significant at the 5% level of significance and 21 attributes are retained in the final list of significant characteristics. The single-index adjusted returns are divided into eight style groups, namely: (1) size; (2) value; (3) momentum; (4) change in growth; (5) change in value; (6) change in liquidity; (7) change in size and (8) change in

University of Cape Town

performance. The multi-index adjusted results show 31 characteristics to be significant at the 5% level while only 20 are included in the final list. The multi-index model adjusted returns results are divided in to nine style groups, namely: (1) size; (2) value; (3) performance; (4) change in growth; (5) change in momentum/ crossover; (6) change in value; (7) change in liquidity; (8) change in size and (9) change in performance.

The size effect is found to exist on the TSE for the out-sample period. The size variable remains significant after risk adjustment using both the single-index and the multi-index models. The existence of the size effect supports the findings of Kato and Schallheim (1985), Cai (1997), Bae and Kim (1998) and Hodoshima, Gorza-Gomez and Kunimura (2000).

The BTMV, CEY, EY and DY effects are all found to exist for the out of sample period. The BTMV effect supports the evidence presented in Chan, Hamao and Lakonishok (1991), Cai (1997) and Bae and Kim (1998). The significance of the CEY ahead of the EY supports the argument of Chan, Hamao and Lakonishok (1991) that the CEY is more useful in explaining reruns on the TSE because it eliminates problems that arise due to depreciation policy. All four effects remain significant after risk adjustment using both asset pricing models.

The results of the in- and out-sample tests are not robust across different time periods. Only eight characteristics are significant, with the same signs, in both the in- and out-sample periods, namely: AssTurn_6m; ICBT_6m; MVT_MV6m; VO_3m; MVT_MV_3m; VO_6m; TV_6m and; TV_3m.

University of Cape Town

# 7. Style Timing

## 7.1. Introduction

It is possible to improve the forecasting power of expected return models by taking the changes in sign and magnitude of style payoffs into account. A characteristic may have consistently positive payoffs for several months and then consistently negative payoffs for the remaining months. The ability to time the direction of monthly payoffs may allow investors to exploit even insignificant characteristics assuming the variation in payoffs occurs in a predictable fashion. While style timing can be used to identify additional characteristics that have the ability to explain the cross section of returns, the aim of this chapter is to asses whether the use of a style timing model, which predicts monthly payoffs, can improve the performance of the significant characteristics identified in Chapter Six.

Wang (2003) describes style momentum as positive and negative autocorrelation in payoffs. Past style payoffs thus have the ability to explain future payoffs. In order to assess whether the style payoffs exhibit style momentum, a twelve month lag correlogram is constructed for each final significant characteristic. In addition, four style timing models are constructed and tested in order to determine if monthly payoffs can be accurately predicted.

The remainder of the chapter is set out as follows. Section 7.2. outlines the data and methodology used. Section 7.3. presents the empirical results and finally, Section 7.4. summarises and concludes.

University of Cape Town

## 7.2. Data and methodology

### 7.2.1. Style consistency assessment

Two separate datasets are tested for style consistency. The first dataset is comprised of 96 monthly payoffs for each final significant variable obtained from the in-sample regressions. There are 29 final significant variables in the in-sample period. The style consistency assessment is performed over the January 1993 to December 2000 time period. The second dataset consists of 48 monthly payoffs for each final significant variable obtained from the out of sample regressions using un-adjusted returns only. There are 19 final significant variables for the out of sample period. The style consistency assessment for this dataset is performed over the January 2001 to December 2004 time period.

The style consistency assessment indicates the consistency of each styles' monthly payoff direction. The ratio of the number of times a payoff is positive and the number of times a payoff is negative is counted and displayed in graphical format. Characteristics with a high consistent direction in payoffs will have a ratio close to 100% and 0% while highly inconsistent payoffs will exhibit ratios of approximately 50%.

University of Cape Town

### 7.2.2. Style momentum assessment

In addition to the style consistency assessment, the relationship between style payoffs and their lagged values are tested. Due to the data being monthly, the lags that are meaningfully related to each style payoff should fall within the first twelve lags. Each final in-sample and out of sample significant variable is tested for momentum in their respective time periods. For each variable a twelve month lag correlogram is computed. The twelve month lag correlograms show the autocorrelation and partial autocorrelation for the first twelve lags.

The sample autocorrelation function for each lag $k$ is measured by the Pearson product-moment coefficient between values of the series $k$ lags apart and is calculated as follows:

$$\rho_k = \frac{\sum_{t=k+1}^{N} (Y_t - \overline{Y})(Y_{t-k} - \overline{Y})}{\sum_{t=1}^{N} (Y_t - \overline{Y})^2} \qquad (7.1.)$$

where $Y_t$ is the observed payoff in month $t$; $\overline{Y}$ in the sample mean; and $N$ is the number of monthly payoffs in the sample. If $\rho_1$ is non-zero there exists first order correlation.

The sample partial autocorrelation coefficient is calculated for lags $k = 1$ to 12 as the regression coefficient on $Y_{t-k}$ when $Y_t$ is regressed on a constant, $Y_{t-1}, \ldots, Y_{t-k}$. The partial autocorrelation coefficient measures the correlation between values of the series $k$ lags apart after controlling for the influence of the intervening lags. If the pattern of autocorrelation is one that can be captured by an autoregression of order less than $k$, the partial autocorrelation at lag $k$ will be close to zero.

The autocorrelations and partial autocorrelations are tested for significance using the following test statistic:

$$\rho_{k,obs} = \rho_k \sqrt{\frac{N-2}{1-\rho_k^2}} \qquad (7.2.)$$

where $N$ is the number of months in the sample. The $\rho_{k,obs}$ statistic has a t-distribution with $(N-2)$ degrees of freedom.

In addition to the above statistic, the autocorrelations and partial autocorrelations are tested for significance using the Ljung-Box (1978) Q-statistic. The Ljung-Box (1978) Q-statistic is used to test the joint hypothesis that all the $\rho_k$ up to twelve lags are simultaneously equal to zero. The Ljung-Box Q-statistic is computed as follows:

University of Cape Town

$$Q_k = N(N+2)\sum_{j=1}^{k}\frac{\rho_j}{N-j} \qquad (7.3.)$$

where $\rho_j$ is the $j^{th}$ autocorrelation; $N$ is the number of months in the sample; and $k$ is the maximum number of lags included in the test . The Ljung-Box Q-statistic follows a chi-squared ($\chi^2$) distribution with $k$ degrees of freedom. As previously mentioned, twelve lags are included in the test.

### 7.2.3. Timing models

Four timing models are constructed and tested. The first three timing models test the explanatory power of trailing moving averages. Again two separate datasets are used. The first dataset consists of the 29 final significant variables obtained from the in-sample regressions. The second dataset consists of the 19 final significant variables obtained from the out of sample regressions. For both datasets, the trailing moving average models are constructed and tested over the out of sample period only. The out of sample period covers 1 January 2001 to 31 December 2004.

For each dataset, the six-month (six-month), twelve-month (12-month) and eighteen-month (18-month) moving averages are calculated and individually regressed on the style payoff one period ahead of the moving average. The constant and slope coefficients are tested against the null hypothesis that they are individually equal to zero. The Pearson correlation coefficient is also used to test the usefulness of each of the three models. The correlation coefficient measures the correlation between the actual monthly payoffs and the estimated monthly payoffs based on trailing moving averages. The correlation coefficient is tested for significance using the test statistic displayed in equation 7.2.

The fourth and final model is a twelve lag autoregressive model (AR12). As with the trailing moving average models, the same two datasets are used, however, the slope of the lagged monthly payoffs ($\beta_{i,k}$ in equation 7.4.) is obtained from the in-sample

University of Cape Town

period and is used to construct the AR12 model over the out of sample period. Testing in-sample lag coefficients over the out of sample period eliminates any look-ahead bias. For each variable, the twelve lag autoregression equation is estimated as follows:

$$y_{est,t} = \alpha_t + \sum_{k=1}^{12} \beta_{t,k} y_{t-k} \qquad (7.4.)$$

where,

$y_{est,t}$ = the estimated payoff in month $t$;

$\alpha_t$ = the constant estimated from the autoregression on the sample that is unique to month $t$;

$\beta_{t,k}$ = the slope of the lagged monthly payoff from the autoregression on the sample unique to month $t$; and

$y_{t-k}$ = the actual payoff for month $t$-$k$.

The AR12 model is evaluated using the following correlation coefficient:

$$r = \frac{\sum_{t=1}^{h}(\hat{y}_t - \sum_{t=1}^{h}\hat{y}_t / h)(y_t - \bar{y})}{\sqrt{\sum_{t=1}^{h}(\hat{y}_t - \sum_{t=1}^{h}\hat{y}_t / h)^2 \sum_{t=1}^{h}(y_t - \bar{y})^2}} \qquad (7.5.)$$

where,

$\hat{y}_t$ = the forecast payoff for month $t$;

$y_t$ = the realized payoff for month $t$;

$h$ = the number of forecasts;

$\sum_{t=1}^{h}\hat{y}_t / h$ = the mean forecasted payoff; and

$\bar{y}$ = the mean realised payoff.

The correlations are tested for significance using the t-test presented in equation 7.2. The correlation coefficient lies between one and negative one. A favourable model

University of Cape Town

will have a correlation coefficient close to one, indicating that the model predicts almost exactly what is realised. An unfavourable model will have a negative correlation coefficient, indicating that the model's forecast payoffs are of the incorrect direction.

Finally, the ability of all four models to correctly predict the direction of the monthly payoffs is assessed. The number of times the model correctly forecasts the direction of the payoffs is counted and divided by the number of total payoff forecasts. The ratio obtained is called the direction ratio. The closer the direction ratio is to one, the better the model.

The non-parametric Sign Test is used to test for significance of the direction ratio. The Sign Test tests the null hypothesis that the models predict the correct sign less than half (50%) of the time. The probability mass function is given by:

$$P(c) = \binom{N}{c} 0.5^{c} (1-0.5)^{N-c} \qquad (7.6.)$$

where,

$N$ = the total number of forecasted payoffs;

$c$ = the number of payoffs correctly forecasted

It is expected that the models will provide forecasts that are more accurate than a random process and thus a one-tailed test is used. The null hypothesis is rejected when the cumulative probability associated with the number of accurate forecasts is greater than (1-$p$) where $p$ is the level of significance.

University of Cape Town

## 7.3. Empirical results

### 7.3.1. Style consistency results

Figure 7.1. displays the consistency of style payoffs for the in-sample period. The proportions of positive payoffs are displayed in dark grey and the proportions of negative payoffs are displayed in light grey. Characteristics with a high degree if inconsistency in the direction of monthly payoffs exhibit ratios close to 50%.

Six characteristics, namely: INV_1yr; PEGI; PEGI_1yr; PEGI_2yr; TD_TA_6m and MOM_1m exhibit consistently negative payoffs over the sample period. Fifteen ratios show consistently positive ratios with NCA_MV_2yr having the highest positive consistency ratio.

**Figure 7.1.: Consistency in monthly style payoffs: In-sample significant attributes**

The figure displays the proportion of months with positive and negative monthly payoffs. The proportions of positive payoffs are displayed in dark grey and the proportions of negative payoffs are displayed in light grey. The mean payoff to each attribute is significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

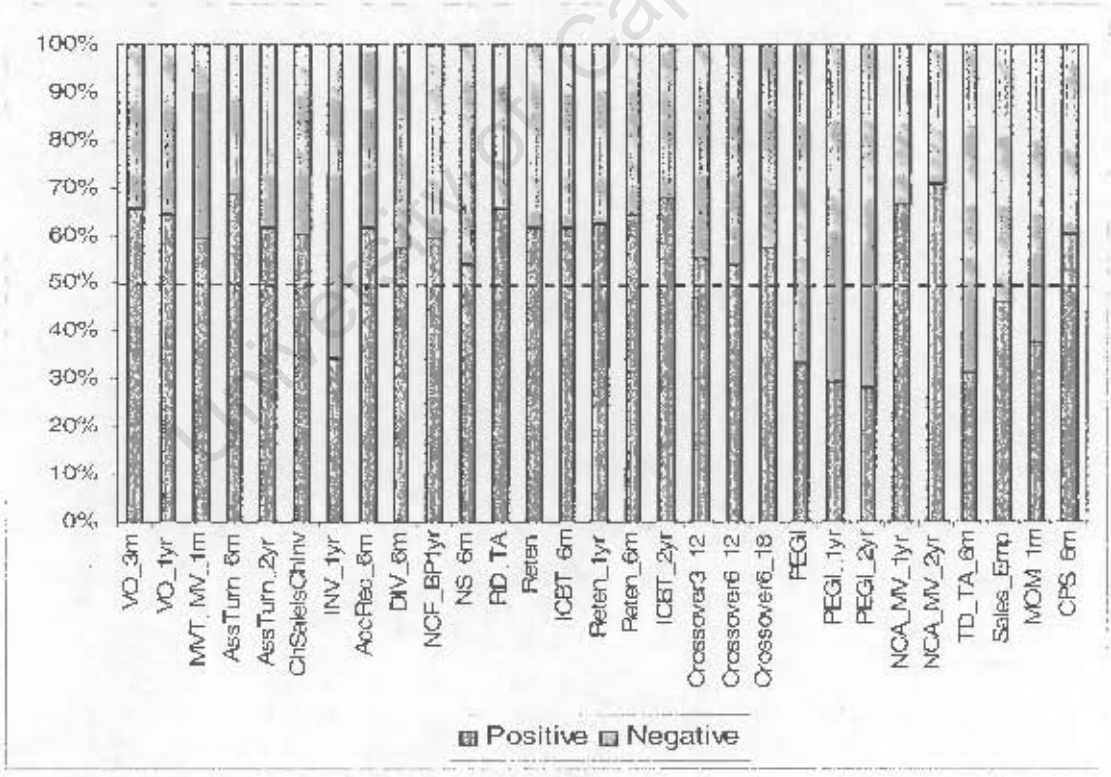
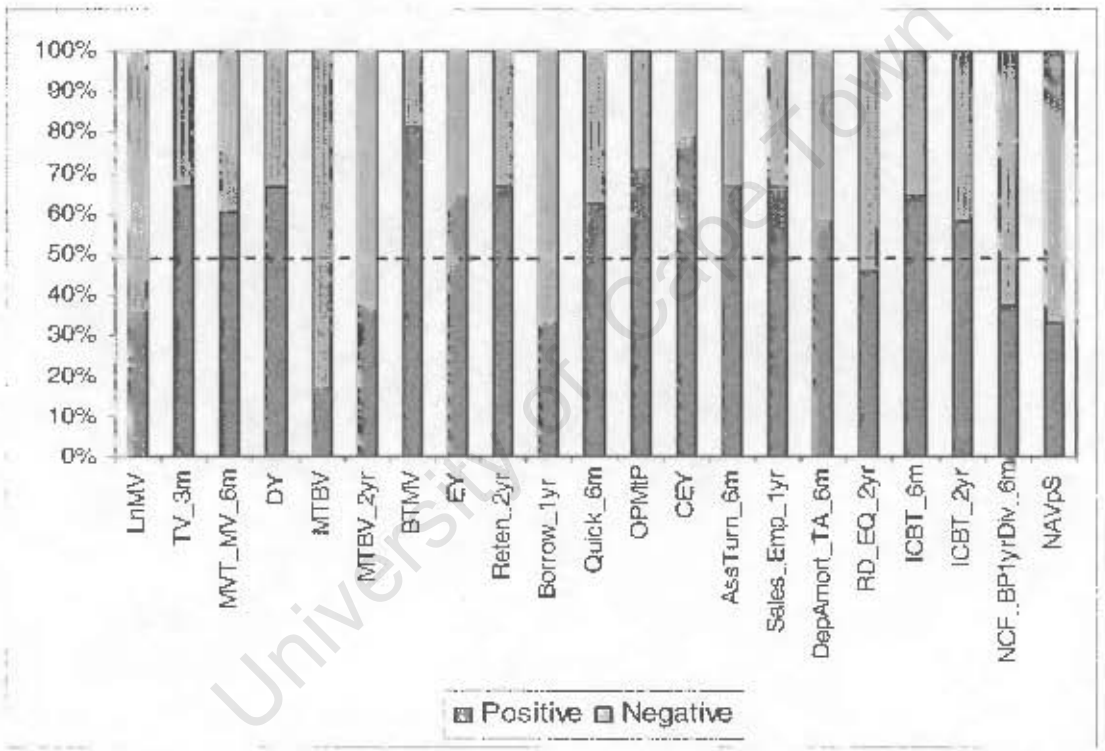



Figure 7.2. displays the consistency of style payoffs for the out-sample period. The results are presented in the same format as those of the in-sample period.

Six characteristics, namely: LnMV; MTBV; MTBV_2yr; Borrow_1yr; NCF_BP1yrDiv_6m; and NAVpS exhibit consistently negative payoffs over the sample period. Eleven ratios show consistently positive ratios with BTMV and CEY having the highest positive consistency ratios.

**Figure 7.2.: Consistency in monthly style payoffs: Out-sample significant attributes**

The figure displays the proportion of months with positive and negative monthly payoffs. The proportions of positive payoffs are displayed in dark grey and the proportions of negative payoffs are displayed in light grey. The mean payoff to each attribute is significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

### 7.3.2. Style momentum results

The autocorrelations and partial autocorrelations for the in-sample period are displayed in Tables 7.1. and 7.2. respectively. The associated Ljung-Box Q-statistics are shown in Table 7.3. and their related p-values are shown in Appendix D.1. All autocorrelations, partial autocorrelations and Ljung-Box Q-statistics significant at the 5% level of significance are displayed in bold font.

**Table 7.1.: Autocorrelations for lags one to twelve of monthly payoffs to significant in-sample characteristics**

The table displays the Pearson product-moment coefficient between characteristic payoffs and lags one to twelve. Autocorrelations significant at the 5% level using the statistic defined in equation 7.2. are highlighted in bold font. The characteristics are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| Style | Characteristic | Lags | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Change in Size | CPS_6m | 0.03 | 0.00 | -0.11 | 0.00 | -0.05 | -0.01 | **-0.21** | -0.04 | 0.00 | 0.05 | -0.09 | 0.08 |
| | NS_6m | 0.09 | 0.15 | **0.35** | 0.20 | 0.19 | 0.03 | 0.05 | 0.16 | 0.09 | 0.19 | 0.16 | 0.03 |
| Change in Liquidity | VO_1yr | 0.07 | **0.28** | 0.16 | **0.24** | **0.26** | 0.09 | -0.03 | 0.14 | 0.05 | 0.05 | 0.00 | -0.04 |
| | VO_3m | 0.14 | 0.05 | -0.02 | 0.05 | -0.04 | 0.17 | 0.03 | 0.02 | 0.09 | 0.04 | -0.08 | 0.05 |
| | MVT_MV_1m | **0.26** | -0.03 | -0.03 | 0.15 | 0.13 | -0.03 | -0.04 | -0.04 | 0.08 | 0.14 | -0.02 | 0.00 |
| Performance | NCF_BP1yr | -0.02 | 0.05 | 0.03 | 0.07 | 0.05 | -0.09 | -0.01 | 0.04 | -0.16 | -0.10 | 0.02 | 0.02 |
| Change in Performance | AssTurn_6m | **0.34** | **0.27** | **0.29** | **0.28** | 0.17 | 0.14 | 0.05 | 0.06 | -0.04 | -0.06 | -0.03 | -0.04 |
| | ICB1_6m | 0.02 | 0.19 | -0.07 | -0.07 | -0.04 | **-0.22** | -0.04 | 0.02 | 0.09 | 0.02 | 0.11 | 0.16 |
| | AssTurn_2yr | **0.32** | **0.33** | **0.39** | **0.37** | **0.23** | **0.26** | 0.13 | 0.15 | 0.14 | 0.09 | 0.05 | 0.12 |
| | ICBT_2yr | 0.17 | 0.03 | 0.10 | -0.06 | -0.03 | -0.06 | **-0.26** | 0.05 | **0.25** | 0.03 | 0.07 | 0.17 |
| | ChSalesChInv | -0.13 | 0.15 | -0.05 | -0.02 | -0.21 | -0.07 | 0.07 | -0.10 | 0.04 | 0.00 | -0.04 | 0.03 |
| | INV_1yr | 0.20 | 0.05 | 0.12 | 0.20 | 0.07 | 0.09 | -0.11 | 0.10 | 0.01 | 0.08 | 0.03 | -0.09 |
| | AccRec_6m | **0.26** | 0.09 | 0.09 | 0.12 | -0.01 | -0.04 | -0.12 | 0.09 | 0.08 | 0.14 | 0.00 | -0.11 |
| | DIV_6m | **0.41** | **0.25** | **0.34** | 0.18 | 0.08 | 0.03 | 0.01 | 0.05 | 0.07 | 0.18 | 0.13 | -0.10 |
| Growth | Reten | **0.21** | 0.15 | **0.36** | **0.24** | 0.09 | 0.04 | 0.07 | 0.05 | -0.11 | -0.02 | 0.05 | -0.01 |
| | RE_TA | -0.17 | 0.11 | -0.07 | 0.16 | 0.09 | **-0.20** | 0.09 | 0.07 | 0.03 | 0.02 | -0.12 | 0.02 |
| Change in Growth | Reten_1yr | 0.01 | 0.19 | 0.11 | 0.00 | 0.06 | -0.07 | -0.10 | 0.01 | -0.18 | -0.01 | 0.09 | -0.10 |
| | Reten_6m | 0.03 | 0.14 | 0.17 | -0.04 | 0.14 | **-0.23** | -0.01 | 0.07 | -0.11 | -0.04 | 0.00 | 0.01 |
| Change in Momentum / Crossover | Crossover6_12 | 0.16 | 0.11 | 0.06 | 0.06 | 0.00 | 0.18 | 0.22 | -0.03 | 0.05 | -0.03 | -0.15 | -0.11 |
| | Crossover6_12 | 0.06 | 0.00 | 0.02 | -0.05 | -0.08 | -0.01 | 0.11 | 0.04 | 0.06 | 0.19 | -0.10 | 0.10 |
| | Crossover3_12 | 0.07 | -0.04 | 0.06 | **-0.21** | 0.11 | 0.00 | -0.05 | -0.06 | 0.01 | 0.20 | 0.03 | 0.01 |
| Change in Value | PEG1_2yr | 0.15 | **0.29** | **0.24** | **0.29** | 0.09 | 0.16 | 0.16 | **0.22** | 0.16 | **0.21** | 0.15 | 0.17 |
| | PEG1_1yr | 0.16 | **0.22** | 0.04 | -0.01 | -0.01 | 0.08 | 0.09 | 0.06 | 0.15 | 0.09 | 0.14 | 0.12 |
| | NCA_MV_2yr | -0.12 | 0.14 | 0.05 | 0.09 | 0.07 | -0.03 | 0.07 | 0.10 | 0.05 | 0.10 | -0.05 | 0.03 |
| | TD_TA_6m | **0.27** | -0.11 | -0.14 | -0.07 | -0.01 | 0.03 | -0.06 | 0.00 | 0.09 | 0.08 | 0.02 | 0.03 |
| | NCA_MV_1yr | -0.13 | 0.11 | 0.13 | -0.02 | -0.01 | -0.17 | -0.01 | 0.06 | 0.05 | -0.07 | 0.00 | 0.00 |
| Value | PEG1 | 0.17 | **0.23** | 0.32 | 0.04 | 0.15 | 0.06 | -0.05 | 0.17 | 0.09 | 0.14 | 0.16 | 0.07 |
| | Sales_Emp | -0.08 | -0.05 | -0.02 | -0.12 | 0.05 | 0.06 | **-0.24** | 0.16 | 0.06 | -0.04 | -0.13 | 0.01 |
| Short-Term Momentum | MOM_1m | -0.12 | 0.17 | -0.11 | 0.03 | 0.10 | -0.04 | 0.00 | 0.08 | -0.02 | -0.04 | -0.15 | 0.04 |

Twenty characteristics show significant autocorrelation with at least one lag and only seven show significance at the first order. No characteristics show significance at the last two lags and only five characteristics show significance after the sixth lag suggesting that autocorrelations are stronger for lags one to six relative to lags seven to twelve.

University of Cape Town

**Table 7.2.: Partial autocorrelations for lags one to twelve of monthly payoffs to significant in-sample characteristics**

The table displays the style payoff partial autocorrelation coefficients for lags one to twelve. The partial correlation coefficient measures the correlation between values of the series $k$ lags apart after controlling for the influence if the intervening lags. Partial autocorrelations significant at the 5% level using the statistic defined in equation 7.2. are highlighted in bold font. The characteristics are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| Style | Characteristic | Lags | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Change in Size | CFS_6m | 0.03 | 0.00 | -0.11 | 0.01 | -0.05 | -0.02 | **-0.21** | -0.04 | 0.00 | 0.00 | -0.11 | 0.07 |
| | NS_6m | 0.09 | 0.15 | **0.33** | 0.16 | 0.11 | -0.15 | -0.12 | 0.04 | 0.11 | 0.16 | 0.15 | -0.10 |
| Change in Liquidity | VO_1yr | 0.07 | **0.28** | 0.13 | 0.17 | 0.20 | -0.02 | **-0.22** | 0.03 | 0.01 | -0.04 | 0.02 | -0.02 |
| | VO_3m | 0.14 | 0.03 | -0.03 | 0.08 | -0.06 | 0.18 | 0.01 | 0.00 | 0.11 | -0.02 | -0.06 | 0.06 |
| | WVT_MV_1m | **0.26** | -0.10 | 0.01 | 0.16 | 0.05 | -0.07 | 0.01 | -0.05 | 0.08 | 0.11 | -0.08 | 0.06 |
| Performance | NCF_BP1yr | -0.02 | 0.05 | 0.03 | 0.07 | 0.09 | -0.09 | -0.03 | 0.04 | -0.17 | -0.10 | 0.05 | 0.03 |
| Change in Performance | AssTurn_6m | **0.34** | 0.17 | 0.18 | 0.14 | -0.02 | -0.01 | -0.06 | -0.03 | -0.11 | -0.06 | 0.02 | 0.02 |
| | ICBT_6m | 0.02 | 0.19 | -0.06 | -0.11 | -0.01 | -0.20 | -0.04 | 0.11 | 0.08 | -0.05 | 0.08 | 0.16 |
| | AssTurn_2yr | **0.32** | **0.25** | **0.26** | 0.20 | -0.01 | 0.05 | -0.15 | -0.03 | 0.00 | -0.01 | -0.01 | 0.08 |
| | ICBT_2yr | 0.17 | -0.03 | 0.11 | -0.10 | 0.00 | -0.07 | **-0.23** | 0.17 | **0.22** | 0.00 | 0.02 | 0.13 |
| | ChSalesInv | -0.13 | 0.14 | 0.02 | -0.05 | **-0.22** | -0.12 | 0.11 | -0.07 | -0.03 | -0.03 | -0.09 | 0.04 |
| | INV_1yr | 0.20 | 0.02 | 0.11 | 0.16 | 0.00 | 0.06 | -0.19 | 0.12 | -0.06 | 0.10 | 0.03 | -0.15 |
| | AccRec_6m | **0.25** | 0.03 | 0.07 | 0.09 | -0.07 | -0.04 | -0.12 | -0.04 | 0.15 | 0.13 | -0.04 | -0.15 |
| | DIV_6m | **0.41** | 0.10 | **0.25** | -0.06 | -0.04 | -0.08 | 0.03 | 0.09 | 0.05 | 0.17 | -0.04 | 0.01 |
| Growth | Reten | **0.21** | 0.14 | **0.31** | 0.14 | -0.05 | **-0.24** | -0.04 | 0.08 | -0.05 | 0.03 | 0.05 | 0.00 |
| | RD_TA | -0.17 | 0.08 | -0.04 | 0.14 | 0.15 | **-0.20** | 0.03 | 0.12 | -0.01 | 0.07 | -0.09 | -0.12 |
| Change in Growth | Reten_1yr | 0.01 | -0.19 | 0.11 | -0.04 | 0.15 | -0.10 | -0.06 | -0.04 | **-0.21** | 0.01 | 0.03 | -0.06 |
| | Reten_6m | 0.03 | 0.14 | 0.16 | -0.07 | 0.10 | **-0.27** | 0.01 | 0.10 | -0.03 | -0.10 | 0.06 | -0.01 |
| Change in Momentum / Crossover | Crossover6_18 | 0.16 | 0.08 | 0.03 | 0.04 | -0.02 | 0.17 | 0.18 | -0.12 | -0.09 | -0.03 | -0.15 | -0.08 |
| | Crossover6_12 | 0.06 | -0.01 | 0.02 | -0.09 | -0.07 | -0.01 | 0.12 | 0.03 | 0.04 | 0.17 | -0.11 | -0.08 |
| | Crossover3_12 | 0.07 | -0.04 | 0.07 | **-0.23** | 0.16 | -0.06 | 0.01 | -0.14 | 0.11 | 0.16 | 0.01 | -0.03 |
| Change in Value | PEGI_2yr | 0.15 | **0.28** | 0.19 | 0.20 | -0.07 | 0.00 | 0.07 | 0.15 | 0.10 | 0.08 | -0.01 | 0.01 |
| | PEGI_1yr | 0.16 | 0.20 | -0.02 | -0.06 | 0.00 | 0.10 | 0.08 | 0.00 | 0.11 | 0.06 | 0.09 | 0.07 |
| | NCA_MV_2yr | -0.12 | 0.12 | 0.08 | 0.09 | 0.07 | -0.04 | 0.03 | 0.11 | 0.05 | 0.09 | 0.06 | -0.02 |
| | TD_TA_6m | **0.27** | -0.19 | -0.06 | -0.03 | -0.01 | -0.05 | -0.05 | 0.02 | 0.08 | 0.03 | 0.00 | 0.07 |
| | NCA_MV_1yr | -0.13 | -0.13 | 0.10 | 0.00 | 0.02 | 0.19 | -0.05 | 0.02 | 0.05 | -0.06 | -0.04 | 0.06 |
| Value | PEGI | 0.17 | **0.21** | **0.27** | -0.08 | 0.04 | -0.05 | -0.12 | 0.16 | 0.12 | 0.15 | 0.02 | -0.03 |
| | Sales_Emp | -0.08 | -0.06 | -0.03 | -0.12 | 0.03 | -0.08 | **-0.27** | 0.12 | 0.08 | -0.06 | -0.19 | 0.04 |
| Short-Term Momentum | MOM_1m | -0.12 | 0.16 | -0.08 | -0.01 | 0.14 | -0.03 | -0.04 | -0.05 | -0.04 | -0.04 | -0.16 | 0.02 |

University of Cape Town

The partial autocorrelation at each lag shows the correlation between the attribute payoff and the lag while controlling for the influence of all earlier lags. The first column of Table 7.2. is identical to the first column of Table 7.1. Sixteen characteristics show significant partial autocorrelation. Only four characteristics show significant partial autocorrelation for lags seven to twelve therefore, as with the autocorrelations, most of the significant partial autocorrelations occur within the first six lags.

**Table 7.3.: Ljung-Box Q-statistics for lags one to twelve of monthly payoffs to significant in-sample characteristics**

The table displays the Ljung-Box Q-statistics for lags one to twelve. Ljung-Box Q-statistics significant at the 5% level are highlighted in bold font. The characteristics are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| Style | Characteristic | Lags | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Change in Size | CPS_6m | 0.12 | 0.12 | 1.39 | 1.39 | 1.60 | 1.64 | 6.16 | 6.33 | 6.34 | 6.62 | 7.49 | 8.23 |
| | MS_6m | 0.87 | 3.22 | 15.33 | 19.40 | 23.13 | 23.20 | 23.52 | 25.06 | 27.03 | 28.47 | 31.32 | 31.40 |
| Change in Liquidity | VO_1yr | 0.50 | 8.50 | 10.98 | 16.93 | 23.69 | 24.60 | 24.76 | 26.90 | 27.12 | 27.34 | 27.35 | 27.53 |
| | VO_3m | 1.85 | 2.11 | 2.13 | 2.70 | 2.87 | 5.75 | 5.86 | 5.91 | 6.70 | 6.86 | 7.61 | 7.89 |
| | VVT_VV_1m | 6.62 | 6.70 | 6.77 | 8.91 | 10.74 | 10.84 | 11.00 | 11.16 | 11.85 | 13.87 | 13.93 | 13.93 |
| Performance | MOF_BH1yr | 0.04 | 0.29 | 0.36 | 0.91 | 1.04 | 2.45 | 2.46 | 2.59 | 5.51 | 6.50 | 6.55 | 6.58 |
| Change in Performance | AssTurn_6m | 11.31 | 18.45 | 26.68 | 31.87 | 37.68 | 39.63 | 40.25 | 40.51 | 40.78 | 41.15 | 41.25 | 41.39 |
| | ICBT_6m | 0.02 | 3.67 | 4.13 | 4.69 | 4.86 | 9.95 | 10.10 | 10.16 | 11.04 | 11.08 | 12.44 | 15.44 |
| | AssTurn_2yr | 19.26 | 29.86 | 36.23 | 50.39 | 56.04 | 63.92 | 65.61 | 68.12 | 70.14 | 71.06 | 71.29 | 72.98 |
| | ICBT_2yr | 2.79 | 2.80 | 3.83 | 4.20 | 4.31 | 4.65 | 11.55 | 12.16 | 18.66 | 18.78 | 19.35 | 22.74 |
| | ChSalesInv | 1.68 | 3.93 | 4.18 | 4.22 | 8.81 | 9.35 | 9.81 | 10.84 | 11.04 | 11.04 | 11.18 | 11.25 |
| | INV_1yr | 3.95 | 4.28 | 5.77 | 9.65 | 10.16 | 10.96 | 12.24 | 13.20 | 13.22 | 13.86 | 14.01 | 14.84 |
| | AccRec_6m | 6.51 | 7.41 | 8.29 | 9.77 | 9.77 | 9.96 | 11.45 | 12.36 | 13.05 | 15.07 | 15.27 | 15.44 |
| | DIV_6m | 16.58 | 22.86 | 34.35 | 37.53 | 38.15 | 38.25 | 38.41 | 39.13 | 39.67 | 43.19 | 44.98 | 46.17 |
| Growth | Reten | 4.31 | 7.59 | 20.39 | 26.45 | 27.24 | 27.42 | 27.91 | 28.65 | 29.96 | 30.02 | 30.33 | 30.35 |
| | RD_TA | 2.73 | 3.91 | 4.45 | 5.25 | 7.79 | 11.89 | 12.71 | 13.17 | 13.30 | 13.36 | 14.97 | 15.02 |
| Change in Growth | Reten_1yr | 0.02 | 3.60 | 4.71 | 4.71 | 5.35 | 5.50 | 6.59 | 6.60 | 10.13 | 10.15 | 11.12 | 12.94 |
| | Reten_6m | 0.09 | 2.14 | 5.01 | 5.20 | 7.10 | 12.82 | 12.83 | 13.34 | 14.74 | 14.94 | 14.94 | 14.95 |
| Change in Momentum / Crossover | Crossover6_12 | 2.62 | 3.71 | 4.10 | 4.52 | 4.52 | 7.77 | 12.92 | 12.99 | 13.27 | 13.35 | 15.86 | 17.13 |
| | Crossover6_12 | 0.35 | 0.35 | 0.39 | 1.09 | 1.78 | 1.80 | 3.17 | 3.36 | 3.73 | 7.49 | 8.65 | 9.84 |
| | Crossover3_12 | 0.53 | 0.67 | 1.38 | 5.85 | 5.89 | 6.89 | 7.12 | 7.47 | 7.48 | 11.78 | 11.91 | 11.91 |
| Change in Value | PEGI_2yr | 2.09 | 10.55 | 16.42 | 24.72 | 25.29 | 27.86 | 30.49 | 35.73 | 38.41 | 43.34 | 45.89 | 49.28 |
| | PEGI_1yr | 2.47 | 7.08 | 7.22 | 7.23 | 7.23 | 7.89 | 8.82 | 9.25 | 11.60 | 12.51 | 14.63 | 16.17 |
| | NCA_MV_2yr | 1.34 | 3.20 | 3.47 | 4.34 | 4.81 | 4.89 | 5.42 | 6.52 | 6.74 | 7.82 | 8.21 | 8.29 |
| | ID_TA_6m | 7.02 | 8.14 | 10.05 | 10.48 | 10.49 | 10.56 | 10.83 | 10.83 | 11.79 | 12.53 | 12.56 | 12.68 |
| | NCA_MV_1yr | 1.56 | 2.81 | 4.48 | 4.50 | 4.51 | 7.53 | 7.53 | 7.92 | 7.92 | 8.47 | 8.47 | 8.47 |
| Value | PEGI | 2.75 | 8.08 | 16.43 | 16.57 | 20.96 | 21.28 | 22.61 | 25.10 | 25.92 | 27.99 | 30.72 | 31.31 |
| | Sales_Emp | 0.65 | 2.89 | 3.93 | 2.27 | 2.50 | 2.93 | 9.29 | 12.58 | 13.17 | 13.32 | 15.19 | 15.25 |
| Short-Term Momentum | MOM_1m | 1.34 | 4.19 | 5.49 | 5.99 | 6.62 | 6.74 | 6.74 | 7.37 | 7.43 | 7.57 | 9.98 | 10.13 |

The Ljung-Box Q-statistic tests the joint hypothesis that all the correlations up to $k$ lags are simultaneously equal to zero. Fifteen characteristics show significant autocorrelation when using the Ljung-Box Q-statistic. Eight characteristics show significance at the first order. Four characteristics, namely; AssTurn_6m; AssTurn_2yr; DIV_6m and Reten show significant autocorrelations at each of the twelve lags.

The out of sample momentum results are displayed in Table 7.4. to 7.6. For each significant characteristic, the autocorrelations and partial autocorrelations for lags one to twelve are displayed in Tables 7.4. and 7.5. respectively. The Ljung-Box Q-statistics are shown in Table 7.6. and the associated p-values are shown in Appendix D.2. All autocorrelations, partial autocorrelations and Ljung-Box Q-statistics significant at the 5% level of significance are displayed in bold font.

University of Cape Town

**Table 7.4.: Autocorrelations of lags one to twelve of monthly payoffs to significant out-sample characteristics**

The table displays the Pearson product-moment coefficient between characteristic payoffs and lags one to twelve. Autocorrelations significant at the 5% level using the statistic defined in equation 7.2. are highlighted in bold font. The characteristics are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using un-adjusted returns. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| Style | Characteristic | Lags | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Value | BTMV | 0.06 | 0.18 | **-0.24** | 0.08 | 0.04 | 0.04 | -0.15 | -0.12 | -0.19 | -0.10 | -0.02 | 0.08 |
| | CEY | 0.00 | 0.18 | 0.08 | 0.03 | -0.21 | -0.14 | -0.03 | -0.09 | -0.14 | -0.13 | 0.20 | -0.16 |
| | DY | 0.12 | **0.31** | 0.03 | -0.03 | 0.16 | -0.03 | -0.12 | **-0.26** | -0.13 | -0.09 | -0.06 | -0.04 |
| | EY | 0.01 | 0.21 | 0.04 | 0.09 | 0.11 | -0.09 | -0.07 | -0.12 | 0.01 | -0.15 | -0.02 | -0.12 |
| Size | LnMV | 0.17 | 0.23 | -0.15 | -0.07 | **-0.27** | -0.19 | **-0.24** | -0.18 | -0.04 | -0.07 | **0.32** | 0.22 |
| | NAVpS | -0.19 | 0.07 | -0.16 | 0.10 | -0.12 | 0.13 | -0.03 | -0.08 | -0.02 | 0.01 | 0.00 | 0.06 |
| Performance | OPMtP | -0.21 | 0.21 | -0.20 | 0.19 | -0.22 | 0.07 | -0.10 | -0.09 | -0.18 | -0.02 | 0.16 | 0.05 |
| Change in Growth | RD_EQ_2yr | -0.01 | 0.15 | 0.10 | -0.19 | -0.16 | -0.13 | **-0.25** | 0.00 | 0.05 | -0.17 | 0.20 | 0.04 |
| Change in Value | MTBV_2yr | 0.00 | -0.01 | 0.10 | -0.04 | 0.00 | 0.05 | -0.04 | 0.02 | -0.09 | -0.17 | **-0.26** | -0.02 |
| Change in Liquidity | TV_3m | -0.09 | -0.05 | **0.26** | 0.16 | -0.09 | 0.04 | 0.13 | 0.03 | -0.12 | -0.03 | -0.05 | -0.01 |
| | MVT_MV_6m | -0.14 | -0.01 | 0.15 | 0.22 | -0.05 | -0.08 | 0.10 | 0.18 | -0.21 | 0.02 | 0.14 | -0.15 |
| Change in Performance | ICBT_6m | 0.13 | 0.13 | 0.06 | 0.23 | -0.02 | -0.08 | -0.05 | -0.06 | 0.00 | -0.04 | -0.09 | 0.08 |
| | Sales_Emp_1yr | 0.01 | -0.01 | 0.09 | -0.06 | 0.07 | -0.12 | 0.10 | -0.05 | -0.17 | -0.07 | -0.07 | 0.00 |
| | NCF_BP1yrDiv_6m | 0.11 | -0.08 | -0.09 | 0.05 | 0.05 | -0.11 | **-0.29** | -0.13 | 0.11 | 0.00 | -0.06 | 0.11 |
| | ICBT_2yr | 0.06 | 0.20 | -0.10 | -0.01 | -0.07 | -0.16 | 0.01 | **-0.27** | -0.02 | 0.04 | 0.16 | **0.32** |
| | DepAmort_TA_6m | -0.09 | 0.23 | -0.08 | 0.12 | -0.10 | -0.10 | 0.04 | -0.06 | 0.01 | 0.03 | 0.15 | -0.04 |
| | Borrow_1yr | -0.13 | 0.13 | 0.18 | 0.09 | 0.09 | -0.15 | **0.31** | **-0.26** | 0.16 | -0.09 | -0.05 | -0.18 |
| | AssTurn_6m | 0.23 | 0.22 | 0.01 | 0.07 | -0.04 | 0.11 | 0.05 | 0.02 | 0.06 | -0.06 | -0.04 | -0.07 |
| | Quick_6m | **-0.24** | -0.12 | -0.05 | 0.02 | 0.04 | 0.02 | -0.01 | 0.03 | -0.07 | -0.02 | 0.12 | 0.06 |

Ten characteristics show significant autocorrelation with at least one lag however these lags are not consistent across characteristics. Only one characteristic, Quick_6m, shows significance at the first order and furthermore, the autocorrelation coefficient is negative. Three characteristics, namely: DY; LnMV; ICBT_2yr and Borrow_1yr are significant for more than one lag.

University of Cape Town

**Table 7.5.: Partial autocorrelations of lags one to twelve of monthly payoffs to significant out-sample characteristics**

The table displays the style payoff partial autocorrelation coefficients for lags one to twelve. The partial correlation coefficient measures the correlation between values of the series $k$ lags apart after controlling for the influence if the intervening lags. Partial autocorrelations significant at the 5% level using the statistic defined in equation 7.2, are highlighted in bold font. The characteristics are significant at the 5% level using Student's (1908) $t$-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using un-adjusted returns. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| Style | Characteristic | Lags | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Value | BTMV | 0.06 | 0.18 | **-0.27** | 0.10 | 0.13 | -0.09 | -0.15 | -0.04 | -0.16 | -0.14 | 0.05 | 0.07 |
| | CEY | 0.00 | 0.18 | 0.08 | 0.00 | **-0.25** | -0.18 | 0.05 | 0.02 | -0.12 | -0.20 | 0.21 | -0.08 |
| | DY | 0.12 | **0.30** | -0.03 | -0.14 | 0.19 | -0.01 | **-0.26** | **-0.26** | 0.10 | 0.07 | -0.12 | -0.01 |
| | EY | 0.01 | 0.21 | 0.04 | 0.05 | 0.10 | -0.13 | -0.13 | -0.09 | 0.04 | -0.10 | 0.03 | -0.05 |
| Size | LnMV | 0.17 | 0.20 | -0.21 | -0.07 | -0.19 | -0.14 | -0.13 | -0.16 | 0.00 | -0.16 | **0.26** | 0.10 |
| | NAVpS | -0.19 | 0.03 | -0.15 | 0.04 | -0.10 | 0.07 | 0.03 | -0.12 | -0.02 | -0.02 | -0.01 | 0.06 |
| Performance | OPMtP | -0.21 | 0.17 | -0.14 | 0.11 | -0.13 | -0.05 | -0.01 | -0.19 | -0.18 | -0.09 | 0.19 | 0.11 |
| Change in Growth | RD_EQ_2yr | -0.01 | 0.15 | 0.10 | -0.21 | -0.21 | -0.10 | -0.17 | 0.02 | 0.09 | -0.23 | 0.05 | 0.02 |
| Change in Value | MTBV_2yr | 0.00 | -0.01 | 0.10 | -0.04 | 0.00 | 0.04 | -0.04 | 0.02 | -0.10 | -0.16 | -0.28 | -0.09 |
| Change in Liquidity | TV_3m | -0.03 | -0.06 | **0.26** | 0.18 | -0.05 | -0.02 | 0.04 | 0.05 | -0.11 | -0.10 | -0.13 | 0.04 |
| | MVT_MV_6m | -0.14 | -0.03 | 0.14 | **0.27** | 0.04 | -0.12 | -0.02 | 0.16 | -0.13 | -0.02 | 0.07 | -0.17 |
| Change in Performance | ICBT_6m | 0.13 | 0.11 | 0.03 | 0.21 | -0.08 | -0.13 | -0.03 | -0.08 | 0.06 | 0.02 | -0.09 | 0.13 |
| | Sales_Emp_1yr | 0.01 | -0.01 | 0.09 | -0.07 | 0.08 | -0.14 | 0.13 | -0.08 | -0.13 | -0.12 | -0.02 | -0.02 |
| | NCF_BP1yrDiv_6m | 0.11 | -0.10 | -0.07 | 0.06 | 0.03 | -0.12 | **-0.26** | -0.09 | 0.08 | -0.09 | -0.03 | 0.16 |
| | ICBT_2yr | 0.05 | 0.20 | -0.12 | -0.04 | -0.02 | -0.16 | 0.04 | -0.23 | -0.04 | 0.16 | 0.10 | **0.30** |
| | DepAmort_TA_6m | -0.09 | 0.22 | -0.05 | 0.06 | -0.06 | -0.16 | 0.07 | -0.01 | -0.02 | 0.08 | 0.13 | -0.06 |
| | Borrow_1yr | -0.13 | 0.11 | 0.22 | 0.13 | 0.07 | -0.21 | 0.22 | -0.23 | **-0.27** | -0.13 | 0.06 | -0.12 |
| | AssTurn_6m | 0.23 | 0.18 | -0.08 | 0.05 | -0.05 | 0.11 | 0.04 | -0.06 | 0.07 | -0.10 | -0.02 | -0.09 |
| | Quick_6m | **-0.24** | -0.19 | -0.15 | -0.07 | 0.00 | 0.02 | 0.02 | 0.05 | -0.04 | -0.05 | 0.09 | 0.14 |

The partial autocorrelation at each lag provides the explanatory power of each lag while controlling for the other eleven lags. The first column of Table 7.5. is identical to the first column of Table 7.4. Eleven characteristics show significant partial autocorrelation. As with the autocorrelations, only Quick_6m is significant at the first order. Only one variable, DY, is significant for more than one lag.

The Ljung-Box Q-statistic tests the joint hypothesis that all the correlations up to $k$ lags are simultaneously equal to zero. Only two characteristics, LnMV and Borrow_1yr show significant autocorrelation when using the Ljung-Box Q-statistic. LnMV becomes significant at the seventh lag and Borrow_1yr is significant at the ninth lag. No characteristics show significance at the first order and no characteristics show significance for all 12 lags.

University of Cape Town

**Table 7.6.: Ljung-Box Q-statistics for lags one to twelve of monthly payoffs to significant out-sample characteristics**

The table displays the Ljung-Box Q-statistics for lags one to twelve. Ljung-Box Q-statistics significant at the 5% level are highlighted in bold font. The characteristics are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| Style | Characteristic | Lags | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Value | BTMV | 0.18 | 1.87 | 5.05 | 5.40 | 5.49 | 5.59 | 6.85 | 7.66 | 9.69 | 10.52 | 10.54 | 10.81 |
| | CEY | 0.00 | 1.61 | 1.96 | 2.00 | 4.53 | 5.67 | 5.70 | 6.21 | 7.43 | 8.41 | 11.06 | 12.79 |
| | DY | 0.70 | 5.79 | 5.85 | 5.89 | 7.28 | 7.32 | 8.22 | 12.19 | 13.21 | 13.75 | 13.96 | 14.04 |
| | EY | 0.01 | 2.31 | 2.40 | 2.86 | 3.53 | 4.03 | 4.35 | 5.14 | 5.15 | 6.47 | 6.48 | 7.51 |
| Size | LnMV | 1.54 | 4.23 | 5.15 | 5.42 | 9.52 | 11.68 | **15.09** | **16.96** | **17.05** | 17.38 | **24.16** | **27.26** |
| | NAVpS | 1.91 | 2.14 | 3.52 | 4.01 | 4.86 | 5.75 | 5.80 | 6.14 | 6.17 | 6.18 | 6.18 | 6.38 |
| Performance | OPMtP | 2.15 | 4.35 | 6.46 | 8.37 | 10.97 | 11.23 | 11.85 | 12.29 | 14.18 | 14.19 | 15.67 | 16.04 |
| Change in Growth | RD_EQ_2yr | 0.01 | 1.11 | 1.62 | 3.50 | 4.99 | 5.96 | 9.56 | 9.56 | 9.71 | 11.55 | 14.26 | 14.36 |
| Change in Value | MTBV_2yr | 0.00 | 0.00 | 0.53 | 0.61 | 0.61 | 0.74 | 0.85 | 0.88 | 1.33 | 3.20 | 7.59 | 7.62 |
| Change in Liquidity | TV_3m | 0.06 | 0.21 | 3.80 | 5.19 | 5.59 | 5.70 | 6.67 | 6.72 | 7.60 | 7.64 | 7.82 | 7.82 |
| | MVT_MV_6m | 1.06 | 1.07 | 2.22 | 4.67 | 4.98 | 5.34 | 5.90 | 7.79 | 10.61 | 10.64 | 11.83 | 13.36 |
| Change in Performance | ICBT_6m | 0.83 | 1.69 | 1.85 | 4.76 | 4.79 | 5.19 | 5.35 | 5.53 | 5.53 | 5.62 | 6.14 | 6.61 |
| | Sales_Emp_1yr | 0.00 | 0.01 | 0.44 | 0.66 | 0.95 | 1.78 | 2.42 | 2.55 | 4.31 | 4.63 | 4.92 | 4.92 |
| | NCF_BP1yrDiv_6m | 0.64 | 0.98 | 1.41 | 1.53 | 1.68 | 2.38 | 7.26 | 8.23 | 8.94 | 8.94 | 9.13 | 9.88 |
| | ICBT_2yr | 0.12 | 2.26 | 2.76 | 2.76 | 3.00 | 4.41 | 4.42 | 8.67 | 8.69 | 8.81 | 10.45 | 17.43 |
| | DepAmort_TA_6m | 0.43 | 3.11 | 3.48 | 4.24 | 4.77 | 5.34 | 5.43 | 5.61 | 5.62 | 5.69 | 7.08 | 7.21 |
| | Borrow_1yr | 0.86 | 1.71 | 3.43 | 3.83 | 4.26 | 5.56 | 11.33 | 15.39 | **16.93** | 16.96 | 17.13 | 19.29 |
| | AssTurn_6m | 2.58 | 5.13 | 5.13 | 5.41 | 5.50 | 6.14 | 6.30 | 6.31 | 6.49 | 6.73 | 6.81 | 7.15 |
| | Quick_6m | 3.02 | 3.77 | 3.91 | 3.94 | 4.04 | 4.06 | 4.06 | 4.11 | 4.37 | 4.40 | 5.29 | 5.68 |

University of Cape Town

### 7.3.3. Timing models

The results of the trailing moving average models are displayed in Table 7.7. for the in-sample significant variables and in Table 7.8. for the out of sample significant variables. All trailing moving average models, for both the in- and out-sample significant variables are constructed over the out of sample period which covers 1 January 2001 to 31 December 2004.

The trailing moving average results for the significant in-sample variables indicate that only a few characteristics show significance at the 5% level. The most successful individual characteristic is the six-month change in the number of shares (NS_6m) and the most successful style group being the change in momentum / crossover group. The 18-month moving average model performs the best with the most significant parameters while the six-month model fares the worst.

**Table 7.7.: (Auto) Regressions between payoffs and their moving averages for significant in-sample characteristics**

The table displays the coefficients and their related t-statistics obtained from the regressions between monthly payoffs to each final significant characteristic and their six-month, 12-month and 18-month trailing moving averages. The final significant variables are obtained from the in-sample cross-sectional regressions performed in Chapter Six. The table also displays the Pearson correlation coefficient which measures the correlation between month payoffs and the estimated monthly payoffs based on the six-month, 12-month and 18-month moving averages. Correlation coefficients and regression coefficients significant at the 5% level of significance are displayed in bold. The regressions are performed over the out of sample period (1 January 2001 to 31 December 2004). The data are obtained form Datastream International at the University of Cape Town.

| Style group | Characteristic | 6-month | | 12-month | | 18-month | |
|---|---|---|---|---|---|---|---|
| | | Coefficient | T-Statistic | Coefficient | T-Statistic | Coefficient | T-Statistic |
| Change in Size | CFS_6m | | | | | | |
| | -constant | 0.0006 | 0.7403 | 0.0016 | 1.5949 | 0.0000 | -0.0058 |
| | -coefficient | 0.1946 | 0.5729 | -0.2947 | -0.5514 | 0.3987 | 0.3657 |
| | -correlation | 0.0902 | 0.5729 | -0.0941 | -0.5514 | 0.0690 | 0.3657 |
| | NS_6m | | | | | | |
| | -constant | **-0.0024** | **-2.0708** | **-0.0046** | **-3.0082** | **-0.0060** | **-2.6148** |
| | -coefficient | -0.7030 | -1.3519 | **-2.7361** | **-2.5881** | **-4.0118** | **-2.2307** |
| | -correlation | -0.2090 | 1.3519 | **-0.4057** | **-2.5881** | **-0.3885** | **-2.2307** |
| Change in Liquidity | VO_1yr | | | | | | |
| | -constant | 0.0011 | 0.8610 | 0.0016 | 1.0417 | 0.0030 | 1.2771 |
| | -coefficient | 0.0187 | 0.0504 | 0.0544 | 0.1014 | -0.8630 | -0.9155 |
| | -correlation | 0.0080 | 0.0504 | 0.0174 | 0.1014 | 0.1705 | -0.9155 |
| | VO_3m | | | | | | |
| | -constant | 0.0019 | 1.4669 | 0.0014 | 0.8809 | 0.0018 | 0.7768 |
| | -coefficient | 0.3668 | 1.2418 | 0.4085 | 1.0512 | 0.0808 | 0.1370 |
| | -correlation | 0.1927 | 1.2418 | 0.1774 | 1.0512 | 0.0259 | 0.1370 |
| | MVT_MV_1m | | | | | | |
| | -constant | 0.0015 | 1.3140 | 0.0011 | 0.7891 | 0.0024 | 1.0748 |
| | -coefficient | 0.2246 | 0.7596 | 0.1362 | 0.3106 | -0.4204 | -0.5316 |
| | -correlation | 0.1197 | 0.7596 | 0.0532 | 0.3106 | -0.1009 | -0.5316 |
| Performance | NCF_BP1yr | | | | | | |
| | -constant | 0.0005 | -0.7157 | -0.0010 | 1.3849 | **-0.0025** | **-2.4471** |
| | -coefficient | 0.0760 | 0.2216 | 0.0612 | 0.1602 | -1.0773 | -1.5339 |
| | -correlation | 0.0350 | 0.2216 | 0.0286 | 0.1602 | -0.2784 | -1.5339 |
| Change in Performance | AssTurn_6m | | | | | | |
| | -constant | 0.0011 | 1.4166 | 0.0020 | 1.9770 | **0.0032** | **2.5860** |
| | -coefficient | 0.3775 | 1.4250 | 0.0756 | 0.1970 | -0.4124 | -0.9622 |
| | -correlation | 0.2196 | 1.4250 | 0.0438 | 0.1970 | -0.1608 | -0.9622 |
| | ICBT_6m | | | | | | |
| | -constant | 0.0009 | 0.0687 | 0.0000 | 0.0148 | -0.0016 | -0.0650 |
| | -coefficient | 0.4452 | 1.5790 | 0.6938 | 1.7968 | 1.1006 | 2.0447 |
| | -correlation | 0.2414 | 1.5790 | 0.2945 | 1.7968 | 0.3604 | 2.0447 |
| | AssTurn_2yr | | | | | | |
| | -constant | 0.0021 | 1.0933 | **0.0035** | **2.0800** | 0.0014 | 0.6814 |
| | -coefficient | -0.1960 | -0.5505 | -0.7283 | -1.0409 | -0.1979 | -0.2248 |
| | -correlation | -0.0867 | -0.5505 | -0.1767 | -1.0409 | -0.0424 | -0.2248 |
| | ICBT_2yr | | | | | | |
| | -constant | 0.0016 | 1.5269 | -0.0005 | -0.3698 | -0.0009 | -0.4499 |
| | -coefficient | 0.1308 | 0.4212 | 0.8676 | 1.7292 | 0.7875 | 1.1344 |
| | -correlation | 0.0665 | 0.4212 | 0.2843 | 1.7292 | 0.2096 | 1.1344 |
| | ChSalesInv | | | | | | |
| | -constant | 0.0010 | 1.6356 | **0.0026** | **3.1499** | 0.0010 | 0.7943 |
| | -coefficient | -0.0303 | -0.0779 | -1.0583 | -1.8082 | -0.0576 | -0.0637 |
| | -correlation | -0.0123 | -0.0779 | -0.2952 | -1.8082 | -0.0120 | -0.0637 |
| | INV_1yr | | | | | | |
| | -constant | -0.0004 | -0.6069 | -0.0010 | -1.3668 | -0.0018 | -1.9870 |
| | -coefficient | 0.0796 | 0.2353 | -0.1501 | -0.2856 | -0.9625 | -1.3521 |
| | -correlation | 0.0372 | 0.2353 | -0.0489 | -0.2856 | -0.2477 | -1.3521 |
| | AccRec_6m | | | | | | |
| | -constant | 0.0003 | 0.3752 | 0.0009 | 1.0575 | 0.0012 | 0.9685 |
| | -coefficient | -0.0613 | -0.1930 | -0.3568 | -0.6166 | -0.7010 | -0.6710 |
| | -correlation | -0.0305 | -0.1930 | -0.1052 | -0.6166 | -0.1258 | -0.6710 |
| | DIV_6m | | | | | | |
| | -constant | -0.0011 | -1.2308 | -0.0016 | -1.4910 | -0.0027 | -1.7659 |
| | -coefficient | -0.2869 | 0.7011 | -0.4016 | -0.6752 | 0.9537 | -1.0146 |
| | -correlation | -0.1226 | -0.7811 | -0.1150 | -0.6752 | -0.1883 | -1.0146 |

University of Cape Town

**Table 7.7.: (Auto) Regressions between payoffs and their moving averages for significant in-sample characteristics**
-continued

| Style group | Characteristic | 6-month Coefficient | 6-month T-Statistic | 12-month Coefficient | 12-month T-Statistic | 18-month Coefficient | 18-month T-Statistic |
|---|---|---|---|---|---|---|---|
| Growth | Reten | | | | | | |
| | -constant | 0.0008 | 0.4955 | 0.0027 | 1.0395 | 0.0005 | 0.2605 |
| | -coefficient | 0.1611 | 0.5154 | 0.0035 | -1.6862 | 0.2902 | 0.3885 |
| | -correlation | 0.0812 | 0.5154 | -0.2778 | -1.6862 | 0.0732 | 0.3885 |
| | RD_TA | | | | | | |
| | -constant | 0.0008 | -0.5141 | -0.0017 | -1.2365 | -0.0026 | -1.4640 |
| | -coefficient | -0.1914 | -0.5327 | -0.8015 | 1.0704 | 1.7633 | 1.0959 |
| | -correlation | -0.0899 | -0.5327 | -0.1506 | -1.0704 | -0.2028 | -1.0959 |
| Change in Growth | Reten_1yr | | | | | | |
| | -constant | 0.0007 | 1.1625 | 0.0013 | 1.9098 | 0.0017 | 1.4210 |
| | -coefficient | 0.1662 | 0.4700 | -0.2818 | -0.5397 | -0.5831 | -0.6161 |
| | -correlation | 0.0741 | 0.4700 | -0.0922 | -0.5397 | -0.1156 | -0.6161 |
| | Reten_6m | | | | | | |
| | -constant | 0.0004 | 0.6645 | 0.0007 | 0.3550 | 0.0001 | 0.1534 |
| | -coefficient | 0.4259 | 1.3244 | 0.3758 | 0.9004 | 0.0861 | 0.1581 |
| | -correlation | 0.2050 | 1.3244 | 0.1526 | 0.9004 | 0.0299 | 0.1581 |
| Change in Momentum / Crossover | Crossover6_18 | | | | | | |
| | -constant | 0.0005 | 0.7427 | 0.0004 | 0.5606 | 0.0007 | 0.7496 |
| | -coefficient | 0.3001 | 0.6478 | 0.0811 | 0.1530 | -0.5962 | -0.7131 |
| | -correlation | 0.1321 | 0.6478 | 0.0262 | 0.1530 | -0.1336 | -0.7131 |
| | Crossover6_12 | | | | | | |
| | -constant | **0.0019** | **2.6951** | 0.0024 | 1.9414 | 0.0020 | 1.6509 |
| | -coefficient | **-2.1564** | **-3.2720** | -3.1474 | -1.8555 | -4.4804 | -1.5943 |
| | -correlation | **-0.4595** | **-3.2720** | -0.3037 | -1.8555 | -0.2885 | -1.5943 |
| | Crossover3_12 | | | | | | |
| | -constant | 0.0001 | 0.8218 | 0.0005 | 0.6421 | 0.0016 | 1.7007 |
| | -coefficient | -1.7158 | **-3.1981** | -1.7129 | 1.2813 | **-5.3238** | **-2.3501** |
| | -correlation | **-0.4513** | **-3.1981** | -0.2146 | -1.2813 | **-0.4059** | **-2.3501** |
| Change in Value | PEGI_2yr | | | | | | |
| | -constant | -0.0013 | -1.4489 | -0.0013 | -1.1680 | -0.0006 | 0.4243 |
| | -coefficient | -0.5837 | -1.0820 | -0.4411 | 0.5260 | -0.7363 | -0.7144 |
| | -correlation | -0.1686 | -1.0820 | -0.0898 | 0.5260 | -0.0405 | -0.7144 |
| | PEGI_1yr | | | | | | |
| | -constant | -0.0011 | -1.8311 | **-0.0018** | **-2.0405** | **-0.0030** | **-2.2819** |
| | -coefficient | -0.4815 | -0.9733 | -1.3767 | 1.4093 | **-3.3032** | **-2.0598** |
| | -correlation | -0.1521 | -0.9733 | -0.2349 | -1.4093 | **-0.3628** | **-2.0598** |
| | NCA_MV_2yr | | | | | | |
| | -constant | 0.0005 | 0.6337 | 0.0008 | 0.9706 | **0.0028** | **2.4381** |
| | -coefficient | 0.1976 | 0.6640 | -0.8040 | -1.6370 | **-2.8996** | **-2.5558** |
| | -correlation | 0.1044 | 0.6640 | -0.2703 | -1.6370 | **-0.4349** | **-2.5558** |
| | TD_TA_6m | | | | | | |
| | -constant | -0.0006 | -0.8928 | -0.0010 | -1.2829 | -0.0009 | 0.9685 |
| | -coefficient | 0.2742 | 0.8986 | -0.0930 | 0.2077 | -0.6427 | -0.9439 |
| | -correlation | 0.1407 | 0.8986 | -0.0347 | 0.2077 | -0.1756 | -0.9439 |
| | NCA_MV_1yr | | | | | | |
| | -constant | 0.0006 | 0.8235 | 0.0013 | 1.7415 | 0.0004 | 0.4254 |
| | -coefficient | -0.3406 | -0.8796 | **-1.5988** | **-2.1206** | 0.1279 | 0.1093 |
| | -correlation | -0.1378 | -0.8796 | **-0.3418** | **-2.1206** | 0.0306 | 0.1093 |
| Value | PEGI | | | | | | |
| | -constant | -0.0009 | -1.3172 | -0.0018 | -2.0211 | -0.0022 | 1.1776 |
| | -coefficient | -0.3437 | -0.7231 | -1.3049 | -1.6414 | -2.4981 | -1.1676 |
| | -correlation | 0.1136 | -0.7231 | -0.2710 | -1.6414 | -0.2155 | -1.1676 |
| | Sales_Emp | | | | | | |
| | -constant | 0.0006 | 0.6405 | 0.0014 | 1.2676 | 0.0012 | 0.9051 |
| | -coefficient | 0.1118 | 0.3506 | -0.7738 | -1.2630 | -0.5271 | -0.4011 |
| | -correlation | 0.0553 | 0.3506 | -0.2117 | -1.2630 | 0.0812 | -0.4011 |
| Short-Term Momentum | MOM_1m | | | | | | |
| | -constant | -0.0017 | -1.0365 | -0.0018 | -1.0365 | -0.0026 | -1.4029 |
| | -coefficient | -0.2547 | -0.5928 | -0.1130 | 0.1827 | -0.7137 | -0.7656 |
| | -correlation | -0.0933 | -0.5928 | -0.0313 | 0.1827 | -0.1432 | -0.7656 |

University of Cape Town

In most cases the regression constants are found to be more significant than the coefficient, indicating that they perform well regardless of economic conditions. The correlation coefficient measures the correlation between the actual and estimated payoffs. Only eight variables show significant correlation coefficients at the 5% level. Furthermore, all the significant correlation coefficients are negative indicating that the model's forecast payoffs are of the incorrect direction. This finding may be useful if any action taken is opposite to that suggested by the models.

The trailing moving average models results for the significant out-sample variables indicate are displayed in Table 7.8. Several characteristics show significance of at least one parameter at the 5% level. As with the in-sample characteristics, the 18-month model appears to be the most successful however the six-month model is almost as useful. Furthermore, the regression constants are, once again, more significant than the coefficients indicating consistency in performance.

The correlation coefficients are particularly weak. Only three variables show significant correlations at the 5% level. Size (LnMV) and the 2-year change in market to book value (MTBV_2yr) have significant negative correlation coefficients and the six-month change in the interest cover before tax ratio (ICBT_6m) has a significant positive correlation coefficient.

University of Cape Town

**Table 7.8.: (Auto) Regressions between payoffs and their moving averages for significant out-sample characteristics**

The table displays the coefficients and their related t-statistics obtained from the regressions between monthly payoffs to each final significant characteristic and their six-month, 12-month and 18-month trailing moving averages. The final significant variables are obtained form the out of sample cross-sectional regressions performed in Chapter Six. The table also displays the Pearson correlation coefficient which measures the correlation between month payoffs and the estimated monthly payoffs based on the six-month, 12-month and 18-month moving averages. Correlation coefficients and regression coefficients significant at the 5% level of significance are displayed in bold. The regressions are performed over the out of sample period (1 January 2001- 31 December 2004). The data are obtained form Datastream International at the University of Cape Town.

| Style group | Characteristic | 6-month | | 12-month | | 18-month | |
|---|---|---|---|---|---|---|---|
| | | Coefficient | T-statistic | Coefficient | T-statistic | Coefficient | T-statistic |
| Size | LnMV | | | | | | |
| | -constant | **-0.0077** | **-2.7428** | -0.0051 | -0.8236 | **-0.0180** | **-2.7967** |
| | -coefficient | -0.4020 | -1.1988 | 0.2452 | 0.2465 | **-2.0250** | **-2.0580** |
| | -correlation | -0.1662 | -1.2284 | 0.0422 | 0.2537 | **-0.3625** | **-2.1302** |
| | NAVpS | | | | | | |
| | -constant | -0.0026 | -1.9352 | -0.0024 | -1.4699 | **-0.0043** | **-2.1997** |
| | -coefficient | -0.3787 | -0.7765 | -0.0672 | -0.0961 | -0.7726 | -0.9035 |
| | -correlation | -0.1219 | -0.7957 | -0.0142 | -0.0851 | -0.1718 | -0.9553 |
| Value | BTMV | | | | | | |
| | -constant | **0.0077** | **2.3892** | **0.0163** | **2.6196** | 0.0036 | 0.9210 |
| | -coefficient | -0.0214 | -0.0626 | -1.0466 | -1.4055 | -0.2359 | -0.1992 |
| | -correlation | -0.0099 | -0.0642 | -0.2343 | -1.4483 | -0.0376 | -0.2062 |
| | CEY | | | | | | |
| | -constant | **0.0046** | **2.7430** | **0.0069** | **2.7079** | **0.0088** | **2.2268** |
| | -coefficient | -0.2510 | -0.7607 | -0.6245 | -1.0516 | -1.3196 | -1.3650 |
| | -correlation | -0.1194 | -0.7795 | -0.1775 | -1.0621 | -0.2498 | -1.4129 |
| | DY | | | | | | |
| | -constant | 0.0024 | 1.1311 | **0.0056** | **2.2142** | 0.0027 | 0.8281 |
| | -coefficient | 0.2524 | 0.9213 | -0.7142 | -1.4925 | 0.1153 | 0.1536 |
| | -correlation | 0.1441 | 0.9441 | -0.2480 | -1.5358 | 0.0290 | 0.1590 |
| | EY | | | | | | |
| | -constant | 0.0018 | 1.2785 | 0.0033 | 1.8517 | 0.0044 | 1.9233 |
| | -coefficient | 0.2870 | 0.9719 | -0.3825 | -0.8064 | -1.3829 | -1.4499 |
| | -correlation | 0.1519 | 0.9960 | -0.1370 | -0.8298 | -0.2643 | -1.5008 |
| Performance | OPMIP | | | | | | |
| | -constant | **0.0054** | **2.5470** | 0.0056 | 1.6328 | 0.0095 | 1.9837 |
| | -coefficient | -0.3361 | -0.7839 | -0.2693 | -0.3278 | -1.3776 | -1.0829 |
| | -correlation | -0.1230 | -0.8033 | -0.0561 | -0.3373 | -0.2005 | -1.1209 |
| Change in Growth | RD_EQ_2yr | | | | | | |
| | -constant | **-0.0022** | **-2.2211** | -0.0027 | -1.8145 | **-0.0051** | **-2.1273** |
| | -coefficient | -0.2023 | -0.5903 | -0.6702 | -0.9328 | -1.9064 | -1.4135 |
| | -correlation | -0.0929 | -0.6048 | -0.1580 | -0.3699 | -0.2581 | -1.4631 |
| Change in Value | MTBV_2yr | | | | | | |
| | -constant | -0.0028 | -1.1852 | -0.0048 | -1.5645 | **-0.0114** | **-2.5851** |
| | -coefficient | 0.0297 | 0.0779 | -0.6794 | -1.0362 | **-3.0234** | **-2.4368** |
| | -correlation | 0.0123 | 0.0799 | -0.1831 | -1.3177 | **-0.4183** | **-2.5223** |
| Change in Liquidity | TV_3m | | | | | | |
| | -constant | 0.0019 | 1.4669 | 0.0014 | 0.8497 | 0.0018 | 0.7492 |
| | -coefficient | 0.3771 | 1.2625 | 0.4264 | 1.1084 | 0.1296 | 0.2255 |
| | -correlation | 0.1958 | 1.2937 | 0.1867 | 1.1405 | 0.0426 | 0.2334 |
| | MVT_MV_6m | | | | | | |
| | -constant | 0.0023 | 1.4023 | 0.0008 | 0.4268 | 0.0001 | 0.0210 |
| | -coefficient | 0.2409 | 0.7105 | 0.5309 | 1.2333 | 0.4789 | 0.7297 |
| | -correlation | 0.1116 | 0.7281 | 0.2069 | 1.2691 | 0.1366 | 0.7553 |

University of Cape Town

**Table 7.8.: (Auto) Regressions between payoffs and their moving averages for significant out-sample characteristics**
-continued

| Style group | Characteristic | 6-month | | 12-month | | 18-month | |
|---|---|---|---|---|---|---|---|
| | | Coefficient | T-statistic | Coefficient | T-statistic | Coefficient | T-statistic |
| Change in Performance | ICBT_6m | | | | | | |
| | -constant | 0.0009 | 0.8587 | 0.0000 | 0.0148 | -0.0016 | -0.8858 |
| | -coefficient | 0.4452 | 1.5730 | 0.6936 | 1.7965 | 1.1006 | 2.0447 |
| | -correlation | 0.2414 | 1.6139 | 0.2845 | 1.8486 | **0.3504** | 2.1164 |
| | Sales_Emp_1yr | | | | | | |
| | -constant | **0.0026** | **2.1162** | **0.0048** | **2.6903** | 0.0041 | 1.2968 |
| | -coefficient | 0.0271 | 0.0785 | -0.5726 | -1.0325 | -0.5662 | -0.5684 |
| | -correlation | 0.0124 | 0.0605 | -0.1744 | -1.0624 | -0.1068 | -0.5684 |
| | NCF_BP1yrDiv_6m | | | | | | |
| | -constant | -0.0014 | -1.8546 | -0.0014 | -1.3806 | -0.0027 | -1.4276 |
| | -coefficient | -0.0064 | -0.0170 | -0.2748 | -0.4567 | -0.9344 | -0.8260 |
| | -correlation | -0.0027 | -0.0174 | -0.0781 | -0.4700 | -0.1642 | -0.8550 |
| | ICBT_2yr | | | | | | |
| | -constant | 0.0016 | 1.5269 | -0.0005 | -0.3856 | -0.0009 | -0.4499 |
| | -coefficient | 0.1308 | 0.4212 | 0.8676 | 1.7292 | 0.7875 | 1.1344 |
| | -correlation | 0.0665 | 0.4316 | 0.2843 | 1.7793 | 0.2096 | 1.1743 |
| | DepAmort_TA_6m | | | | | | |
| | -constant | 0.0032 | 1.1897 | 0.0008 | 0.2139 | -0.0011 | -0.2219 |
| | -coefficient | 0.1183 | 0.3285 | 0.3329 | 0.6002 | 0.8081 | 0.9392 |
| | -correlation | 0.0519 | 0.3396 | 0.1024 | 0.6176 | 0.1748 | 0.9722 |
| | Borrow_1yr | | | | | | |
| | -constant | -0.0019 | -1.7415 | **-0.0038** | **-2.6760** | **-0.0048** | **-2.2536** |
| | -coefficient | 0.1441 | 0.4254 | -0.5822 | -1.1244 | -1.4570 | -1.6334 |
| | -correlation | 0.0673 | 0.4370 | -0.1894 | -1.1570 | -0.2949 | -1.6907 |
| | AssTurn_6m | | | | | | |
| | -constant | 0.0011 | 1.4156 | 0.0020 | 1.9770 | **0.0032** | **2.5868** |
| | -coefficient | 0.3775 | 1.4250 | 0.0756 | 0.1970 | -0.4124 | -0.8622 |
| | -correlation | 0.2198 | 1.4572 | 0.0338 | 0.2027 | -0.1608 | -0.8925 |
| | Quick_6m | | | | | | |
| | -constant | **0.0025** | **2.7277** | 0.0016 | 1.2092 | 0.0037 | 1.7636 |
| | -coefficient | -0.9170 | -1.5156 | -0.2256 | -0.2430 | -1.7314 | -1.2143 |
| | -correlation | -0.2330 | -1.5530 | -0.0416 | -0.2501 | -0.2237 | -1.2570 |

The results for the AR12 models are displayed in Table 7.9. for the in-sample significant variables and in Table 7.10. for the out of sample significant variables. All AR12 models are constructed over the out of sample period (1 January 2001 – 31 December 2004) using lag coefficients obtained from autoregressions performed over the in-sample period (1 January 1993 – 31 December 2000) thus ensuring that the tests contain no look-ahead bias. The lag coefficients used are shown in Table 7.1. for the in-sample variables and Appendix D.3. for the out of sample variables.

The AR12 model is not particularly successful when using either dataset. Only one characteristic in each dataset shows a significant correlation between realised and estimated payoffs. The only significant in-sample characteristic in the one-year change in the retention ratio (Rcten_1yr) however the correlation coefficient is negative. Size (LnMV) has the only significant correlation coefficient of the out-sample variables and is positive.

University of Cape Town

**Table 7.9.: AR12 model results for in-sample significant variables**

The table displays the results of the AR12 model presented in equation 7.4. for the in-sample significant variables. The correlation coefficients between estimated and actual monthly payoffs are displayed. Correlation coefficients significant at the 5% level of significance are displayed in bold. The AR12 models are constructed over the out of sample period (1 January 2001 – 31 December 2004) using lag coefficients obtained from autoregressions performed over the in-sample period (1 January 1993 – 31 December 2000). The data are obtained form Datastream International at the University of Cape Town.

| Style group | Characteristic | Correlation Coefficient | T-statistic |
|---|---|---|---|
| Change in Size | CPS_6m | 0.1287 | 0.7569 |
| | NS_6m | -0.1784 | -1.0571 |
| Change in Liquidity | VO_1yr | 0.0442 | 0.2579 |
| | VO_3m | 0.0058 | 0.0340 |
| | MVT_MV_1m | -0.0430 | -0.2507 |
| Performance | NCF_BP1yr | 0.0825 | 0.4824 |
| Change in Performance | AssTurn_6m | -0.0817 | -0.4781 |
| | ICBT_6m | 0.2183 | 1.3044 |
| | AssTurn_2yr | -0.1195 | -0.7019 |
| | ICBT_2yr | 0.2708 | 1.6401 |
| | ChSalesChInv | -0.1299 | -0.7637 |
| | INV_1yr | -0.1032 | -0.6052 |
| | AccRec_6m | -0.1409 | -0.8301 |
| | DIV_6m | -0.1769 | -1.0482 |
| Growth | Reten | -0.1695 | -1.0031 |
| | RD_TA | 0.2384 | 1.4314 |
| Change in Growth | Reten_1yr | **-0.3728** | **-2.3425** |
| | Reten_6m | 0.2781 | 1.6881 |
| Change in Momentum / Crossover | Crossover6_18 | -0.0147 | -0.0855 |
| | Crossover6_12 | -0.0101 | -0.0589 |
| | Crossover3_12 | 0.0074 | 0.0431 |
| Change in Value | PEGI_2yr | 0.0259 | 0.1512 |
| | PEGI_1yr | -0.2200 | -1.3149 |
| | NCA_MV_2yr | -0.1489 | -0.8778 |
| | TD_TA_6m | 0.0746 | 0.4364 |
| | NCA_MV_1yr | 0.0377 | 0.2200 |
| Value | PEGI | -0.1234 | -0.7251 |
| | Sales_Emp | 0.0456 | 0.2660 |
| Short-Term Momentum | MOM_1m | 0.0979 | 0.5739 |

University of Cape Town

**Table 7.10.: AR12 model results for out of sample significant variables**

The table displays the results of the AR12 model presented in equation 7.4. for the out of sample significant variables. The correlation coefficients between estimated and actual monthly payoffs are displayed. Correlation coefficients significant at the 5% level of significance are displayed in bold. The AR12 models are constructed over the out of sample period (1 January 2001 – 31 December 2004) using lag coefficients obtained from autoregressions performed over the in-sample period (1 January 1993 – 31 December 2000). The data are obtained form Datastream International at the University of Cape Town.

| Style Group | Characteristic | Correlation Coefficient | T-statistic |
|---|---|---|---|
| Size | LnMV | **0.3841** | **2.4259** |
| | NAVpS | 0.0182 | 0.1061 |
| Value | BTMV | 0.0776 | 0.4539 |
| | CEY | -0.0601 | -0.3513 |
| | DY | -0.2188 | -1.3074 |
| | EY | -0.0966 | -0.5661 |
| Performance | OPMtP | 0.0193 | 0.1127 |
| Change in Growth | RD_EQ_2yr | 0.2370 | 1.4222 |
| Change in Value | MTBV_2yr | -0.0604 | -0.3526 |
| Change in Liquidity | TV_3m | 0.0200 | 0.1166 |
| | MVT_MV_6m | 0.1597 | 0.9434 |
| Change in Performance | ICBT_6m | 0.2183 | 1.3044 |
| | Sales_Emp_1yr | 0.0232 | 0.1354 |
| | NCF_BP1yrDiv_6m | 0.2023 | 1.2044 |
| | ICBT_2yr | 0.2708 | 1.6401 |
| | DepAmort_TA_6m | 0.1220 | 0.7170 |
| | Borrow_1yr | 0.2127 | 1.2694 |
| | AssTurn_6m | -0.0817 | -0.4781 |
| | Quick_6m | -0.0948 | -0.5552 |

Direction ratios are displayed in Table 7.11. and 7.12. for the in-sample and out of sample variables respectively. Figure 7.3. and 7.4. present, in graphical format, the mean and standard deviation of the direction ratios for the in-sample and out of sample variables respectively.

The in-sample dataset results indicate that all four models correctly predict the direction of the monthly payoffs more than 50% of the time. The 12-month moving average model is the most accurate predictor with an average direction ratio of 54.12%. The poorest predictor of the direction of payoffs is the AR12 model which only just exceeds the 50% mark.

University of Cape Town

**Table 7.11.: Direction ratios for in-sample variables**

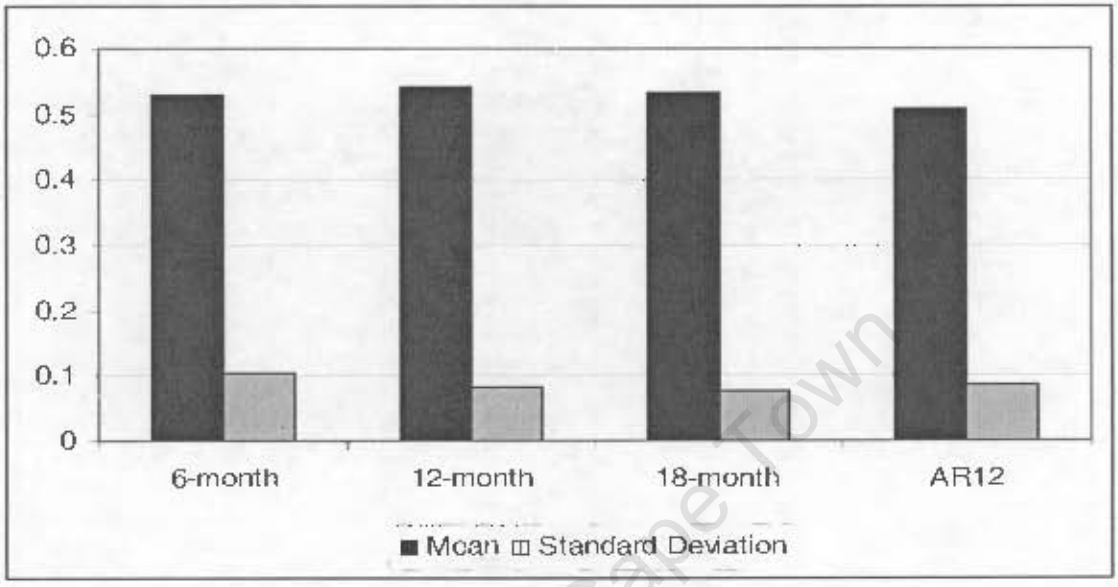
The table displays the direction ratios which show the number of times a payoff is correctly forecasted to total forecasts for each characteristic in each model. The realised monthly payoffs are derived from the cross-sectional regressions using un-adjusted returns over the 1 January 2001 to 31 December 2004 period. Ratios significant at the 5% level using the non-parametric Sign Test are displayed in bold.

| Style group | Characteristic | 6-month | 12-month | 18-month | AR12 |
|---|---|---|---|---|---|
| Change in Size | CPS_6m | 0.4762 | 0.5556 | 0.5667 | 0.6111 |
| | NS_6m | **0.6190** | 0.5000 | 0.5667 | **0.6389** |
| Change in Liquidity | VO_1yr | 0.5238 | 0.5556 | 0.5667 | 0.4444 |
| | VO_3m | **0.6667** | **0.6389** | 0.5667 | 0.3889 |
| | MV1_MV_1m | 0.4286 | 0.4722 | 0.4333 | 0.5556 |
| Performance | NCF_BP1yr | 0.4286 | 0.4722 | 0.4667 | 0.4722 |
| Change in Performance | AssTurn_6m | **0.7619** | **0.7222** | **0.7000** | 0.4444 |
| | ICBT_6m | **0.6667** | **0.6667** | 0.5667 | 0.5278 |
| | AssTurn_2yr | 0.5238 | 0.5833 | 0.6000 | **0.6389** |
| | ICBT_2yr | **0.6429** | 0.6111 | 0.5000 | 0.4444 |
| | ChSalesInv | **0.6429** | **0.6389** | **0.6333** | 0.3333 |
| | INV_1yr | 0.5714 | 0.6111 | 0.6000 | 0.5278 |
| | AccRec_6m | 0.5000 | 0.4722 | 0.5000 | 0.5833 |
| | DIV_6m | 0.4048 | 0.5833 | 0.5000 | 0.5556 |
| Growth | Reten | 0.4524 | 0.4444 | 0.5667 | 0.5000 |
| | RD_TA | 0.5476 | 0.4444 | 0.5667 | **0.6389** |
| Change in Growth | Reten_1yr | 0.5238 | 0.5556 | **0.6333** | 0.5000 |
| | Reten_6m | 0.5238 | 0.5833 | 0.5333 | 0.4167 |
| Change in Momentum / Crossover | Crossover6_18 | 0.5476 | 0.3611 | 0.4333 | 0.5278 |
| | Crossover6_12 | 0.3333 | 0.4722 | 0.4667 | 0.6111 |
| | Crossover3_12 | 0.2619 | 0.4722 | 0.4000 | 0.3333 |
| Change in Value | PEGI_2yr | 0.4524 | 0.5833 | 0.5333 | 0.5000 |
| | PEGI_1yr | 0.5476 | 0.5556 | 0.5333 | 0.5833 |
| | NCA_MV_2yr | 0.5714 | 0.4722 | 0.3667 | 0.5000 |
| | TD_TA_6m | 0.5000 | 0.5278 | 0.5000 | 0.4444 |
| | NCA_MV_1yr | 0.5238 | 0.4167 | 0.6000 | 0.5278 |
| Value | PEGI | 0.5714 | 0.5833 | 0.5000 | 0.5000 |
| | Sales_Emp | 0.5952 | 0.5556 | **0.6333** | 0.4167 |
| Short-Term Momentum | MOM_1m | 0.5238 | 0.5833 | 0.4333 | 0.5556 |
| Mean | | 0.5287 | 0.5412 | 0.5333 | 0.5077 |
| Standard Deviation | | 0.1033 | 0.0815 | 0.0777 | 0.0849 |

University of Cape Town

**Figure 7.3.: Average direction ratios for in-sample characteristics**

The graph displays the direction ratios demonstrating the number of times the direction of the payoff to an attribute is correctly forecasted to total forecasts. The black bars show the mean direction ratios for each model and the grey bars display the associated standard deviations. The realised monthly payoffs are obtained from cross-sectional regressions on an-adjusted total monthly returns data over the period 1 January 1993 to 31 December 2000. The data are obtained form Datastream International at the University of Cape Town.




The direction ratios for the out of sample variables are substantially higher than those of the in-sample variables. Once again all models predict the correct direction of the monthly payoffs more than 50% of the time. Furthermore, the 12-month model is again the best predictor with an average direction ratio of 64.04%. The six-month model, while having a lower average direction ratio, does predict a greater amount of individual characteristic payoff directions significantly. As with the in-sample variables, the worst predictor is the AR12 model with an average direction ratio of 53.65%.

University of Cape Town

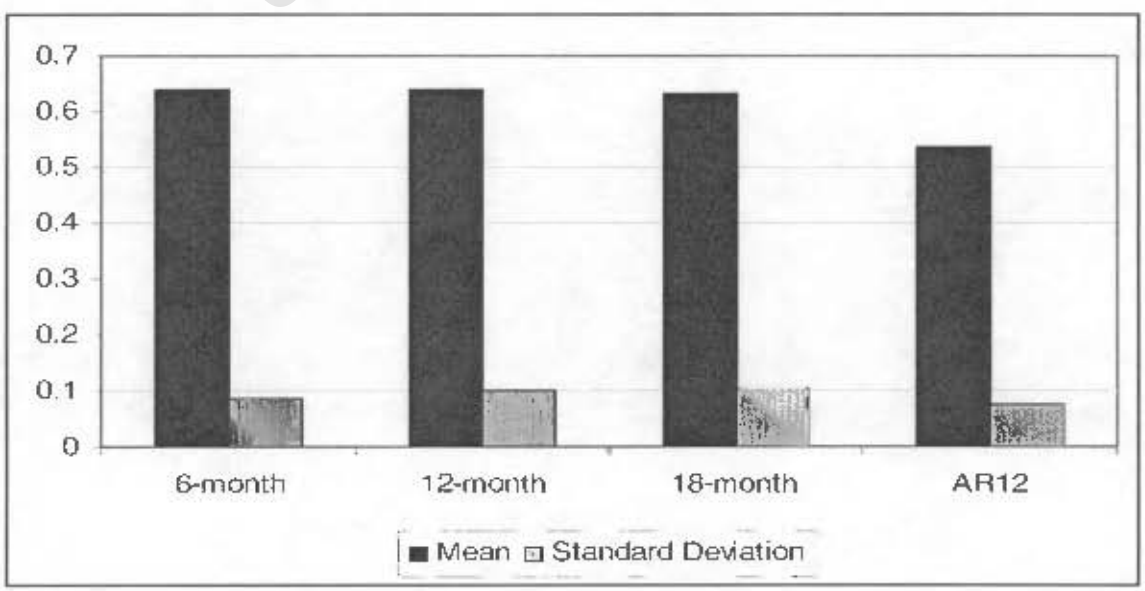
**Table 7.12.: Direction ratios for out-sample variables**

The table displays the direction ratios which show the number of times a payoff is correctly forecasted to total forecasts for each characteristic in each model. The realised monthly payoffs are derived from the cross-sectional regressions using un-adjusted returns over the 1 January 2001 to 31 December 2004 period. Ratios significant at the 5% level using the non-parametric Sign Test are displayed in bold.

| Style Group | Characteristic | 6-month | 12-month | 18-month | AR12 |
|---|---|---|---|---|---|
| Size | LnMV | 0.4524 | **0.6389** | 0.5667 | **0.6389** |
| | NAVpS | 0.5714 | 0.6111 | **0.6667** | 0.4722 |
| Value | BTMV | **0.8095** | **0.8333** | **0.8667** | 0.4722 |
| | CEY | **0.6667** | **0.8333** | **0.8000** | 0.4722 |
| | DY | 0.5952 | 0.5000 | 0.5667 | 0.6111 |
| | EY | **0.7381** | 0.5556 | 0.5667 | 0.4444 |
| Performance | OPMtP | **0.6905** | **0.7778** | **0.7667** | 0.5000 |
| Change in Growth | RD_EQ_2yr | 0.5238 | 0.5278 | 0.5333 | **0.6389** |
| Change in Value | MTBV_2yr | 0.5952 | 0.5000 | 0.5333 | 0.4444 |
| Change in Liquidity | TV_3m | **0.6905** | 0.6111 | 0.5667 | 0.5556 |
| | MVT_MV_6m | 0.5714 | 0.5833 | 0.5000 | 0.5278 |
| Change in Performance | ICBT_6m | **0.6667** | **0.6667** | 0.5667 | 0.4444 |
| | Sales_Emp_1yr | **0.6905** | **0.6667** | **0.7000** | **0.6389** |
| | NCF_BP1yrDiv_6m | **0.6190** | 0.5556 | **0.6333** | 0.6111 |
| | ICBT_2yr | **0.6429** | 0.6111 | 0.5000 | 0.5278 |
| | DepAmort_TA_6m | **0.6429** | **0.6667** | **0.6333** | 0.4722 |
| | Borrow_1yr | **0.6190** | **0.6944** | **0.7333** | 0.5833 |
| | AssTurn_6m | **0.7619** | **0.7222** | **0.7000** | **0.6389** |
| | Quick_6m | 0.5714 | 0.6111 | 0.6000 | 0.5000 |
| Mean | | 0.6378 | 0.6404 | 0.6316 | 0.5365 |
| Standard Deviation | | 0.0850 | 0.0995 | 0.1051 | 0.0747 |

**Figure 7.4.: Average direction ratios for out-sample characteristics**

The graph displays the direction ratios demonstrating the number of times the direction of the payoff to an attribute is correctly forecasted to total forecasts. The black bars show the mean direction ratios for each model and the grey bars display the associated standard deviations. The realised monthly payoffs are obtained from cross-sectional regressions on un-adjusted total monthly returns data over the period 1 January 2001 to 31 December 2004. The data are obtained form Datastream International at the University of Cape Town.




University of Cape Town

## 7.4. Summary and conclusion

The aim of this chapter is to investigate the usefulness of timing models. The timing models are used to forecast monthly payoffs to significant variables obtained from the regression analyses performed in Chapter Six.

First, a style consistency assessment is conducted in order to determine if an investigation into timing is justified. Second, a style momentum assessment is performed. Four timing models are constructed and tested. The first three models are trailing moving average models, namely: six-month moving average; 12-month moving average and 18-month moving average. The fourth model is a twelve lag autoregressive model.

The style consistency assessment shows that the ability to time the direction of style payoffs is valuable for both the in- and out-sample datasets. This is indicated by several significant characteristics, from both samples, showing inconsistency in the direction of monthly payoffs.

For each dataset a twelve lag correlogram is constructed. The in-sample correlogram shows that the autocorrelations are stronger over the first six lags as opposed to the last twelve lags. Twenty of the twenty-nine characteristics have significant auto correlations at least one lag. The Ljung-Box Q-statistics show significant autocorrelation for only fifteen characteristics. The out-sample correlogram shows significant autocorrelation for ten characteristics. The significant autocorrelations are evenly dispersed across lags one to twelve. Only two characteristics are significant when using the Ljung-Box Q-statistic, namely: LnMV which only become significant after the twelfth lag and Borrow_1yr, which only becomes significant at the ninth lag.

Of the four timing models constructed, the 18-month trailing moving average model appears to be the most successful in both the in-sample and out-sample datasets. The AR12 model performs poorly in both datasets with only two significant correlation coefficients in total. The four models are also evaluated by computing the direction ratio for each variable in each dataset as the ratio between the number of times a

University of Cape Town

payoff direction is correctly forecasted to total forecasts. In both datasets, the 12-month trailing moving average model is the most successful model at predicting the direction of payoffs correctly. The 12-month model predicts the correct direction, on average, 54.12% of the time for the in-sample characteristics and, on average, 64.04% of the time for the out-sample characteristics. Once again, the worst performer is the AR12 model which only just exceeds 50% in both datasets.

University of Cape Town

# 8. Summary of Results and Conclusion

## 8.1. Introduction

This thesis attempts to identify firm-specific attributes that exhibit a significant relationship with the cross-sectional variation of stock returns on the TSE. Several significant attributes are identified in two independent time periods. The observed results are however somewhat spurious as they are not consistent between the two time periods.

The presence of anomalies is clearly established and numerous firm-specific attributes remain significant after risk adjustment using the CAPM. This finding is in direct conflict with the predictions of the CAPM in an efficient market. However, the joint hypothesis asserts that it is not possible to determine if the anomalies arise as a result of an inefficient market or a misspecified model. It is therefore not possible to determine if the TSE is inefficient or the CAPM is misspecified. It may also be possible that the both the TSE is inefficient and the CAPM is misspecified.

The behaviour of the monthly payoffs to significant variables is examined for predictability. The three trailing moving average models constructed, in particular the 18-month moving average model, show forecasting ability. Furthermore, all the timing models constructed have the ability to predict the direction of payoffs correctly for more than half of the time.

The remainder of this chapter is set out as follows. Section 8.2. summarises the findings of the analyses performed in Chapters Five, Six and Seven and Section 8.3. discusses possible extensions to the research conducted in this thesis.

University of Cape Town

## 8.2. Summary of results

Monthly stock return data and firm-specific attribute data for 979 stocks listed on Section One of the TSE as of 31 May 2005 are downloaded from Datastream International. In total, 229 firm-specific attributes are constructed and tested for the ability to predict stock returns. The data are adjusted for thin trading using a thin trade filter and winsorised to truncate any outliers or extreme observations. The thin trade filter removes 286 thinly traded shares from the sample and 43 shares are removed for lack of return data. The final sample thus contains 651 stocks. The thin trade filter and the use of monthly data reduces the effects of non-synchronous trading bias. Datastream International only updates information once it becomes publicly available and thus the data are free from look-ahead bias.

The structure of the TSE is briefly investigated. It is shown that, with respect to market capitalisation, the TSE is dominated by the Financial sector followed by the Cyclical Services, Basic Industries and General Industrials sectors. As expected, the Resources and Utilities sectors are the smallest. A cluster analysis shows the existence of three to five clusters. A principal component analysis points towards the existence of the five factor breakdown. A promax (oblique) rotation procedure is used to identify the five indices used to proxy for the five factors. The five indices are used to construct a multi-index model. The five indices are: (1) Hotels (HOTELS); (2) Discount, Superstores and Warehouses (DSCTSPRSTORES); (3) Resources (RESOURCES); (4) Diversified Industrials (DIVERSIFIEDINDS) and (5) Food Producers and Processors (FOODPRDRPRCR). Cumulatively, the five indices explain just less than 90% of common variation of the sample.

The ability of the single-index and multi-index models to explain the time series variation in stock returns is compared. Two tests are performed. The first test (Test 1) tests the single-index model and multi-index model by performing time series regressions over the sample period. The second test (Test 2) determines whether one model has the ability to explain returns beyond that of the other model. It is shown that the multi-index model has the ability to explain a greater proportion of the variation in returns relative to the single-index model. Furthermore, the multi-index

University of Cape Town

model explains a greater proportion of the variation in returns that is not explained by the single-index model than the single-index model explains with respect to the multi-index model. The single-index model is significant at the 5% level and the multi-index model is significant at the 10% level.

The relationship between stock returns and firm-specific attributes on the TSE is investigated by performing cross-sectional regression analysis. The regressions are run over an in-sample period and an out of sample period. The out of sample stock return data are adjusted to determine if the firm-specific attributes have the ability to explain returns beyond that of these single-index and multi-index models.

The empirical results for the in-sample regressions show that 47 significant firm-specific attributes exist at the 5% level. A simplification procedure which employs correlation and cluster analyses is used to simplify the list of significant variables by removing attributes whose payoffs are highly correlated. The final list contains 29 of the most significant variables. These variables are separated into ten style groups: (1) change in size; (2) change in liquidity; (3) performance; (4) change in performance; (5) growth; (6) change in growth; (7) change in momentum/ crossover; (8) change in value; (9) value and (10) short-term momentum.

University of Cape Town

The in-sample results show support for previous findings on the TSE. Furthermore, several new variables are found to be useful in predicting returns. Xu and Zhang (2004) find research and development intensity to be significant and this finding is confirmed here. The insignificance in size (LnMV) may be a result of the sample construction however, it does support the findings of Hawawini (1991), Daniel Titman and Wei (2001) and Bauer, Derwall and Molenaar (2003) albeit using a different methodology. The finding that the CEY is more significant than the EY supports Chan, Hamao and Lakonishok (1991) and Cai (1997).

Out of sample regressions are run in order to determine if the in-sample results are robust across different time periods. The un-adjusted results show 41 firm-specific attributes to be significant at the 5% level. The simplified list of significant attributes contains 19 attributes and is divided into seven style groups, namely: (1) size; (2) value; (3) performance; (4) change in growth; (5) change in value; (6) change in

liquidity and (7) change in performance. The results of the in- and out-sample tests using un-adjusted returns are substantially different are not robust across different time periods. Only eight characteristics are significant in both the in- and out-sample periods, namely: the six-month change in asset turnover (AssTurn_6m); the six-month change in the interest cover before tax ratio (ICBT_6m); the three-month and six-month change in market value traded to market value ratios (MVT_MV_3m and MVT_MV_6m); the three-month and six-month change in absolute trading volume (VO_3m and VO_6m); and the three-month and six-month change in the trading volume ratio (TV_6m and TV_3m). The eight characteristics all exhibit a positive relationship with stock returns in both time periods

The single-index adjusted results indicate that 48 attributes are significant at the 5% level of significance and 21 attributes are retained in the final list of significant characteristics. The single-index model adjusted returns are divided into eight style groups, namely: (1) size; (2) value; (3) momentum; (4) change in growth; (5) change in value; (6) change in liquidity; (7) change in size and (8) change in performance. The multi-index adjusted results show 31 characteristics to be significant at the 5% level while only 20 are included in the final list. The multi-index adjusted returns results are divided in to nine style groups, namely: (1) size; (2) value; (3) performance; (4) change in growth; (5) change in momentum / crossover; (6) change in value; (7) change in liquidity; (8) change in size and (9) change in performance.

The size effect identified by Kato and Schallheim (1985), Cai (1997), Bae and Kim (1998) and Hodoshima, Gorza-Gomez and Kunimura (2000) on the TSE is confirmed here for the out of sample period. The size variable also has the ability to predict returns beyond that of the single-index and the multi-index models. Several value variables are also found to be significant. The BTMV effect supports the evidence presented in Chan, Hamao and Lakonishok (1991), Cai (1997) and Bae and Kim (1998). The significance of the CEY ahead of the EY supports the argument of Chan, Hamao and Lakonishok (1991) that the CEY is more useful in explaining returns on the TSE. The significance on the DY confirms the findings of Michaud (1999). All value variables remain significant after risk adjustment using both return generating models.

University of Cape Town

The behaviour of the payoffs to the final significant variables is assessed and the predictability of payoffs is examined. A style consistency assessment shows that an investigation into timing is justified as several characteristics exhibit inconsistency in the direction of payoffs. Four timing models are constructed and tested. The first three models are trailing moving average models which use the six-month, 12-month and 18-month moving average of payoffs to predict payoffs one month ahead of the moving average. The fourth model is a 12 lag autoregressive model (AR12).

The 18-month trailing moving average model is shown to be the most successful in both the in-sample and out-sample datasets with the most significant regression constants, coefficients and correlations. The AR12 model is the worst predictor of monthly payoffs. The direction ratio is also used to evaluate each model. All four models have the ability to predict the direction of monthly payoffs correctly greater than 50% of the time. The 12-month trailing moving average model is the most successful model at predicting the direction of payoffs correctly for both the in-sample and out of sample characteristics.

University of Cape Town

## 8.3. Suggested extensions

There exists several areas of further research on the topic of style anomalies on the TSE. Three of the more prominent areas, namely: (1) seasonality; (2) multivariate analysis and (3) transactions costs are discussed in this section.

One of the most prevalent anomalies documented over the past few decades is the January effect. Stock returns, especially those of small firms, are higher in January than the remaining eleven months of the year. The investigation into the January effect on the TSE is prompted by differing tax laws between the U.S. and Japan. In Japan, there exists no capital gains tax for individual investors and hence no tax benefits for losses. At the company level, capital gains tax is charged, however, the company may choose when its tax year ends. Therefore, the tax loss selling hypothesis is a weak argument for the January effect on the TSE, especially since over 50% of firms have a fiscal year end in March [Kato and Schallheim, (1985)]. If the tax-loss selling hypothesis were to hold, one would expect an April effect to exist

on the TSE. Furthermore, Kato and Schallheim (1985) identify three peaks in the time series of returns viz. January, June and December. Both the January and June peaks are found to be significant. The authors rationalise the finding by arguing that Japanese workers receive substantial bonuses in June and December and therefore the increase in returns is a result of an increase investment arising from such bonuses.

An investigation into the usefulness of multifactor models may be valuable. Although the univariate analyses find several individually significant variables, these variables maybe dominated by other significant variables and thus become redundant when combined in a multifactor model. Therefore univariate analysis provides only limited useful information for forecasting returns [Michaud (1999)]. Michaud (1999) reiterates that the aim of multifactor modelling is to create comprehensive and parsimonious representation of the active return generating process. Furthermore, the included factors should be relatively uncorrelated with one another and should have intuitive investment content.

Finally, the potential value obtained by a practitioner through exploiting the empirical anomalies maybe uncertain due to the failure of the methodologies to account for transaction costs, liquidity constraints and other relevant market frictions. Banz (1981) and Reinganum (1981) argue that the size anomaly is profitable irrespective of transaction costs, however, Stoll and Whaley (1983) show that transaction costs have the ability to explain the size effect and thus should be included in a two factor CAPM. Amihud and Mendelson (1986) argue that liquidity is an additional dimension in asset pricing as smaller, less liquid stocks exhibit liquidity premiums. Therefore, the need to determine if return premiums associated with anomalies exceeds those of any associated market frictions arises so that the exploitation of the anomalies by practitioners is economically profitable. Roll (1994:70) is not particularly optimistic regarding the usefulness of empirical anomalies by practitioners as he states that:

> *"Over the past decade, I have attempted to exploit many of the seemingly most promising inefficiencies by actually trading significant amounts of money... Many of these effects are surprisingly strong in reported empirical work, but I have never found one that worked in practice."*

University of Cape Town

# References


Anderson, R.E., Black, W.C., Hair, J.F., and Tatham, R.L. (1992), Multivariate data analysis 3rd edition. Maxwell MacMillian

Amihud, Y., Mendelson, H., 1986. Asset pricing and the bid-ask spread. Journal of Financial Economics 17(2), 223-250.

Bachelier, L., 1900. Théorie de la spéculation. Annales de l'Ecole Normale Superiure 17, 21-86. Reprinted in Cootner (1964).

Bae, K. H., Kim, J., 1998 The usefulness of earnings versus book value for predicting stock returns and cross corporate ownership in Japan. Japan and the World Economy 10, 467-485

Banz, R., 1981. The relationship between return and market value of common stocks. Journal of Financial Economics, 9, 3 –18.

Banz, R., Breen, W., 1986. Sample dependant results using accounting and market data: some evidence. Journal of Finance 41(4), 779-794.

Ball, R., Brown, P. 1968. An empirical evaluation of accounting income numbers. Journal of Accounting Research, Autumn, 159-178.

Basu, S., 1977. Investment performance of common stocks in relation to their price-earnings ratios: A test of the efficient market hypothesis. Journal of Finance, June, 663-682.

Basu, S.,1983. The relationship between earnings' yield, market value and return for NYSE common stocks: further evidence. Journal of Financial Economics 12, 129-156.

Bauer, R., Derwall, J., Molenaar, R., 2004. The real-time predictability of the size and value premium in Japan. Pacific-Basin Finance Journal 12, 503– 523

Berk, J., 1995. A critique of size-related anomalies. Review of Financial Studies 8(2), 275-286.

Bhandari, L., 1988. Debt-equity ratio and expected common stock returns. Journal of Finance 43(2), 507-528.

Bildersee, J., Cheh, J., Lee, C., 1990. The international price-earnings ration phenomenon: a partial explanation. Japan and the World Economy 2, 263-282

Bildersee, J., Cheh, J., Zutshi, A., 1993. The performance of Japanese common stocks in relation to their net current asset values. Japan and the World Economy. 5, 197-215

Black, F., 1972. Capital market equilibrium with restricted borrowing. Journal of Business 45(3), 444-455.


University of Cape Town

Black, F., 1993. Beta and return. Journal of Portfolio Management 20(1), 8-18

Black, F., Fischer, L., Jensen M., Scholes, M. 1972. The capital asset pricing model: Some empirical tests, in: MC. Jensen, ed., Studies in the theory of capital markets (Praeger, New York) 79-121.

Blume, M., 1980. Stock returns and dividend yields: some more evidence. Review of Economics and Statistics 62, 567-577.

Blume, M., Stambaugh, R., 1983. Biases in computed returns: An application to the size effect. Journal of Financial Economics, 14, 387-404

Branch, B. 1977. A tax loss trading rule. Journal of Business, University of Chicago Press, 50(2), 198-207

Bremer, M., Hiraki, T.,1999. Volume and individual security returns on the Tokyo Stock Exchange. Pacific-Basin Finance Journal 7, 351–370

Brown, P., Kleidon, A., Marsh, T., 1983. New evidence on the nature of size-related anomalies in stock prices. Journal of Financial Economics, 12 (1983) 33-56.

Cai, J., 1997. Glamour and value strategies on the Tokyo Stock Exchange. Journal of Business Finance and Accounting, 24, 1291– 1310

Cattell, R., Jaspers, J., 1967. A general plasmode (No. 30-10-5-2) for factor analytic exercises and research. Multivariate Behavioural Research Monographs 67(3).

Chan, K., Hamao, Y., Lakonishok, J., 1991. Fundamentals and stock returns in Japan. Journal of Finance, 46, 1739-1789

Chan, K.C., Chen, N., 1991. Structural and return characteristics of small and large firms. Journal of Finance, 451– 471

Chang, R.P., McLeavey, D.W., Rhee, S.G., 1995. Short-term abnormal returns of the contrarian strategy in the Japanese stock market. Journal of Business Finance and Accounting 22, 1035–1048.

Chen, N., Roll, R., Ross, S.A., 1986. Economic forces and the stock market. Journal of Business, 69, 383– 403.

Chen, N., Zhang, F., 1998. Risk and return of value stocks. Journal of Business, 71, 501– 535

Cheng, A., 1995. The UK stock market and economic factors: a new approach. Journal of Business Finance & Accounting 22(1), 129-142.

Choi, F., Hino, H., Min, S., Nam, S., Ujie, J., Stonehill, A.I., 1983. Analyzing foreign financial statements: The use and misuse of international ratio analysis. Journal of International Business Studies, 14 (1), 113-131

University of Cape Town

Choi, J., 1995. The Japanese and US stock prices: A comparative fundamental analysis. Japan and the World Economy, 7, 347-360

Chung, H., Lee, B., 1998. Fundamental and non-fundamental components in stock prices of Pacific-Rim countries. Pacific-Basin Finance Journal 6, 321–346

Cook, T., Rozeff, M., 1984. Size and earnings/price ratio anomalies: one effect or two? Journal of Financial and Quantitative Analysis 19(4), 449-466.

Daniel, K., Titman, S., 1997. Evidence on the characteristics of cross sectional variation in stock returns. Journal of Finance 52(1), 1-33.

Daniel, K., Titman, S., Wei, K.C.J., 2001. Explaining the cross-section of stock returns in Japan: Factors or characteristics? Journal of Finance 55, 743–766.

Davis, J., 1994. The cross section of realised stock returns: the pre-COMPUSTAT evidence. Journal of Finance, 49(5), 1579-1593.

Deakin, E., 1976. Distributions of financial accounting ratios: some empirical evidence. Accounting Review 51(1), 90-96.

De Bondt, W., Thaler, R., 1985. Does the stock market overreact?, Journal of Finance 40, 793-805.

Dimson, E. 1979. Risk measurement when shares are subject to infrequent trading. Journal of Financial Economics 7, 197-226.

Dimson, E., Marsh, P., 1983. The stability of UK risk measures and the problem of thin trading, Journal Of Finance, 38(3), 753-784.

Dimson E., Marsh P. 2001. UK financial markets returns, 1955 –2000. The Journal of Business, 74 (1), 1-31.

Elton, E., Gruber, M., 1988. A multi-index risk model of the Japanese stock market. Japan and the World Economy 1, 21-44.

Elton, E., Gruber, M., 1989. Exceptional data and Japanese stock prices. Japan and the World Economy 1, 391-401

Fama, E., 1965. The behaviour of stock market prices. Journal of Business 38(1), 34-104.

Fama, E., 1970. Efficient capital markets. Journal of Finance 25(2), 383-417.

Fama, E., 1991. Efficient capital markets II. The Journal of Finance. 46(5), 1575-1616

Fama, E., Fisher, L., Jensen, M., Roll, R., 1969. The reaction of stock prices to new information. International Economic Review, 10(1), 1-21.

University of Cape Town

Fama, E., and French, K. 1992. The cross-section of expected stock returns. Journal of Finance 47(2):427–465.

Fama, E., French, K., 1988a. Permanent and temporary components of stock prices. Journal of Political Economy96, 246–273.

Fama, E.F., French, K., 1988b. Dividend yields and expected stock returns. Journal of Financial Economics, 22, 3– 23.

Fama, E.F., French, K., 1993. Common risk factors in the returns on stocks and bonds. Journal of Financial Economics 33, 3 – 53.

Fama, E., French, K., 1996a. The CAPM is wanted, dead or alive. Journal of Finance 51(5), 1947-1958.

Fama, E., French, K., 1996b. Multifactor explanations of asset pricing anomalies. Journal of Finance 51(1), 55-84.

Fama, E.F., French, K., 1998. Value versus growth: The international evidence. Journal of Finance 53, 1975–1999.

Fama, E., and MacBeth, J., 1973. Risk, return, and equilibrium: Empirical tests. Journal of Political Economy 81(3):607–636.

Fama, E., Poterba, J., 1991. Were Japanese stock prices too high? Journal of Financial Economics 29, 337-363.

Fama, E., Fisher, L., Jensen, M., Roll, R. 1969. The adjustment of stock prices to new information. International Economic Review, 10, 1-21.

Fisher, L., 1966. Some new stock market indexes. Journal of Business 39(2/2), 191-225.

Frecka, T., Hopwood, W., 1983. The effects of outliers on the cross-sectional distributional properties of financial ratios. Accounting Review 58(1), 115-128.

French, K., Roll, R., 1986. Stock return variances: The arrival of information and the reaction of traders, Journal of Financial Economics 17, 5-26.

Grinold, R., 1989. The fundamental law of active management. Journal of Portfolio Management 15(3), 30–37.

Grinold, R., Kahn, R., 1995. Active Portfolio Management: Quantitative Theory and Applications. McGraw-Hill: New York, 221-224.

Grossman, S., Stiglitz, J., 1980. On the impossibility of informationally efficient markets. American Economic Review 70(3), 393-408.

University of Cape Town

Hall, C., Hamao, Y., Harris, T.S., 1994. A comparison of relations between security market prices, returns and accounting measures in Japan and the United States. Journal of International Financial Management and Accounting, 5, 47-73.

Hamao, Y., 1988. An empirical examination of the arbitrage pricing theory using Japanese data. Japan and the World Economy 1, 45-61

Haugen, R.A., Baker, N.L., 1996. Commonalities in the determinants of expected stock returns. Journal of Financial Economics 41, 401–439.

Haugen, R., Lakonishok, J. 1988, The incredible January Effect: The stock market's unsolved mystery, Dow-Jones-Irwin, Homewood, IL.

Hawawini, G., 1991. Stock market anomalies and the pricing of equity on the Tokyo stock exchange. In Japanese Financial Market Research (W. T. Ziemba, W. Bailey and Y. Hamao, eds.) Amsterdam: Elsevier, 231–250.

Hawawini, G., Keim, D., 2000. The cross-section of common stock returns: a review of the evidence and some new findings. In: Ziemba, W., Keim, D. (eds), Security Market Imperfections in World Wide Equity Markets, 3-43. Cambridge University Press: Cambridge.

Hodoshima, J., Garza–Gómez, X., Kunimura, M., 2000. Cross-Sectional Regression Analysis of Return and Beta in Japan. Journal of Economics and Business 52, 515–533

Ibbotson, R., 1975. The performance of common stock new issues. Journal of Financial Economics 2, 235-272.

Jaffe, J.F. 1974. Special information and insider trading. The Journal of Business 47(3).

Jaffe, J., Keim, D., Westerfield, R., 1989. Earnings yield, market values, and stock returns. Journal of Finance, 44, 135-148

Janari, E., 2005. The behaviour of style anomalies on the Australian Stock Exchange: A univariate and multivariate analysis. Unpublished Masters Thesis, University of Cape Town.

Jegadeesh, N., 1990. Evidence of predictable behaviour of security returns. Journal of Finance, 45(3), 881-898

Jegadeesh, N., 1992. Does market risk really explain the size effect. Journal of Financial and Quantitative Analysis, 27(3), 337-351

Jegadeesh, N., Titman, S., 1993. Returns to buying winners and selling losers: Implications for stock market efficiency. Journal of Finance 48, 65–91.

Jensen, M., 1978. Some anomalous evidence regarding market efficiency. Journal of Financial Economics, 6, 95-102

University of Cape Town

Jensen M. and Ruback R., 1983. The market for corporate control: The scientific evidence. Journal of Financial Economics, 11, 5-50.

Kato, K., 1990. Being a winner in the Tokyo Stock Market: The case for an anomaly fund. Journal of Portfolio Management, 16, 52-56.

Kato, K. and J.S. Schallheim, 1985, Seasonal and size anomalies in the Japanese stock market, Journal of Financial and Quantitative Analysis 20, no. 2, 243-272.

Keim, D., 1983. Size-related anomalies and stock return seasonality: Further empirical evidence. Journal of Financial Economics 12, 13-32.

Keim, D.B., 1986, The CAPM and equity return regularities, Financial Analysis Journal 42, 19-34.

Kendall, K., 1953. The analysis of economic time series, Part 1: Prices. Journal of the Royal Statistical Society 96, 11- 25

Kothari, S., Shanken, J., Sloan, R., 1995. Another look at the cross-section of expected stock returns. Journal of Finance 50(1), 185-223.

Lakonishok, J., Lee, L. 2001. Are insider trades informative? The Review of Financial Studies, 14(1), 79-111.

Lakonishok, J., Schleifer, A., Vishny, R.W., 1994. Contrarian investment, extrapolation and risk. Journal of Finance 49, 1541–1578.

Lakonishok, J., Shapiro, A, 1984. Stock returns, beta, variance and size: An empirical analysis. Financial Analysts Journal, July-August, 36-41

Lakonishok, J., Smidt, S., 1988. Are seasonal anomalies real? A ninety-year perspective. Review of Financial Studies 1, 403-425.

Lau, S., Quay, S., Ramsey, C., 1974. The Tokyo Stock Exchange and the capital asset pricing model. The Journal of Finance, 29, 507-514

Lintner, J., 1965. Security prices, risk and maximal gains from diversification. Journal of Finance 20(4), 587-615.

Ljung, G., Box, G., 1978. On a measure of lack of fit in time series models. Biometrika 65(2), 297-303.

Lo, A., MacKinlay, A.C., 1988. Stock market prices do not follow random walks: Evidence from a simple specification test. The Review of Financial Studies, 1(1), 41-66

Lo, A., MacKinlay, A.C., 1990. Data-snooping biases in tests of financial asset pricing models. Review of Financial Studies 3, 431–468.

University of Cape Town

Loughran, T., 1997. Book-to-market across firm size, exchange, and seasonality: Is there an effect? The Journal of Financial and Quantitative Analysis, 32(3), 249-268

MacKinlay, A.C., 1995. Multifactor models do not explain deviations from the CAPM. Journal of Financial Economics 38, 3-28

Markowitz, H., 1952. Portfolio selection. Journal of Finance 7(1), 77-91.

Merton, R., 1987. A simple model of capital market equilibrium with incomplete information. Journal of Finance 42(3), 483-510.

Michaud R., 1999. Investment styles, market anomalies, and global stock selection. The Research Foundation of the Institute of Chartered Financial Analysts, USA.

Mossin, J., 1966. Equilibrium in a capital asset market. Econometrica 34(4), 768-783.

Ou, J.A., Penman, S.H., 1989. Financial statement analysis and the prediction of stock returns. Journal of Accounting and Economics, 11, 295-329

Pearson, K. 1896. Mathematical contributions to the theory of evolution III: regression, heredity and panmixia. Philosophical Transactions of the Royal Society of London 187, 253-318

Poterba, J., Summers, L., 1988. Mean reversion in stock prices: Evidence and implications. Journal of Financial Economy 22, 27–59.

Reinganum, M., 1981a. Abnormal returns in small firm portfolios. Financial Analysts Journal 37(2), 52-56.

Reinganum, M., 1981. Misspecification of capital asset pricing: Empirical anomalies based on earnings' yields and market values, Journal of Financial Economics, March, 19-46.

Reinganum, M., 1983. The anomalous stock market behaviour of small firms in January: empirical tests for tax-loss selling effects. Journal of Financial Economics 12, 89-104.

Reinganum, M., Smith, J., 1983. Investor preference for large firms: new evidence on economies of size. Journal of Industrial Economics 32(2), 213-227.

Reinganum, M., Kiholm Smith, J., 1983. Investor preference for large firms: New evidence on economies of size. Journal of Industrial Economics, 32(2), 213-227.

Ritter, J. 1988. The buying and selling behaviour of individual investors at the turn of the year, Journal of Finance, 43, 701-717.

Ritter, J., Chopra, N. 1989. Portfolio rebalancing and the turn of the year effect, Journal of Finance, 44, 149-166.

University of Cape Town

Roberts, H., 1957. Stock market patterns and financial analysis: Methodological suggestions. Journal of Finance, 14, 1-10

Robertson, M., 2002. Firm-specific attributes and the cross-section of JSE securities exchange returns. Unpublished PhD Thesis, University of Cape Town, Cape Town.

Roll, R., 1977. A critique of the asset pricing theory's tests. Journal of Financial Economics 4, 129-176.

Roll, R., 1981, A possible explanation of the small firm effect, Journal of Finance 36, 879-888.

Roll, R. 1994. What every CFO should know about scientific progress in financial economics: What is known and what remains to be resolved. Financial Management, 23, 67-75

Roll, R. and Ross S., 1980. An empirical investigation of the arbitrage pricing theory. Journal of Finance 35, 1073-1103.

Roll, R., Ross, S., 1994. On the cross-sectional relation between expected returns and betas. Journal of Finance 49, 101-121.

Ross, S., 1976. The arbitrage theory of capital asset pricing. Journal of Economic Theory 13(2), 341-360.

Rozeff, M., Kinney Jr, W., 1976. Capital market seasonality: the case of common stock returns. Journal of Financial Economics 3, 379-402.

Sameulson, P. 1965. Proof that properly anticipated prices fluctuate randomly. Industrial Management Review, 4, 41-50.

Schleifer, A., Summers L. 1990. The noise trader approach to finance. Journal of Economic Perspectives, 4, 19-33.

Schwert, G., 1977. Stock exchange seats as capital assets. Journal of Financial Economics 4, 51-78.

Schwert, G., 1983. Size and stock returns, and other empirical regularities. Journal of Financial Economics 12, 3-12

Scholes, M., Williams, J., 1977. Estimating betas from non-synchronous data. Journal of Financial Economics, 5, 309-327.

Sharpe, W., 1964. Capital asset prices: a theory of market equilibrium under conditions of risk. Journal of Finance 19(3), 425-442.

Seyhun, H., 1986. Insiders' profits, costs of trading, and market efficiency. The Journal of Financial Economics, 16, 189-212.

University of Cape Town

Seyhun, H. 1993. Can omitted risk factors explain the January effect: A stochastic dominance approach. Journal of Financial and Quantitative Analysis, 28(2), 195-212.

So, J., 1987. Some empirical evidence on the outliers and the non-normal distribution of financial ratios. Journal of Business Finance and Accounting, 14(4), 483-496.

Statsoft, Inc. 1984-2003. Cluster Analysis.
(http://www.statsoftinc.com/textbook/stcluan.html)

Statsoft, Inc. 1984-2003. Principal Components and Factor Analysis.
(http://www.statsoftinc.com/textbook/stfacan.html)

Stoll H., Whaley R., 1983. Transaction costs and the small firm effect. Journal of Financial Economics 12 , 57-79.

Stone, D., Ziemba, W., 1993. Land and stock prices in Japan. Journal of Economic Perspectives, 7(3), 149-165

Student, 1908. The probable error of a mean. Biometrika 6(1), 1-25

Treynor, J.L. 1981. What does it take to win the trading game. Financial Analysts Journal, January–February, 55–60.

van Rensburg, P, Slaney, K. 1997. Market segmentation on The Johannesburg Stock Exchange. Journal of Studies in Economics and Econometrics, 21(3), 1-23.

van Rensburg, P., Robertson, M., 2003. Style characteristics and the cross-section of JSE returns Investment Analysts Journal, 57, 7-16

Wachtel, S., 1942. Certain observations on seasonal movements in stock prices. Journal of Business 15, 184-193.

Wang, K. 2003. Style rotation, momentum and multifactor analysis. Discussion Paper, presented to Northern Finance Association (NFA) 2003 Conference.

Xu, M., Zhang, C., 2004. The explanatory power of R&D for the cross-section of stock returns: Japan 1985–2000. Pacific-Basin Finance Journal 12, 245– 269

Ziemba, W., 1991. Japanese security market regularities: Monthly, turn-of-the-month and year, holiday and golden week effects. Japan and the World Economy 3, 119-146

Ziemba, W., Hensel, C., 1994. Worldwide security market anomalies. Philosophical Transactions: Physical Science and Engineering, 347(1684), 495-509

University of Cape Town

# List of Appendices

**Appendix A** ..... **1**

*Appendix A.1.: Index Organisation on the Tokyo Stock Exchange (TSE)* ..... *1*

*Appendix A.2.: Datastream International Definitions* ..... *2*

*Appendix A.3.: Attribute availability for the first month in each sample year* ..... *11*

*Appendix A.4.: Average monthly attribute availability for each sample* ..... *15*

*Appendix A.5.: Pearson correlation matrix for firm-specific variables* ..... *17*

**Appendix B** ..... **1**

*Appendix B.1.: Datastream International industry classification levels* ..... *1*

*Appendix B.2.: FTSE Actuaries classification structure* ..... *2*

*Appendix B.3.: TSE level six sector and sub sector indices excluded from the analysis* ..... *4*

*Appendix B.4.: Tree diagram for TSE sector and sub-sector indices* ..... *5*

*Appendix B.5.: Cluster constituents: Three clusters* ..... *6*

*Appendix B.6.: Cluster constituents: Four clusters* ..... *7*

*Appendix B.7.: Cluster constituents: Five clusters* ..... *8*

*Appendix B.8.: Pearson correlation matrix for 108 TSE level six indices* ..... *9*

*Appendix B.9.: Pearson correlation matrix for 29 TSE level six indices* ..... *14*

*Appendix B.10.: TSE share indices' un-rotated loadings for five factors* ..... *15*

*Appendix B.11.: TSE share indices' varimax rotated loadings for five factors* ..... *16*

*Appendix B.12.: Factors identified in principal components analysis* ..... *17*

**Appendix C** ..... **1**

*Appendix C.1.: Univariate cross-sectional regression results* ..... *1*

*Appendix C.2.: Cross-sectional univariate regression results by year* ..... *5*

*Appendix C.3.: Correlation matrix of monthly payoffs to significant firm-specific attributes* ..... *15*

*Appendix C.4.: Univariate cross-sectional regression results for un-adjusted returns* ..... *18*

*Appendix C.5.: Univariate cross-sectional regression results for single-index adjusted returns* ..... *22*

*Appendix C.6.: Univariate cross-sectional regression results for multi-index adjusted returns* ..... *26*

*Appendix C.7.: Correlation matrix of monthly payoffs to significant firm-specific attributes for un-adjusted returns* ..... *30*

*Appendix C.8.: Correlation matrix of monthly payoffs to significant firm-specific attributes for single-index adjusted returns* ..... *33*

*Appendix C.8.: Correlation matrix of monthly payoffs to significant firm-specific attributes for multi-index adjusted returns* ..... *36*

University of Cape Town

*Appendix C.10.1.: Correlation matrix for the performance and value cluster: Un-adjusted returns* ..... 37

*Appendix C.10.2.: Correlation matrix for the change in value cluster: Un-adjusted returns* ..... 37

*Appendix C.10.3.: Correlation matrix for the value; change in performance, liquidity and growth cluster: Un-adjusted returns* ..... 38

*Appendix C.10.4.: Correlation matrix for the size and value cluster: Un-adjusted returns* 38

*Appendix C.10.5.: Correlation matrix for simplified list of significant variables using un-adjusted returns* ..... 39

*Appendix C.11.1.: Correlation matrix for the change in value and performance cluster: Single-index adjusted returns* ..... 40

*Appendix C.11.2.: Correlation matrix for the value; performance and change in growth cluster: Single-index adjusted returns* ..... 40

*Appendix C.11.3.: Correlation matrix for the size cluster: single-index adjusted returns* .. 41

*Appendix C.11.4.: Correlation matrix for the momentum; value; change in size, growth, liquidity and value cluster: Single-index adjusted returns* ..... 41

*Appendix C.11.5.: Correlation matrix for simplified list of significant variables using single-index adjusted returns returns* ..... 42

*Appendix C.12.1.: Correlation matrix for the performance; value; change in liquidity and performance cluster: Multi-index adjusted returns* ..... 43

*Appendix C.12.2.: Correlation matrix for the value; liquidity; crossover; change in value, performance and growth cluster: Multi-index adjusted returns* ..... 43

*Appendix C.12.3.: Correlation matrix for the size and value cluster: Multi-index adjusted returns* ..... 44

*Appendix C.12.4.: Correlation matrix for simplified list of significant variables using multi-index adjusted returns returns* ..... 44

*Appendix C.13.1.: Cumulative Monthly Payoffs for single-index adjusted returns: Size* .... 45

*Appendix C.13.2.: Cumulative Monthly Payoffs for single-index adjusted returns: Value.* 45

*Appendix C.13.3.: Cumulative Monthly Payoffs for single-index adjusted returns: Momentum* ..... 46

*Appendix C.13.4.: Cumulative Monthly Payoffs for single-index adjusted returns: Change in growth* ..... 46

*Appendix C.13.5.: Cumulative Monthly Payoffs for single-index adjusted returns: Change in liquidity* ..... 47

*Appendix C.13.6.: Cumulative Monthly Payoffs for single-index adjusted returns: Change in value* ..... 47

*Appendix C.13.7.: Cumulative Monthly Payoffs for single-index adjusted returns: Change in size* ..... 48

*Appendix C.13.8.: Cumulative Monthly Payoffs for single-index adjusted returns: Change in performance* ..... 48

*Appendix C.14.1.: Cumulative Monthly Payoffs for multi-index adjusted returns: Size* ..... 49

*Appendix C.14.2.: Cumulative Monthly Payoffs for multi-index adjusted returns: Value* .. 49

University of Cape Town

*Appendix C.14.3.: Cumulative Monthly Payoffs for multi-index adjusted returns: Performance* ..... 50

*Appendix C.14.4.: Cumulative Monthly Payoffs for multi-index adjusted returns: Change in growth* ..... 50

*Appendix C.14.5.: Cumulative Monthly Payoffs for multi-index adjusted returns: Change in momentum/ crossover* ..... 51

*Appendix C.14.6.: Cumulative Monthly Payoffs for multi-index adjusted returns: Change in value* ..... 51

*Appendix C.14.7.: Cumulative Monthly Payoffs for multi-index adjusted returns: Change in liquidity* ..... 52

*Appendix C.14.8.: Cumulative Monthly Payoffs for multi-index adjusted returns: Change in size* ..... 52

*Appendix C.14.9.: Cumulative Monthly Payoffs for multi-index adjusted returns: Change in performance* ..... 53

*Appendix C.15.: Comparison of in- and out-sample results* ..... 54

**Appendix D** ..... **1**

*Appendix D.1.: Ljung-Box P-values for lags one to twelve of monthly payoffs to significant characteristics* ..... 1

*Appendix D.2.: Ljung-Box P-values for lags one to twelve of monthly payoffs to significant characteristics* ..... 2

*Appendix D.3..: Autocorrelations of lags one to twelve of monthly payoffs to out of sample significant characteristics* ..... 3

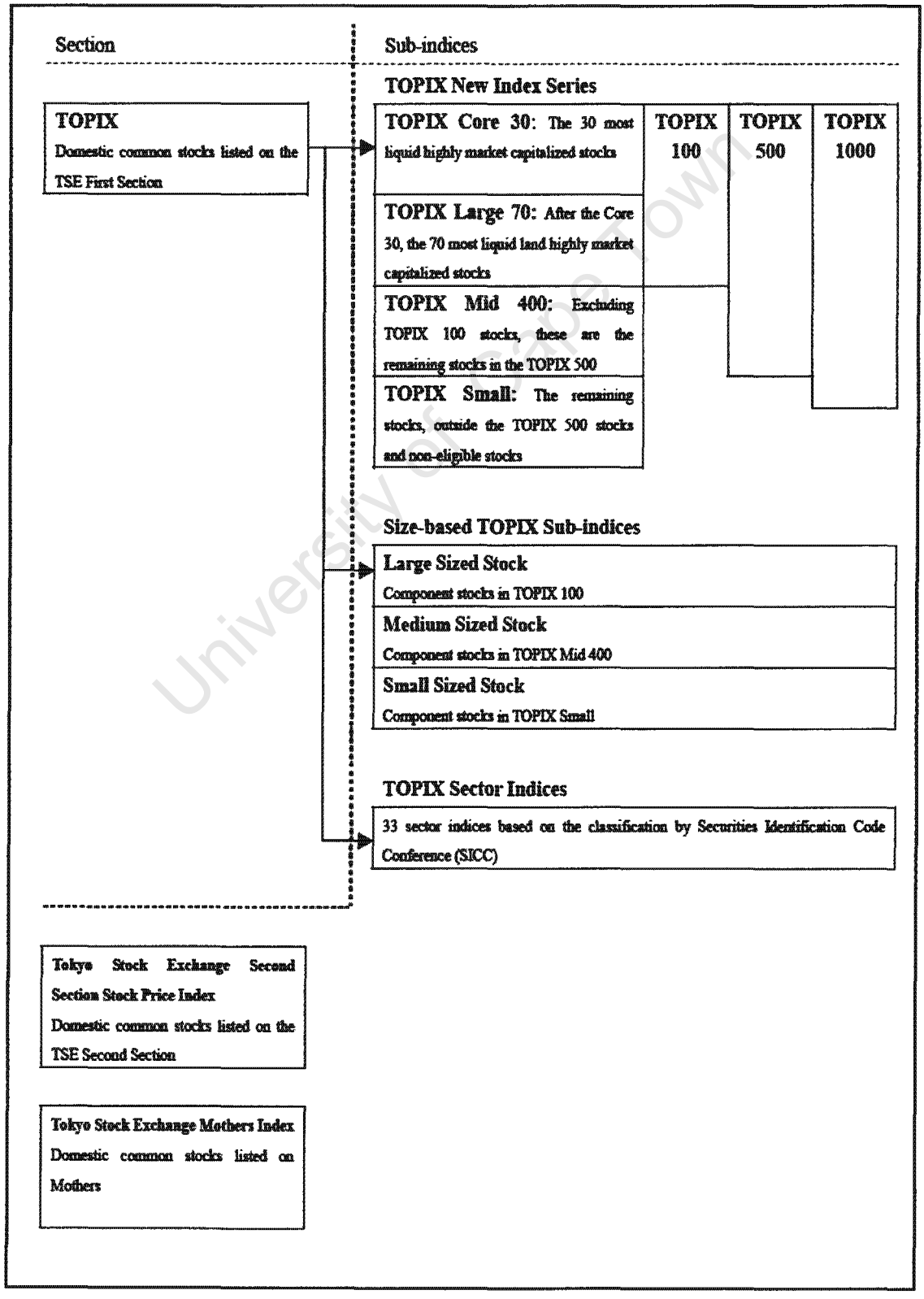
University of Cape Town

# Appendix A

Appendices contained in Appendix A refer to Chapter 4, Data and Descriptive Statistics.

## Appendix A.1.: Index organisation on the Tokyo Stock Exchange (TSE)

The diagram shows the structures of Indices which TSE calculates and publishes. TSE also calculates and publishes total return index as well as price return. The diagram is sourced from the TSE Guidebook, 2005, TSE Inc.




University of Cape Town

**Appendix A.2.: Datastream International definitions**

Below are listed the definition of the Datastream International items used in the analysis. All information is sourced from Datastream International at the University of Cape Town.

**Amortisation of Intangibles** **(975)**

The non-movement of funds as shown in the Cashflow / Sources and Uses Statement and relating to the intangible assets.

**Assets Index** **(AI)**

The assets index is calculated by expressing each latest year-end net tangible asset per share as a percentage of the net tangible asset per share obtained from the first accounts, adjusted for capital factors. For sectors, total net tangible assets is used.

**Assets per Share** **(APSH)**

A company accounts item. This is also referred to as the book value or net tangible assets per share. This is defined as net tangible assets (shareholder's equity minus intangibles) divided by the year-end number of shares. For reduced formats countries and Worldscope sourced emerging markets, intangibles have not been deducted from shareholder's equity. It is calculated from company account items 305 (shareholder's equity) and 344 (intangible assets).

**Book Value per Share** **(1308)**

Calculated on an issue basis, using that portion of share capital and reserves (excluding preference capital) minus intangibles attributable to the issue, divided by the year-end number of shares in that issue. It is adjusted for subsequent rights and scrip issues.

**Borrowing Ratio** **(733)**

Total debt divided by equity capital and reserves minus total intangibles.

**Borrowings Repayable Within 1 Year** **(309)**

Bank overdrafts, loans and other short-term borrowing. The current portion of long-term loans is included.

University of Cape Town

**Capital Gearing** **(731)**

Preference capital plus total debt, divided by total capital employed plus short term borrowings minus total intangibles minus future income tax benefits.

**Capital Ratio** **(772)**

Total share capital and reserves plus minority interests less intangible assets divided by total creditors and equivalent plus borrowings repayable in less than 1 year and provisions for liabilities in less than 1 year. (%)

**Cash Earnings per Share** **(792)**

Earned for ordinary plus deferred tax and operating provisions, divided by the number of shares in issue.

**Cash Flow Margin** **(719)**

Cash earnings as a percentage of sales.

**Change in Cash and Equivalent** **(450)**

This shows the increase or decrease in cash, bank balances, short-term loans, deposits and short-term investments.

**Depreciation** **(136)**

This includes provisions for amounts written off, and depreciation of tangible fixed assets. Amortisation of intangible assets is included only if a separate breakdown is not disclosed in the annual report.

**Discount Par** **(DISP)**

This value represents the percentage discount of the current share price to its net asset value at par. The bigger the negative, the bigger the discount. A positive value implies a premium.

**Dividend Cover** **(DCV)**

The dividend cover is the maximum dividend that a company could pay out of earnings divided by the actual dividend paid.

University of Cape Town

**Dividend Yield** **(DY)**

The dividend per share as a percentage of the share price. The underlying dividend is based on an anticipated annual dividend over the following twelve months and for that reason may be calculated on a rolling twelve-month basis, or as the "indicated" annual amount, or it may be a forecast. The dividend yield is based on gross dividends (including tax credits) where available. Special or once-off dividends are generally excluded.

**Dividends Paid** **(434)**

Ordinary and preference dividends paid during the period, often representing the previous year's final and current year's interim dividends.

**Dividends per Share** **(DPS)**

Dividend per share on a twelve-month rolling basis, taking interim dividends into account.

**Earnings per Share** **(EPS)**

The latest annualised rate that may reflect the last financial year or be derived from an aggregation of interim period earnings. Where the interim announcements are irregular or lacking in detail, the current earnings per share (EPS) may be a forecast provided by local sources.

**Equity Capital and Reserves** **(305)**

The equity share capital and reserves of the company. Preference capital is not included.

Standard adjustments include:

- goodwill shown against reserves is transferred to total intangibles
- capital and other grants shown as deferred liabilities are transferred to reserves
- proposed dividends are deducted if the balance sheet is shown before appropriations
- hybrid capital and other non-equity capital may have been excluded

University of Cape Town

**Gross profit on sales** **(603)**

Total sales less cost of sales.

**Industry Classification** **(INDC)**

Datastream classifies each company by industry (that is, its primary activity only). Equities with the same industrial classification are grouped into sectors. Datastream industrial classifications exist at six levels:

Equities are classified at the most detailed level appropriate. They are classified by main activity according to the sector definitions published by the FTSE Actuaries. At levels 4, 5 and 6, the number of sectors and sub-sectors will vary over time

**Interest Cover Before Tax** **(ICBT)**

Earnings before interest and tax (adjusted operating profit plus total non-operating income) divided by interest paid.

**Market Value** **(MV)**

The share price multiplied by the number of ordinary shares in issue. The amount in issue is updated whenever new tranches of stock are issued or after a capital change. For companies with more than one class of equity capital, the market value is expressed according to the individual issue. Market value is displayed in millions of units of local currency.

**Market Value to Book Value** **(MTBV)**

The market value to book value (also called discount to net asset value) divides the market value by the net book value.

**Net cashflow** **(1048)**

Changes in net cash before the impact of exchange adjustments and reflects cash inflow after financing.

**Net Profit Margin** **(717)**

Profits after tax (adjusted) divided by total sales.

University of Cape Town

**Number of Shares** **(NS)**

The number of shares used in the calculation of earnings per share. The year-end number of shares is used.

**Operating Profit Margin** **(713)**

Operating profit (adjusted for exceptional items) divided by total sales.

**Payout Ratio** **(POUT)**

The ratio of dividends per share to the net earnings per share (adjusted) for the last financial period.

**Price** **(P)**

The latest price available to Datastream International from the appropriate market in primary units of currency. It is the previous day's closing price from the default exchange. The 'current' prices taken at the close of market are stored each day. These stored prices are adjusted for subsequent capital actions, and this adjusted figure then becomes the default price. Prices are generally based on 'last trade' or an official price fixing. For stocks which are listed on more than one exchange within the country, default prices are taken from the primary exchange of that country (note that this is not necessarily the 'home' exchange of the stock).

**Pre-tax profit margin (%)** **(716)**

Pre-tax profit (excluding associates) divided by total sales. (%)

**Pre-tax profits** **(154)**

The pre-tax profit for the financial period as reported by the company. This includes any dividends received from associated companies.

**Price/Cashflow Ratio** **(PC)**

Current price divided by cash earnings per share for the appropriate financial year, adjusted for capital changes.

**Price/Earnings ratio** **(PE)**

This is the price divided by the earnings rate per share at the required date.

University of Cape Town

**Price to Book** **(PTBV)**

This is the price dividend by the book value or net tangible assets per share for the appropriate financial year end, adjusted for capital changes.

**Quick Assets Ratio** **(742)**

Total current assets minus total stock and work in progress, divided by total current liabilities.

**Research and Development** **(119)**

This figure includes regular write-offs to the profit and loss account of research and development capitalised in the balance sheet. Also included are disclosed amounts of expenditure in the year which are not capitalised.

**Return Index** **(RI)**

Theoretical growth in value of a share holding over a specified period, assuming that dividends are re-invested to purchase additional units of an equity at the closing price applicable on the ex-dividend date.

**Return on Capital Employed** **(707)**

Pre-tax profit (excluding associates) adjusted for exceptional items plus total interest charges, divided by total capital employed plus borrowings repayable within one year minus total intangibles.

**Return on shareholders equity (%)** **(701)**

Adjusted Earned for Ordinary divided by Equity capital and reserves less intangibles plus deferred tax. (%)

**Return on Equity (Published)** **(1506)**

Earned for ordinary, divided by equity capital and reserves minus total intangibles.

**Return on capital employed (%)** **(707)**

Earnings before interest and tax divided by total capital employed plus short term borrowings minus total intangibles.

University of Cape Town

**Total Assets** **(392)**

The sum of tangible fixed assets, intangible assets, investments (including associates), other assets, total stocks & work in progress, total debtors & equivalent and cash & cash equivalents.

Common adjustments:

- deferred tax, if shown as an asset, is offset against deferred tax liability
- goodwill carried in reserves is transferred to intangible assets
- advances on work in progress, if disclosed as a liability by the company, has been offset against stocks and work in progress

**Total Cash and Equivalent** **(375)**

For industrials, this includes cash, bank balances, short-term loans and deposits, and investments shown under current assets. For banks and finance companies, it includes cash and balances with other banks, money at call and short notice, treasury bills and term deposits maturing under one month. Placements with banks are excluded.

**Total Current Assets** **(376)**

Includes stocks, work in progress, trade and other debtors, cash and equivalent, and any other current assets. Trade accounts receivable after one year are included.

**Total Current Liabilities** **(389)**

Includes current provisions, trade and other creditors, borrowings repayable within one year, and any other current liabilities. Trade accounts payable after one year are included. Where the balance sheet is stated before profit appropriation, the as reported figure for current liabilities is increased by the amount of proposed dividends outstanding at balance sheet date.

**Total Debt** **(1301)**

The total of all long and short term borrowings, including any subordinate debt and 'debt-like' hybrid finance instruments.

University of Cape Town

**Total Debtors and Equivalent** **(370)**

The total of balances outstanding due to the organisation in the normal course of trading. Accounts receivable after one year are included in this item.

**Total Intangibles** **(344)**

This includes research and development, goodwill, patents, trade marks, deferred charges, formation expenses and concessions. The figure may differ from that reported due to the fact that deferred charges may have been shown as part of 'other assets' and goodwill on acquisition may have been deducted from share capital and reserves.

**Total Loan Capital** **(321)**

The total loan capital repayable after one year. It includes debentures, bonds, convertibles, notes, leasing finance, and 'debt-like' hybrid financial instruments.

**Total Number of Employees** **(219)**

The average number of employees as disclosed by the company. The year end number is used if the average number is not disclosed

**Total Sales** **(104)**

The amount of sales of goods and services to third parties relating to the normal industrial activities of the company. It is net of sales related taxes and excludes any royalty income, rental income, and other operating income.

**Total Stock and Work In Progress** **(364)**

This includes finished goods, raw materials, work in progress less any advances paid, and any other stocks. It is stated net of any provisions for obsolete stocks. The most common adjustment applied to the as disclosed figure is the inclusion of advances on work in progress if shown as a liability.

**Turnover by Volume** **(VO)**

The number of shares traded for a stock for a particular month. The figure is always expressed in thousands. For stocks which are traded on more than one exchange

University of Cape Town

within the country, default volumes are taken from the primary exchange of that country (note that this is not necessarily the 'home' exchange of the stock).

**Working Capital Ratio** **(741)**

Total current assets divided by total current liabilities.

University of Cape Town

## Appendix A.3.: Attribute availability for the first month in each sample year

The number of observations for each firm-specific attribute for the first month of each year included in the analysis. The number of observations are displayed after the sample is adjusted for thin trading and lack of return data. The final sample includes 651 companied and hence each attribute has a maximum of 651 available observations. The in-sample period covers 1 January 1993 to 31 December 2000 and the out of sample period covers 1 January 2001 to 31 December 2004. Attribute definitions and constructions are displayed in Table 4.1. The data are obtained from Datastream International at the University of Cape Town.

| | 1993/01/31 | 1994/01/31 | 1995/01/31 | 1996/01/31 | 1997/01/31 | 1998/01/31 | 1999/01/31 | 2000/01/31 | 2001/01/31 | 2002/01/31 | 2003/01/31 | 2004/01/31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACCREC | 567 | 580 | 591 | 603 | 617 | 626 | 639 | 651 | 650 | 651 | 651 | 651 |
| ACCREC_1YR | 567 | 578 | 590 | 603 | 617 | 626 | 639 | 651 | 650 | 651 | 651 | 651 |
| ACCREC_2YR | 567 | 577 | 588 | 600 | 614 | 626 | 635 | 651 | 649 | 651 | 651 | 651 |
| ACCREC_6M | 567 | 571 | 583 | 596 | 605 | 619 | 629 | 647 | 648 | 651 | 651 | 651 |
| ASSTURN | 564 | 567 | 580 | 591 | 603 | 617 | 626 | 639 | 648 | 650 | 651 | 651 |
| ASSTURN_1YR | 552 | 564 | 567 | 580 | 591 | 603 | 617 | 626 | 636 | 648 | 650 | 651 |
| ASSTURN_2YR | 567 | 580 | 591 | 603 | 617 | 626 | 639 | 651 | 651 | 651 | 651 | 651 |
| ASSTURN_6M | 567 | 578 | 590 | 603 | 617 | 626 | 639 | 651 | 651 | 651 | 651 | 651 |
| BORROW | 567 | 577 | 588 | 600 | 614 | 626 | 635 | 651 | 651 | 651 | 651 | 651 |
| BORROW_1YR | 567 | 571 | 583 | 596 | 605 | 619 | 629 | 647 | 651 | 651 | 651 | 651 |
| BORROW_2YR | 564 | 567 | 580 | 591 | 603 | 617 | 626 | 639 | 651 | 651 | 651 | 651 |
| BORROW_6M | 552 | 564 | 567 | 580 | 591 | 603 | 617 | 626 | 639 | 651 | 651 | 651 |
| BTMV | 567 | 578 | 590 | 603 | 617 | 626 | 639 | 651 | 651 | 651 | 651 | 651 |
| BTMV_1YR | 567 | 577 | 588 | 600 | 614 | 626 | 635 | 651 | 651 | 651 | 651 | 651 |
| BTMV_2YR | 567 | 571 | 583 | 596 | 605 | 619 | 629 | 647 | 651 | 651 | 651 | 651 |
| BTMV_6M | 564 | 567 | 580 | 591 | 603 | 617 | 626 | 639 | 651 | 651 | 651 | 651 |
| BVPS | 552 | 564 | 567 | 580 | 591 | 603 | 617 | 626 | 639 | 651 | 651 | 651 |
| BVPS_1YR | 568 | 581 | 593 | 603 | 614 | 624 | 636 | 650 | 651 | 651 | 651 | 651 |
| BVPS_2YR | 568 | 579 | 592 | 603 | 614 | 624 | 636 | 649 | 651 | 651 | 651 | 651 |
| BVPS_6M | 568 | 577 | 586 | 601 | 611 | 624 | 633 | 648 | 651 | 651 | 651 | 651 |
| CEY | 568 | 572 | 583 | 598 | 604 | 617 | 627 | 644 | 651 | 651 | 651 | 651 |
| CEY_1YR | 566 | 568 | 581 | 593 | 602 | 614 | 624 | 636 | 651 | 651 | 651 | 651 |
| CEY_2YR | 539 | 566 | 568 | 581 | 592 | 603 | 614 | 624 | 638 | 651 | 651 | 651 |
| CEY_6M | 533 | 537 | 553 | 566 | 577 | 590 | 615 | 631 | 634 | 636 | 640 | 644 |
| CFMTP | 533 | 537 | 553 | 565 | 577 | 590 | 613 | 627 | 634 | 636 | 640 | 644 |
| CFMTP_1YR | 533 | 536 | 550 | 565 | 577 | 590 | 611 | 626 | 634 | 636 | 640 | 644 |
| CFMTP_2YR | 533 | 536 | 550 | 565 | 576 | 590 | 611 | 625 | 634 | 635 | 639 | 644 |
| CFMTP_6M | 524 | 533 | 537 | 552 | 565 | 577 | 590 | 615 | 628 | 634 | 636 | 640 |
| CHEPS_P_1YR | 0 | 524 | 533 | 536 | 552 | 566 | 577 | 590 | 613 | 628 | 634 | 636 |
| CHEPS_P_2YR | 558 | 572 | 586 | 598 | 611 | 622 | 636 | 650 | 650 | 651 | 651 | 651 |
| CHEPS_P_6M | 558 | 570 | 585 | 598 | 611 | 622 | 636 | 649 | 650 | 651 | 651 | 651 |
| CHSALELSCHAR | 558 | 568 | 579 | 595 | 608 | 622 | 632 | 648 | 649 | 651 | 651 | 651 |
| CHSALELSCHINV | 558 | 562 | 575 | 591 | 599 | 615 | 626 | 644 | 648 | 651 | 651 | 651 |
| CPS | 555 | 558 | 572 | 586 | 597 | 611 | 622 | 636 | 648 | 650 | 651 | 651 |
| CPS_1YR | 526 | 555 | 558 | 572 | 585 | 598 | 611 | 622 | 635 | 648 | 650 | 651 |
| CPS_2YR | 558 | 572 | 586 | 598 | 611 | 622 | 636 | 650 | 650 | 651 | 651 | 651 |
| CPS_6M | 558 | 570 | 585 | 598 | 611 | 622 | 636 | 649 | 650 | 651 | 651 | 651 |
| CROSSOVER1_18 | 558 | 568 | 579 | 595 | 608 | 622 | 632 | 648 | 649 | 651 | 651 | 651 |
| CROSSOVER1_3 | 558 | 562 | 575 | 591 | 599 | 615 | 626 | 644 | 648 | 651 | 651 | 651 |
| CROSSOVER3_1 | 555 | 558 | 572 | 586 | 597 | 611 | 622 | 636 | 648 | 650 | 651 | 651 |
| CROSSOVER3_12 | 526 | 555 | 558 | 572 | 585 | 598 | 611 | 622 | 635 | 648 | 650 | 651 |
| CROSSOVER3_18 | 567 | 579 | 591 | 603 | 606 | 623 | 633 | 646 | 651 | 651 | 651 | 651 |
| CROSSOVER6_12 | 553 | 511 | 510 | 533 | 561 | 585 | 568 | 507 | 542 | 534 | 463 | 510 |
| CROSSOVER6_18 | 549 | 522 | 492 | 516 | 537 | 564 | 581 | 495 | 505 | 496 | 510 | 444 |
| DEPAMORT_TA | 540 | 549 | 522 | 492 | 516 | 537 | 564 | 581 | 495 | 505 | 496 | 510 |
| DEPAMORT_TA_1YR | 566 | 578 | 590 | 601 | 616 | 625 | 636 | 649 | 651 | 651 | 651 | 651 |
| DEPAMORT_TA_2YR | 554 | 541 | 536 | 540 | 549 | 571 | 582 | 576 | 583 | 588 | 562 | 573 |
| DEPAMORT_TA_6M | 550 | 552 | 544 | 536 | 546 | 551 | 580 | 582 | 576 | 584 | 587 | 560 |
| DIV | 544 | 550 | 552 | 544 | 536 | 546 | 551 | 580 | 582 | 576 | 584 | 587 |
| DIV_1YR | 542 | 557 | 571 | 582 | 594 | 613 | 626 | 638 | 638 | 640 | 645 | 649 |
| DIV_2YR | 541 | 545 | 560 | 574 | 583 | 595 | 616 | 634 | 638 | 637 | 641 | 646 |
| DIV_6M | 538 | 542 | 557 | 571 | 582 | 594 | 613 | 626 | 638 | 637 | 640 | 645 |
| DPS | 529 | 538 | 542 | 557 | 571 | 582 | 594 | 613 | 626 | 637 | 638 | 640 |
| DPS_1YR | 542 | 557 | 571 | 582 | 594 | 613 | 626 | 638 | 638 | 640 | 645 | 649 |
| DPS_2YR | 541 | 545 | 560 | 574 | 583 | 595 | 616 | 634 | 638 | 637 | 641 | 646 |
| DPS_6M | 538 | 542 | 557 | 571 | 582 | 594 | 613 | 626 | 638 | 637 | 640 | 645 |

UNIVERSITY OF CAPE TOWN

**Appendix A.3.: Attribute availability for the first month in each sample year**
-continued

| | 1993/01/31 | 1994/01/31 | 1995/01/31 | 1996/01/31 | 1997/01/31 | 1998/01/31 | 1999/01/31 | 2000/01/31 | 2001/01/31 | 2002/01/31 | 2003/01/31 | 2004/01/31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DY | 529 | 538 | 542 | 557 | 571 | 582 | 594 | 613 | 626 | 637 | 638 | 640 |
| DY_1YR | 567 | 579 | 591 | 603 | 606 | 623 | 633 | 646 | 651 | 651 | 651 | 651 |
| DY_2YR | 553 | 511 | 510 | 533 | 561 | 585 | 568 | 507 | 542 | 534 | 463 | 510 |
| DY_6M | 549 | 522 | 492 | 516 | 537 | 564 | 581 | 495 | 505 | 496 | 510 | 444 |
| EPS | 540 | 549 | 522 | 492 | 516 | 537 | 564 | 581 | 495 | 505 | 496 | 510 |
| EPS_1YR | 568 | 580 | 595 | 604 | 609 | 634 | 637 | 638 | 638 | 639 | 642 | 649 |
| EPS_2YR | 557 | 568 | 581 | 596 | 604 | 609 | 634 | 638 | 638 | 638 | 640 | 646 |
| EPS_2YRAV | 556 | 568 | 580 | 595 | 604 | 609 | 634 | 636 | 638 | 638 | 639 | 642 |
| EPS_6M | 548 | 556 | 568 | 580 | 595 | 604 | 609 | 634 | 636 | 638 | 638 | 639 |
| EQCAPRES | 546 | 558 | 572 | 585 | 598 | 603 | 607 | 634 | 633 | 632 | 636 | 635 |
| EQCAPRES_1YR | 544 | 557 | 570 | 583 | 598 | 603 | 605 | 629 | 633 | 632 | 636 | 635 |
| EQCAPRES_2YR | 522 | 545 | 557 | 572 | 583 | 596 | 603 | 604 | 631 | 630 | 630 | 631 |
| EQCAPRES_6M | 482 | 521 | 545 | 557 | 571 | 582 | 596 | 601 | 603 | 631 | 631 | 628 |
| EY | 547 | 559 | 569 | 584 | 595 | 604 | 636 | 638 | 638 | 638 | 641 | 645 |
| EY_1YR | 534 | 542 | 552 | 564 | 575 | 580 | 606 | 606 | 611 | 604 | 605 | 606 |
| EY_2YR | 528 | 534 | 543 | 553 | 566 | 575 | 582 | 610 | 606 | 611 | 604 | 606 |
| EY_6M | 507 | 528 | 534 | 543 | 553 | 566 | 575 | 582 | 610 | 606 | 611 | 604 |
| GEAR | 534 | 542 | 552 | 564 | 575 | 580 | 606 | 608 | 611 | 604 | 604 | 606 |
| GEAR_1YR | 528 | 534 | 543 | 553 | 566 | 575 | 582 | 610 | 606 | 611 | 603 | 605 |
| GEAR_2YR | 507 | 528 | 534 | 543 | 553 | 566 | 575 | 582 | 610 | 606 | 610 | 604 |
| GEAR_6M | 512 | 517 | 526 | 540 | 549 | 557 | 588 | 590 | 589 | 588 | 590 | 592 |
| GROWTH | 512 | 516 | 525 | 539 | 549 | 555 | 584 | 590 | 589 | 588 | 589 | 592 |
| GROWTH_1YR | 505 | 511 | 517 | 526 | 540 | 549 | 557 | 588 | 588 | 588 | 588 | 590 |
| GROWTH_2YR | 485 | 504 | 511 | 517 | 526 | 540 | 549 | 557 | 587 | 588 | 588 | 588 |
| GROWTH_6M | 512 | 517 | 526 | 540 | 549 | 557 | 588 | 590 | 588 | 588 | 589 | 592 |
| ICBT | 512 | 516 | 525 | 539 | 549 | 555 | 584 | 590 | 588 | 588 | 589 | 592 |
| ICBT_1YR | 505 | 511 | 517 | 526 | 540 | 549 | 557 | 588 | 588 | 588 | 588 | 589 |
| ICBT_2YR | 485 | 504 | 511 | 517 | 526 | 540 | 549 | 557 | 587 | 588 | 588 | 588 |
| ICBT_6M | 539 | 550 | 564 | 577 | 591 | 597 | 623 | 636 | 638 | 638 | 641 | 645 |
| INTAN_MV | 539 | 542 | 557 | 571 | 580 | 592 | 612 | 632 | 637 | 637 | 640 | 645 |
| INTAN_MV_1YR | 533 | 539 | 550 | 564 | 577 | 591 | 597 | 623 | 636 | 638 | 637 | 641 |
| INTAN_MV_2YR | 515 | 533 | 539 | 550 | 564 | 577 | 591 | 597 | 623 | 636 | 638 | 637 |
| INTAN_MV_6M | 541 | 552 | 565 | 578 | 592 | 598 | 625 | 637 | 638 | 638 | 640 | 645 |
| INV | 540 | 543 | 558 | 571 | 581 | 593 | 613 | 633 | 637 | 638 | 639 | 645 |
| INV_1YR | 534 | 541 | 551 | 565 | 577 | 592 | 598 | 625 | 637 | 637 | 637 | 640 |
| INV_2YR | 517 | 534 | 541 | 551 | 565 | 577 | 592 | 598 | 625 | 637 | 636 | 638 |
| INV_6M | 541 | 552 | 565 | 579 | 593 | 599 | 625 | 637 | 638 | 638 | 640 | 645 |
| LNMV | 541 | 544 | 557 | 571 | 581 | 594 | 613 | 633 | 638 | 638 | 639 | 645 |
| LNMV_1M | 535 | 541 | 551 | 565 | 577 | 592 | 599 | 625 | 637 | 638 | 637 | 640 |
| LNMV_1YR | 517 | 535 | 541 | 551 | 565 | 577 | 592 | 599 | 625 | 637 | 637 | 638 |
| LNMV_2YR | 283 | 295 | 313 | 293 | 481 | 493 | 505 | 508 | 632 | 638 | 640 | 645 |
| LNMV_3M | 283 | 286 | 307 | 288 | 456 | 489 | 499 | 503 | 620 | 638 | 639 | 645 |
| LNMV_6M | 266 | 272 | 291 | 275 | 286 | 474 | 482 | 489 | 506 | 632 | 637 | 640 |
| MOM_12M | 540 | 543 | 557 | 571 | 582 | 594 | 615 | 629 | 638 | 638 | 639 | 645 |
| MOM_18M | 532 | 540 | 543 | 558 | 572 | 583 | 594 | 618 | 633 | 638 | 637 | 640 |
| MOM_1M | 512 | 532 | 540 | 543 | 558 | 572 | 583 | 594 | 618 | 633 | 637 | 638 |
| MOM_3M | 546 | 558 | 572 | 585 | 598 | 603 | 607 | 634 | 633 | 632 | 636 | 635 |
| MOM_6M | 544 | 557 | 570 | 583 | 598 | 603 | 606 | 629 | 633 | 632 | 636 | 635 |
| MTBV | 522 | 545 | 557 | 572 | 583 | 596 | 603 | 605 | 631 | 630 | 630 | 631 |
| MTBV_1YR | 482 | 521 | 545 | 557 | 571 | 582 | 596 | 601 | 604 | 631 | 631 | 628 |
| MTBV_2YR | 283 | 289 | 310 | 292 | 476 | 491 | 502 | 505 | 632 | 638 | 640 | 645 |
| MTBV_6M | 283 | 286 | 307 | 289 | 456 | 490 | 500 | 500 | 620 | 638 | 639 | 645 |

University of Cape Town

## Appendix A.3.: Attribute availability for the first month in each sample year
-continued

| | 1993/01/31 | 1994/01/31 | 1995/01/31 | 1996/01/31 | 1997/01/31 | 1998/01/31 | 1999/01/31 | 2000/01/31 | 2001/01/31 | 2002/01/31 | 2003/01/31 | 2004/01/31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MVT | 264 | 272 | 285 | 272 | 285 | 469 | 480 | 486 | 503 | 632 | 637 | 640 |
| MVT_1M | 231 | 256 | 269 | 251 | 284 | 281 | 460 | 465 | 500 | 505 | 631 | 638 |
| MVT_1YR | 494 | 509 | 526 | 539 | 552 | 560 | 587 | 601 | 605 | 608 | 609 | 617 |
| MVT_2YR | 490 | 497 | 515 | 530 | 539 | 552 | 571 | 593 | 603 | 606 | 609 | 615 |
| MVT_3M | 392 | 491 | 504 | 522 | 536 | 549 | 557 | 583 | 597 | 602 | 603 | 608 |
| MVT_6M | 200 | 392 | 491 | 504 | 522 | 536 | 549 | 557 | 583 | 597 | 599 | 603 |
| MVT_MV | 504 | 506 | 517 | 527 | 537 | 546 | 570 | 583 | 587 | 587 | 589 | 591 |
| MVT_MV_1M | 504 | 506 | 516 | 526 | 536 | 546 | 567 | 580 | 587 | 587 | 588 | 591 |
| MVT_MV_1YR | 496 | 504 | 505 | 516 | 527 | 537 | 546 | 570 | 582 | 587 | 587 | 589 |
| MVT_MV_2YR | 476 | 496 | 503 | 504 | 517 | 527 | 537 | 546 | 569 | 582 | 587 | 587 |
| MVT_MV_3M | 566 | 578 | 590 | 601 | 616 | 625 | 636 | 649 | 651 | 651 | 651 | 651 |
| MVT_MV_6M | 554 | 541 | 536 | 540 | 549 | 571 | 582 | 576 | 583 | 588 | 562 | 573 |
| NAVPS | 550 | 552 | 544 | 537 | 546 | 551 | 580 | 582 | 576 | 584 | 587 | 560 |
| NAVPS_1YR | 544 | 550 | 552 | 544 | 537 | 546 | 551 | 580 | 582 | 576 | 584 | 587 |
| NAVPS_2YR | 539 | 547 | 558 | 570 | 584 | 596 | 604 | 636 | 635 | 636 | 635 | 639 |
| NAVPS_6M | 536 | 546 | 557 | 569 | 583 | 596 | 601 | 630 | 635 | 636 | 635 | 639 |
| NCA_MV | 519 | 538 | 547 | 558 | 570 | 584 | 0 | 602 | 633 | 635 | 635 | 634 |
| NCA_MV_1YR | 481 | 519 | 538 | 547 | 558 | 570 | 0 | 595 | 600 | 633 | 634 | 635 |
| NCA_MV_2YR | 519 | 530 | 541 | 554 | 562 | 571 | 0 | 604 | 602 | 603 | 603 | 608 |
| NCA_MV_6M | 517 | 526 | 538 | 551 | 560 | 567 | 0 | 602 | 600 | 601 | 600 | 605 |
| NCF | 508 | 517 | 528 | 537 | 550 | 560 | 0 | 600 | 600 | 600 | 600 | 601 |
| NCF_1YR | 489 | 508 | 517 | 526 | 535 | 550 | 0 | 569 | 598 | 601 | 599 | 601 |
| NCF_2YR | 505 | 513 | 523 | 535 | 546 | 552 | 0 | 588 | 587 | 587 | 589 | 591 |
| NCF_6M | 505 | 508 | 517 | 530 | 537 | 547 | 0 | 585 | 586 | 587 | 588 | 591 |
| NCF_BP1YR | 499 | 505 | 512 | 523 | 535 | 546 | 0 | 577 | 587 | 586 | 587 | 589 |
| NCF_BP1YR_1YR | 481 | 499 | 504 | 512 | 523 | 535 | 0 | 552 | 576 | 587 | 586 | 587 |
| NCF_BP1YR_2YR | 557 | 567 | 580 | 593 | 601 | 607 | 0 | 637 | 638 | 638 | 640 | 645 |
| NCF_BP1YR_6M | 557 | 565 | 578 | 593 | 601 | 606 | 0 | 637 | 638 | 638 | 639 | 645 |
| NCF_BP1YRDIV | 549 | 557 | 567 | 580 | 593 | 601 | 0 | 635 | 637 | 638 | 637 | 640 |
| NCF_BP1YRDIV_1YR | 524 | 549 | 557 | 567 | 580 | 593 | 0 | 607 | 635 | 637 | 637 | 638 |
| NCF_BP1YRDIV_2YR | 497 | 469 | 490 | 510 | 542 | 555 | 0 | 496 | 483 | 496 | 437 | 500 |
| NCF_BP1YRDIV_6M | 491 | 457 | 471 | 489 | 527 | 542 | 0 | 477 | 470 | 459 | 419 | 473 |
| NCF_TD | 472 | 446 | 441 | 461 | 496 | 518 | 0 | 420 | 404 | 409 | 383 | 387 |
| NCF_TD_1YR | 438 | 435 | 444 | 435 | 470 | 488 | 0 | 443 | 379 | 416 | 368 | 411 |
| NCF_TD_2YR | 541 | 543 | 558 | 572 | 583 | 594 | 0 | 633 | 638 | 638 | 640 | 645 |
| NCF_TD_6M | 540 | 543 | 557 | 570 | 582 | 594 | 0 | 629 | 638 | 638 | 639 | 645 |
| NPMTP | 532 | 541 | 543 | 558 | 571 | 583 | 0 | 618 | 633 | 638 | 637 | 640 |
| NPMTP_1YR | 512 | 532 | 541 | 543 | 558 | 571 | 0 | 594 | 618 | 633 | 637 | 638 |
| NPMTP_2YR | 546 | 558 | 568 | 583 | 596 | 602 | 0 | 633 | 629 | 636 | 639 | 645 |
| NPMTP_6M | 537 | 544 | 538 | 531 | 542 | 558 | 0 | 594 | 588 | 583 | 590 | 565 |
| NS | 528 | 536 | 546 | 538 | 531 | 541 | 0 | 590 | 587 | 570 | 583 | 588 |
| NS_1YR | 497 | 529 | 536 | 546 | 538 | 531 | 0 | 558 | 585 | 593 | 569 | 584 |
| NS_2YR | 547 | 559 | 569 | 584 | 595 | 604 | 0 | 638 | 638 | 638 | 640 | 645 |
| NS_6M | 535 | 542 | 552 | 564 | 575 | 580 | 0 | 603 | 611 | 606 | 606 | 606 |
| OPMTP | 530 | 535 | 543 | 553 | 566 | 575 | 0 | 610 | 606 | 611 | 605 | 607 |
| OPMTP_1YR | 507 | 530 | 535 | 543 | 553 | 566 | 0 | 582 | 610 | 606 | 610 | 606 |
| OPMTP_2YR | 547 | 559 | 569 | 584 | 595 | 604 | 0 | 638 | 638 | 638 | 640 | 645 |
| OPMTP_6M | 521 | 534 | 543 | 553 | 553 | 552 | 0 | 571 | 574 | 569 | 564 | 559 |
| P | 512 | 522 | 535 | 544 | 551 | 552 | 0 | 573 | 571 | 575 | 569 | 564 |
| P_1M | 494 | 512 | 522 | 535 | 544 | 551 | 0 | 553 | 573 | 571 | 574 | 570 |
| P_1YR | 567 | 569 | 583 | 596 | 604 | 615 | 629 | 642 | 650 | 651 | 651 | 651 |
| P_2YR | 564 | 567 | 579 | 591 | 603 | 606 | 623 | 633 | 646 | 651 | 651 | 651 |
| P_3M | 552 | 564 | 567 | 579 | 591 | 608 | 606 | 623 | 633 | 646 | 651 | 651 |
| P_6M | 551 | 565 | 580 | 594 | 603 | 608 | 635 | 636 | 638 | 638 | 638 | 644 |
| PEGI | 551 | 562 | 578 | 594 | 603 | 607 | 631 | 636 | 638 | 638 | 638 | 644 |
| PEGI_1YR | 541 | 551 | 565 | 580 | 594 | 608 | 608 | 634 | 636 | 638 | 637 | 638 |
| PEGI_2YR | 491 | 541 | 551 | 565 | 580 | 594 | 603 | 608 | 635 | 636 | 637 | 638 |
| PEGI_6M | 541 | 551 | 565 | 580 | 594 | 608 | 608 | 634 | 636 | 638 | 637 | 638 |

**Appendix A.3.: Attribute availability for the first month in each sample year**
-continued

| | 1993/01/31 | 1994/01/31 | 1995/01/31 | 1996/01/31 | 1997/01/31 | 1998/01/31 | 1999/01/31 | 2000/01/31 | 2001/01/31 | 2002/01/31 | 2003/01/31 | 2004/01/31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PPMTP | 141 | 134 | 129 | 85 | 71 | 69 | 66 | 48 | 88 | 94 | 34 | 21 |
| PPMTP_1YR | 129 | 130 | 121 | 80 | 66 | 66 | 62 | 47 | 16 | 54 | 18 | 16 |
| PPMTP_2YR | 104 | 120 | 119 | 75 | 61 | 61 | 61 | 45 | 18 | 13 | 8 | 8 |
| PPMTP_6M | 268 | 269 | 273 | 278 | 283 | 288 | 304 | 283 | 443 | 480 | 482 | 487 |
| QUICK | 264 | 267 | 270 | 275 | 281 | 283 | 297 | 280 | 424 | 474 | 479 | 483 |
| QUICK_1YR | 256 | 262 | 263 | 268 | 275 | 277 | 282 | 279 | 274 | 438 | 475 | 479 |
| QUICK_2YR | 222 | 253 | 258 | 260 | 267 | 272 | 275 | 261 | 291 | 277 | 438 | 474 |
| QUICK_6M | 268 | 269 | 273 | 278 | 283 | 288 | 304 | 283 | 443 | 480 | 482 | 487 |
| RD_EQ | 264 | 267 | 270 | 275 | 281 | 283 | 297 | 280 | 424 | 474 | 479 | 483 |
| RD_EQ_1YR | 256 | 262 | 263 | 268 | 275 | 277 | 282 | 279 | 274 | 438 | 475 | 479 |
| RD_EQ_2YR | 222 | 253 | 258 | 260 | 267 | 272 | 275 | 261 | 291 | 277 | 438 | 474 |
| RD_EQ_6M | 557 | 568 | 581 | 595 | 224 | 225 | 185 | 133 | 586 | 606 | 607 | 606 |
| RD_TA | 268 | 269 | 273 | 278 | 283 | 224 | 185 | 133 | 543 | 605 | 606 | 606 |
| RD_TA_1YR | 549 | 557 | 568 | 581 | 194 | 212 | 180 | 130 | 130 | 581 | 599 | 597 |
| RD_TA_2YR | 557 | 568 | 581 | 595 | 82 | 184 | 168 | 126 | 178 | 132 | 575 | 592 |
| RD_TA_6M | 557 | 568 | 581 | 595 | 603 | 609 | 636 | 638 | 638 | 638 | 640 | 645 |
| RETEN | 557 | 566 | 579 | 595 | 603 | 608 | 632 | 638 | 638 | 638 | 639 | 645 |
| RETEN_1YR | 549 | 557 | 568 | 581 | 595 | 603 | 609 | 636 | 638 | 638 | 637 | 640 |
| RETEN_2YR | 524 | 549 | 557 | 568 | 581 | 595 | 603 | 609 | 636 | 638 | 637 | 638 |
| RETEN_6M | 557 | 567 | 583 | 595 | 603 | 635 | 637 | 638 | 638 | 639 | 645 | 649 |
| ROCE | 535 | 542 | 549 | 559 | 579 | 590 | 593 | 621 | 622 | 625 | 627 | 623 |
| ROCE_1YR | 540 | 542 | 557 | 570 | 582 | 593 | 617 | 632 | 638 | 638 | 640 | 645 |
| ROCE_2YR | 540 | 542 | 556 | 569 | 581 | 593 | 613 | 628 | 638 | 638 | 639 | 645 |
| ROCE_6M | 531 | 540 | 542 | 556 | 570 | 582 | 593 | 617 | 632 | 638 | 637 | 640 |
| ROEPUB | 512 | 531 | 540 | 541 | 557 | 570 | 582 | 593 | 617 | 632 | 637 | 638 |
| ROEPUB_1YR | 557 | 31 | 90 | 206 | 230 | 230 | 192 | 139 | 612 | 638 | 641 | 645 |
| ROEPUB_2YR | 556 | 27 | 75 | 202 | 228 | 229 | 192 | 139 | 564 | 638 | 639 | 645 |
| ROEPUB_6M | 484 | 504 | 510 | 514 | 199 | 218 | 187 | 136 | 137 | 612 | 637 | 641 |
| SALES_EMP | 511 | 517 | 525 | 537 | 545 | 553 | 584 | 585 | 583 | 583 | 584 | 587 |
| SALES_EMP_1YR | 511 | 516 | 524 | 536 | 545 | 551 | 580 | 585 | 583 | 583 | 583 | 587 |
| SALES_EMP_2YR | 504 | 511 | 516 | 523 | 536 | 545 | 553 | 584 | 583 | 583 | 583 | 584 |
| SALES_EMP_6M | 484 | 504 | 510 | 514 | 522 | 536 | 545 | 553 | 582 | 583 | 583 | 583 |
| SALES_P | 557 | 567 | 580 | 594 | 603 | 608 | 635 | 637 | 638 | 638 | 641 | 645 |
| SALES_P_1YR | 549 | 557 | 567 | 580 | 594 | 603 | 603 | 635 | 637 | 638 | 638 | 641 |
| SALES_P_2YR | 504 | 511 | 516 | 523 | 536 | 545 | 553 | 584 | 583 | 583 | 583 | 584 |
| SALES_P_6M | 9 | 29 | 85 | 196 | 219 | 218 | 182 | 130 | 573 | 593 | 602 | 598 |
| TD_TA | 511 | 517 | 526 | 540 | 549 | 557 | 181 | 130 | 531 | 591 | 599 | 598 |
| TD_TA_1YR | 511 | 517 | 526 | 540 | 188 | 203 | 176 | 126 | 127 | 563 | 583 | 585 |
| TD_TA_2YR | 227 | 228 | 192 | 27 | 80 | 178 | 162 | 122 | 175 | 130 | 560 | 577 |
| TD_TA_6M | 508 | 517 | 527 | 536 | 549 | 559 | 568 | 599 | 599 | 600 | 600 | 601 |
| TLC_TA | 544 | 556 | 567 | 582 | 594 | 601 | 630 | 632 | 629 | 635 | 637 | 644 |
| TLC_TA_1YR | 544 | 546 | 90 | 206 | 228 | 229 | 192 | 139 | 607 | 634 | 636 | 643 |
| TLC_TA_2YR | 544 | 556 | 75 | 202 | 227 | 228 | 192 | 139 | 559 | 634 | 636 | 643 |
| TLC_TA_6M | 544 | 556 | 30 | 85 | 199 | 216 | 187 | 136 | 135 | 605 | 630 | 634 |
| TV | 544 | 556 | 9 | 28 | 83 | 189 | 175 | 131 | 186 | 138 | 603 | 633 |
| TV_1M | 567 | 580 | 591 | 603 | 617 | 626 | 639 | 651 | 651 | 651 | 651 | 651 |
| TV_1YR | 567 | 578 | 590 | 603 | 617 | 626 | 639 | 651 | 651 | 651 | 651 | 651 |
| TV_2YR | 567 | 580 | 591 | 603 | 617 | 626 | 639 | 651 | 651 | 651 | 651 | 651 |
| TV_3M | 567 | 578 | 590 | 603 | 617 | 626 | 639 | 651 | 651 | 651 | 651 | 651 |
| TV_6M | 567 | 577 | 588 | 600 | 614 | 626 | 635 | 651 | 651 | 651 | 651 | 651 |
| VO | 567 | 571 | 583 | 596 | 605 | 619 | 629 | 647 | 651 | 651 | 651 | 651 |
| VO_1M | 564 | 567 | 580 | 591 | 603 | 617 | 626 | 639 | 651 | 651 | 651 | 651 |
| VO_1YR | 555 | 567 | 571 | 583 | 596 | 605 | 619 | 629 | 647 | 651 | 651 | 651 |
| VO_2YR | 557 | 565 | 581 | 596 | 612 | 621 | 624 | 645 | 640 | 647 | 645 | 642 |
| VO_3M | 546 | 575 | 577 | 582 | 602 | 619 | 621 | 642 | 637 | 644 | 644 | 639 |
| VO_6M | 564 | 567 | 580 | 590 | 601 | 616 | 626 | 639 | 650 | 651 | 650 | 651 |
| WC | 564 | 567 | 580 | 590 | 601 | 616 | 626 | 639 | 650 | 651 | 650 | 651 |
| WC_1YR | 555 | 567 | 570 | 583 | 595 | 605 | 618 | 629 | 647 | 651 | 651 | 650 |
| WC_2YR | 555 | 567 | 570 | 583 | 595 | 605 | 618 | 629 | 647 | 651 | 651 | 650 |
| WC_6M | 555 | 567 | 570 | 583 | 595 | 605 | 618 | 629 | 647 | 651 | 651 | 650 |

Kyoto University Research Information Repository

## Appendix A.4.: Average monthly attribute availability for each sample

The table shows the average monthly number of observations for each firm-specific attribute included in the analysis for both the in-sample and out-samples. The number of observations are displayed after the sample is adjusted for thin trading and lack of return data. The final sample includes 651 companied and hence each attribute has a maximum of 651 available observations. The in-sample period covers 1 January 1993 to 31 December 2000 and the out of sample period covers 1 January 2001 to 31 December 2004. The percentage change variables are clearly indicated by including either "_1m", "_3m", "_6m", "_1yr", or "_2yr" at the end of the attributes' name. Attribute definitions and constructions are displayed in Table 4.1. The data are obtained from Datastream International at the University of Cape Town.

| Characteristic | In-Sample | Out-Sample | Characteristic | In-Sample | Out-Sample |
|---|---|---|---|---|---|
| ACCREC | 613 | 651 | DY_6M | 536 | 501 |
| ACCREC_1YR | 613 | 651 | EPS | 541 | 504 |
| ACCREC_2YR | 611 | 651 | EPS_1YR | 609 | 643 |
| ACCREC_6M | 608 | 651 | EPS_2YR | 603 | 642 |
| ASSTURN | 603 | 650 | EPS_2YRAV | 598 | 640 |
| ASSTURN_1YR | 592 | 648 | EPS_6M | 587 | 638 |
| ASSTURN_2YR | 613 | 651 | EQCAPRES | 596 | 635 |
| ASSTURN_6M | 613 | 651 | EQCAPRES_1YR | 590 | 633 |
| BORROW | 611 | 651 | EQCAPRES_2YR | 583 | 631 |
| BORROW_1YR | 608 | 651 | EQCAPRES_6M | 569 | 628 |
| BORROW_2YR | 603 | 651 | EY | 600 | 643 |
| BORROW_6M | 592 | 650 | EY_1YR | 574 | 605 |
| BTMV | 613 | 651 | EY_2YR | 569 | 606 |
| BTMV_1YR | 611 | 651 | EY_6M | 558 | 607 |
| BTMV_2YR | 608 | 651 | GEAR | 574 | 605 |
| BTMV_6M | 603 | 651 | GEAR_1YR | 569 | 606 |
| BVPS | 592 | 650 | GEAR_2YR | 558 | 607 |
| BVPS_1YR | 613 | 651 | GEAR_6M | 555 | 591 |
| BVPS_2YR | 612 | 651 | GROWTH | 550 | 590 |
| BVPS_6M | 610 | 651 | GROWTH_1YR | 545 | 589 |
| CEY | 608 | 651 | GROWTH_2YR | 533 | 588 |
| CEY_1YR | 602 | 651 | GROWTH_6M | 555 | 590 |
| CEY_2YR | 591 | 649 | ICBT | 550 | 590 |
| CEY_6M | 584 | 641 | ICBT_1YR | 545 | 589 |
| CFMTP | 583 | 641 | ICBT_2YR | 533 | 588 |
| CFMTP_1YR | 581 | 640 | ICBT_6M | 591 | 643 |
| CFMTP_2YR | 577 | 639 | INTAN_MV | 584 | 641 |
| CFMTP_6M | 571 | 637 | INTAN_MV_1YR | 578 | 639 |
| CHEPS_P_1YR | 552 | 632 | INTAN_MV_2YR | 565 | 636 |
| CHEPS_P_2YR | 609 | 651 | INTAN_MV_6M | 592 | 642 |
| CHEPS_P_6M | 608 | 651 | INV | 585 | 641 |
| CHSALELSCHAR | 606 | 651 | INV_1YR | 579 | 639 |
| CHSALELSCHINV | 603 | 651 | INV_2YR | 566 | 636 |
| CPS | 597 | 650 | INV_6M | 592 | 642 |
| CPS_1YR | 584 | 648 | LNMV | 586 | 641 |
| CPS_2YR | 609 | 651 | LNMV_1M | 579 | 639 |
| CPS_6M | 608 | 651 | LNMV_1YR | 566 | 636 |
| CROSSOVER1_18 | 606 | 651 | LNMV_2YR | 427 | 642 |
| CROSSOVER1_3 | 603 | 651 | LNMV_3M | 400 | 639 |
| CROSSOVER3_1 | 597 | 650 | LNMV_6M | 375 | 630 |
| CROSSOVER3_12 | 584 | 648 | MOM_12M | 583 | 641 |
| CROSSOVER3_18 | 611 | 651 | MOM_18M | 577 | 639 |
| CROSSOVER6_12 | 534 | 504 | MOM_1M | 564 | 635 |
| CROSSOVER6_18 | 536 | 501 | MOM_3M | 596 | 635 |
| DEPAMORT_TA | 541 | 504 | MOM_6M | 590 | 633 |
| DEPAMORT_TA_1YR | 612 | 651 | MTBV | 583 | 631 |
| DEPAMORT_TA_2YR | 558 | 578 | MTBV_1YR | 569 | 628 |
| DEPAMORT_TA_6M | 556 | 577 | MTBV_2YR | 426 | 642 |
| DIV | 552 | 579 | MTBV_6M | 399 | 639 |
| DIV_1YR | 594 | 643 | MVT | 374 | 630 |
| DIV_2YR | 588 | 642 | MVT_1M | 338 | 595 |
| DIV_6M | 582 | 640 | MVT_1YR | 553 | 613 |
| DPS | 569 | 637 | MVT_2YR | 543 | 609 |
| DPS_1YR | 594 | 643 | MVT_3M | 534 | 606 |
| DPS_2YR | 588 | 642 | MVT_6M | 503 | 600 |
| DPS_6M | 582 | 640 | MVT_MV | 544 | 590 |
| DY | 569 | 637 | MVT_MV_1M | 539 | 589 |
| DY_1YR | 611 | 651 | MVT_MV_1YR | 533 | 588 |
| DY_2YR | 534 | 504 | MVT_MV_2YR | 522 | 585 |

University of Cape Town

## Appendix A.5.: Pearson correlation matrix for firm-specific variables

The matrix shows the average monthly cross-sectional Pearson correlation coefficients for all firm specific variables used in the analysis. Correlations greater than 0.7 and less than -0.7 are highlighted with a black background and a white font. The percentage change variables are clearly indicated by including either "_1m", "_3m", "_6m", "_1yr", or "_2yr" at the end of the attributes' name. Data obtained from Datastream International for the period 1 January 1993 to 31 December 2000 is used.

| | P | P_1M | P_3M | P_6M | P_1YR | P_2YR | LNMV | LNMV_1M | LNMV_3M | LNMV_6M | LNMV_1YR | LNMV_2YR | VO | VO_1M | VO_3M | VO_6M | VO_1YR | VO_2YR | TV | TV_1M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 1.000 | | | | | | | | | | | | | | | | | | | |
| P_1M | 0.118 | 1.000 | | | | | | | | | | | | | | | | | | |
| P_3M | 0.244 | 0.457 | 1.000 | | | | | | | | | | | | | | | | | |
| P_6M | 0.382 | 0.340 | 0.646 | 1.000 | | | | | | | | | | | | | | | | |
| P_1YR | 0.668 | 0.268 | 0.483 | 0.680 | 1.000 | | | | | | | | | | | | | | | |
| P_2YR | 0.610 | 0.184 | 0.280 | 0.554 | 0.893 | 1.000 | | | | | | | | | | | | | | |
| LNMV | 0.518 | 0.093 | 0.155 | 0.298 | 0.470 | 0.583 | 1.000 | | | | | | | | | | | | | |
| LNMV_1M | 0.158 | 0.899 | 0.427 | 0.371 | 0.270 | 0.206 | 0.121 | 1.000 | | | | | | | | | | | | |
| LNMV_3M | 0.284 | 0.471 | 0.847 | 0.650 | 0.548 | 0.401 | 0.182 | 0.498 | 1.000 | | | | | | | | | | | |
| LNMV_6M | 0.401 | 0.366 | 0.611 | 0.901 | 0.700 | 0.525 | 0.246 | 0.377 | 0.752 | 1.000 | | | | | | | | | | |
| LNMV_1YR | 0.545 | 0.277 | 0.514 | 0.702 | 0.975 | 0.877 | 0.317 | 0.308 | 0.569 | 0.767 | 1.000 | | | | | | | | | |
| LNMV_2YR | 0.554 | 0.178 | 0.345 | 0.550 | 0.867 | 0.964 | 0.362 | 0.206 | 0.406 | 0.566 | 0.894 | 1.000 | | | | | | | | |
| VO | 0.079 | 0.168 | 0.064 | 0.060 | 0.075 | 0.110 | 0.569 | 0.158 | 0.106 | 0.080 | 0.100 | 0.132 | 1.000 | | | | | | | |
| VO_1M | 0.068 | 0.119 | 0.059 | 0.067 | 0.078 | 0.016 | 0.096 | 0.099 | 0.064 | 0.078 | 0.082 | 0.018 | 0.324 | 1.000 | | | | | | |
| VO_3M | 0.084 | 0.149 | 0.097 | 0.106 | 0.079 | 0.020 | 0.092 | 0.150 | 0.074 | 0.074 | 0.091 | 0.023 | 0.401 | 0.803 | 1.000 | | | | | |
| VO_6M | 0.010 | 0.155 | 0.088 | 0.125 | 0.088 | 0.034 | 0.065 | 0.157 | 0.078 | 0.098 | 0.109 | 0.032 | 0.368 | 0.666 | 0.881 | 1.000 | | | | |
| VO_1YR | 0.084 | 0.135 | 0.070 | 0.106 | 0.084 | 0.015 | 0.036 | 0.136 | 0.040 | 0.075 | 0.085 | 0.015 | 0.405 | 0.538 | 0.717 | 0.838 | 1.000 | | | |
| VO_2YR | 0.074 | 0.087 | 0.037 | 0.155 | 0.088 | 0.126 | 0.033 | 0.107 | 0.031 | 0.109 | 0.090 | 0.091 | 0.481 | 0.398 | 0.534 | 0.650 | 0.837 | 1.000 | | |
| TV | 0.048 | 0.146 | 0.049 | 0.081 | 0.063 | 0.051 | 0.041 | 0.139 | 0.034 | 0.061 | 0.065 | 0.039 | 0.355 | 0.280 | 0.390 | 0.536 | 0.672 | 0.748 | 1.000 | |
| TV_1M | 0.068 | 0.138 | 0.058 | 0.067 | 0.073 | 0.010 | 0.095 | 0.097 | 0.064 | 0.075 | 0.082 | 0.012 | 0.123 | 0.318 | 0.315 | 0.392 | 0.467 | 0.512 | 0.646 | 1.000 |
| TV_3M | 0.084 | 0.145 | 0.097 | 0.107 | 0.080 | 0.020 | 0.092 | 0.150 | 0.074 | 0.074 | 0.091 | 0.023 | 0.401 | 0.803 | 1.000 | 0.881 | 0.717 | 0.534 | 0.555 | 0.646 |
| TV_6M | 0.010 | 0.155 | 0.088 | 0.125 | 0.088 | 0.034 | 0.065 | 0.157 | 0.078 | 0.098 | 0.109 | 0.032 | 0.368 | 0.666 | 0.881 | 1.000 | 0.838 | 0.650 | 0.536 | 0.512 |
| TV_1YR | 0.050 | 0.137 | 0.070 | 0.106 | 0.084 | 0.015 | 0.036 | 0.136 | 0.040 | 0.075 | 0.085 | 0.015 | 0.405 | 0.538 | 0.717 | 0.838 | 1.000 | 0.837 | 0.672 | 0.467 |
| TV_2YR | 0.060 | 0.211 | 0.046 | 0.166 | 0.209 | 0.308 | 0.031 | 0.200 | 0.029 | 0.113 | 0.093 | 0.296 | 0.477 | 0.398 | 0.534 | 0.650 | 0.837 | 1.000 | 0.748 | 0.392 |
| MVT | 0.072 | 0.082 | 0.095 | 0.097 | 0.093 | 0.046 | 0.038 | 0.035 | 0.037 | 0.033 | 0.041 | 0.026 | 0.114 | 0.064 | 0.104 | 0.150 | 0.107 | 0.096 | 0.104 | 0.064 |
| MVT_1M | 0.026 | 0.059 | 0.150 | 0.008 | 0.088 | 0.023 | 0.061 | 0.080 | 0.147 | 0.006 | 0.047 | 0.058 | 0.070 | 0.054 | 0.030 | 0.361 | 0.042 | 0.030 | 0.107 | 0.064 |
| MVT_3M | 0.017 | 0.109 | 0.074 | 0.021 | 0.134 | 0.053 | 0.097 | 0.072 | 0.046 | 0.035 | 0.103 | 0.043 | 0.104 | 0.168 | 0.323 | 0.043 | 0.077 | 0.055 | 0.542 | 0.348 |
| MVT_6M | 0.013 | 0.150 | 0.079 | 0.090 | 0.103 | 0.121 | 0.067 | 0.136 | 0.035 | 0.024 | 0.101 | 0.150 | 0.115 | 0.074 | 0.115 | 0.043 | 0.022 | 0.031 | 0.492 | 0.254 |
| MVT_1YR | 0.136 | 0.040 | 0.087 | 0.110 | 0.074 | 0.215 | 0.039 | 0.209 | 0.056 | 0.080 | 0.057 | 0.206 | 0.021 | 0.040 | 0.040 | 0.060 | 0.060 | 0.040 | 0.057 | 0.018 |
| MVT_2YR | 0.154 | 0.033 | 0.035 | 0.047 | 0.018 | 0.050 | 0.029 | 0.057 | 0.038 | 0.044 | 0.026 | 0.053 | 0.021 | 0.042 | 0.032 | 0.021 | 0.026 | 0.018 | 0.052 | 0.249 |
| MVT_MV | 0.004 | 0.048 | 0.041 | 0.002 | 0.009 | 0.001 | 0.048 | 0.44 | 0.021 | 0.008 | 0.007 | 0.021 | 0.548 | 0.350 | 0.658 | 0.109 | 0.060 | 0.035 | 0.064 | 0.725 |
| MVT_MV_1M | 0.053 | 0.113 | 0.058 | 0.057 | 0.013 | 0.015 | 0.008 | 0.056 | 0.045 | 0.019 | 0.013 | 0.015 | 0.154 | 0.05 | 0.115 | 0.027 | 0.023 | 0.026 | 0.036 | 0.600 |
| MVT_MV_3M | 0.088 | 0.168 | 0.097 | 0.036 | 0.079 | 0.025 | 0.094 | 0.34 | 0.073 | 0.113 | 0.081 | 0.055 | 0.107 | 0.045 | 0.098 | 0.018 | 0.022 | 0.026 | 0.057 | 0.168 |
| MVT_MV_6M | 0.032 | 0.131 | 0.091 | 0.024 | 0.055 | 0.054 | 0.071 | 0.150 | 0.075 | 0.058 | 0.103 | 0.050 | 0.148 | 0.033 | 0.057 | 0.008 | 0.022 | 0.026 | 0.042 | 0.534 |
| MVT_MV_1YR | 0.082 | 0.030 | 0.076 | 0.030 | 0.010 | 0.117 | 0.018 | 0.104 | 0.049 | 0.024 | 0.037 | 0.145 | 0.058 | 0.025 | 0.018 | 0.008 | 0.008 | 0.006 | 0.021 | 0.018 |
| MVT_MV_2YR | 0.025 | 0.017 | 0.052 | 0.014 | 0.043 | 0.015 | 0.030 | 0.006 | 0.014 | 0.004 | 0.029 | 0.026 | 0.021 | 0.003 | 0.008 | 0.003 | 0.001 | 0.001 | 0.001 | 0.000 |
| EPS | 0.000 | 0.001 | 0.004 | 0.010 | 0.018 | 0.009 | 0.041 | 0.004 | 0.015 | 0.002 | 0.022 | 0.028 | 0.003 | 0.002 | 0.003 | 0.003 | 0.004 | 0.004 | 0.009 | 0.007 |
| EPS 6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EPS_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EPS 2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DY | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DY_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DY_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DY_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BTBV | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BTBV_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BTBV_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BTBV_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BTMV | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BTMV_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BTMV_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BTMV_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EY | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EY_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EY_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EY_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| RETEM | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| RETEM_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| RETEM_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| RETEM_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| GROWTH | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| GROWTH_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| GROWTH_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| GROWTH_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| GEAR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| GEAR_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| GEAR_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| GEAR_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BORROW | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BORROW_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BORROW_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BORROW_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NIC | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NIC_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NIC_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NIC_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| QUICK | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| QUICK_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| QUICK_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| QUICK_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DPMTP | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DPMTP_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DPMTP_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DPMTP_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EPMTP | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EPMTP_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EPMTP_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EPMTP_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EPS | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EPS_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EPS_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EPS_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BVPS | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BVPS_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BVPS_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BVPS_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BOEPUD | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BOEPUD_6M | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BOEPUD_1YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| BOEPUD_2YR | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

University of Pretoria

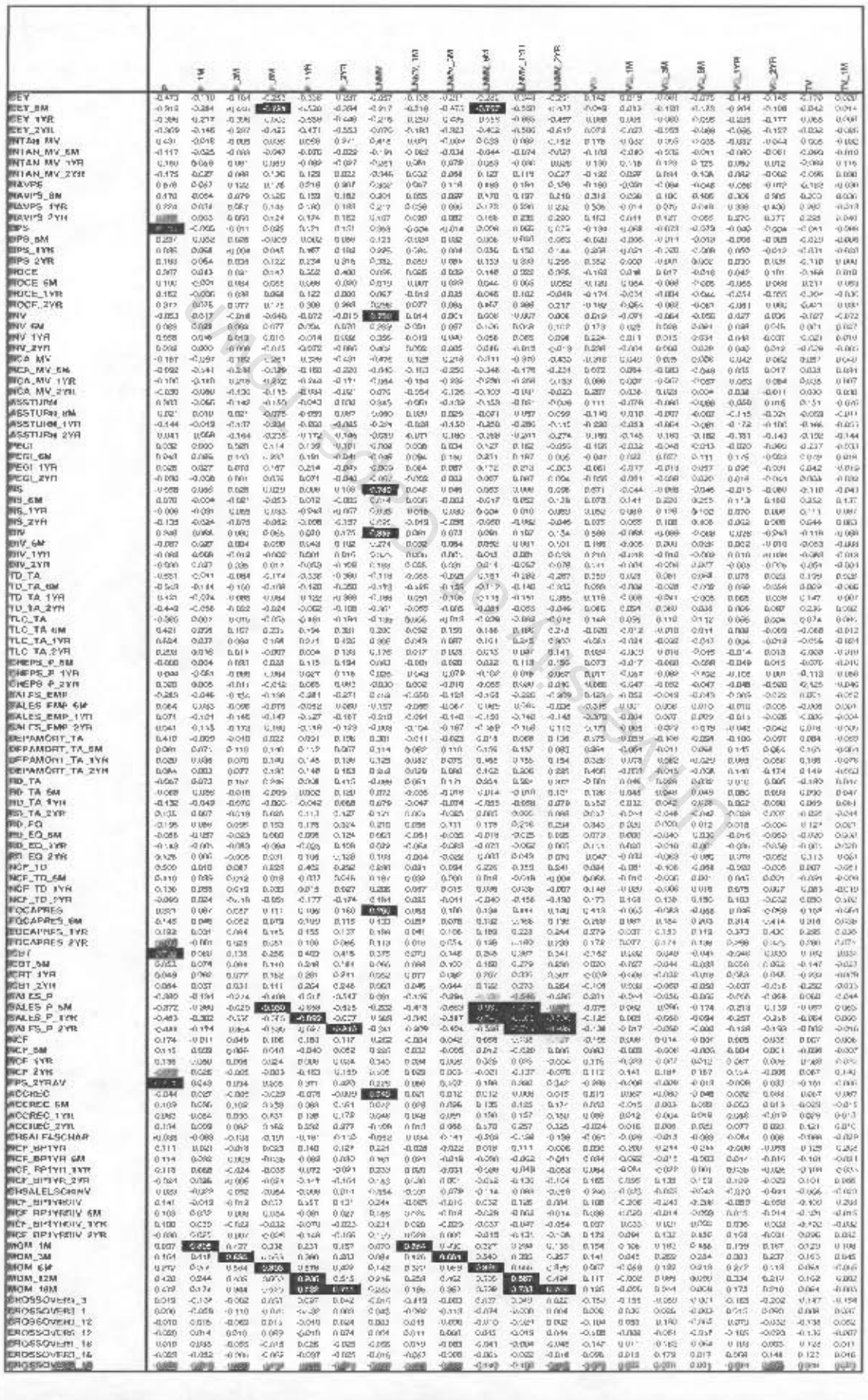
**Appendix A.4.: Average monthly attribute availability for each sample**
-continued

| Characteristic | In-Sample | Out-Sample | Characteristic | In-Sample | Out-Sample |
|---|---|---|---|---|---|
| MVT_MV_3M | 612 | 651 | RD_EQ_6M | 193 | 604 |
| MVT_MV_6M | 558 | 578 | RD_TA | 282 | 594 |
| NAVPS | 557 | 577 | RD_TA_1YR | 262 | 565 |
| NAVPS_1YR | 552 | 579 | RD_TA_2YR | 262 | 448 |
| NAVPS_2YR | 588 | 638 | RD_TA_6M | 193 | 642 |
| NAVPS_6M | 582 | 636 | RETEN | 601 | 641 |
| NCA_MV | 463 | 635 | RETEN_1YR | 596 | 640 |
| NCA_MV_1YR | 450 | 631 | RETEN_2YR | 583 | 638 |
| NCA_MV_2YR | 455 | 606 | RETEN_6M | 604 | 643 |
| NCA_MV_6M | 449 | 602 | ROCE | 573 | 624 |
| NCF | 445 | 601 | ROCE_1YR | 588 | 642 |
| NCF_1YR | 436 | 600 | ROCE_2YR | 582 | 641 |
| NCF_2YR | 439 | 590 | ROCE_6M | 576 | 639 |
| NCF_6M | 435 | 589 | ROEPUB | 563 | 635 |
| NCF_BP1YR | 432 | 588 | ROEPUB_1YR | 198 | 642 |
| NCF_BP1YR_1YR | 423 | 586 | ROEPUB_2YR | 155 | 633 |
| NCF_BP1YR_2YR | 485 | 642 | ROEPUB_6M | 122 | 604 |
| NCF_BP1YR_6M | 481 | 641 | SALES_EMP | 551 | 596 |
| NCF_BP1YRDIV | 478 | 639 | SALES_EMP_1YR | 546 | 585 |
| NCF_BP1YRDIV_1YR | 469 | 638 | SALES_EMP_2YR | 541 | 584 |
| NCF_BP1YRDIV_2YR | 418 | 502 | SALES_EMP_6M | 530 | 583 |
| NCF_BP1YRDIV_6M | 397 | 450 | SALES_P | 606 | 643 |
| NCF_TD | 383 | 415 | SALES_P_1YR | 595 | 640 |
| NCF_TD_1YR | 372 | 407 | SALES_P_2YR | 541 | 584 |
| NCF_TD_2YR | 473 | 642 | SALES_P_6M | 187 | 595 |
| NCF_TD_6M | 468 | 641 | TD_TA | 638 | 582 |
| NPMTP | 463 | 639 | TD_TA_1YR | 628 | 551 |
| NPMTP_1YR | 454 | 635 | TD_TA_2YR | 598 | 437 |
| NPMTP_2YR | 479 | 641 | TD_TA_6M | 476 | 601 |
| NPMTP_6M | 445 | 578 | TLC_TA | 596 | 640 |
| NS | 444 | 577 | TLC_TA_1YR | 197 | 638 |
| NS_1YR | 440 | 583 | TLC_TA_2YR | 154 | 628 |
| NS_2YR | 481 | 642 | TLC_TA_6M | 121 | 598 |
| NS_6M | 460 | 606 | TV | 623 | 476 |
| OPMTP | 457 | 607 | TV_1M | 613 | 651 |
| OPMTP_1YR | 450 | 608 | TV_1YR | 613 | 651 |
| OPMTP_2YR | 481 | 642 | TV_2YR | 613 | 651 |
| OPMTP_6M | 445 | 566 | TV_3M | 613 | 651 |
| P | 443 | 567 | TV_6M | 611 | 651 |
| P_1M | 437 | 570 | VO | 608 | 651 |
| P_1YR | 605 | 651 | VO_1M | 603 | 651 |
| P_2YR | 600 | 651 | VO_1YR | 597 | 651 |
| P_3M | 590 | 648 | VO_2YR | 606 | 647 |
| P_6M | 604 | 642 | VO_3M | 600 | 643 |
| PEGI | 599 | 640 | VO_6M | 602 | 650 |
| PEGI_1YR | 593 | 639 | WC | 602 | 650 |
| PEGI_2YR | 580 | 637 | WC_1YR | 597 | 650 |
| PEGI_6M | 593 | 639 | WC_2YR | 597 | 650 |
| PPMTP | 82 | 38 | WC_6M | 597 | 650 |
| PPMTP_1YR | 76 | 26 | | | |
| PPMTP_2YR | 72 | 10 | | | |
| PPMTP_6M | 297 | 482 | | | |
| QUICK | 282 | 470 | | | |
| QUICK_1YR | 272 | 456 | | | |
| QUICK_2YR | 265 | 406 | | | |
| QUICK_6M | 297 | 482 | | | |
| RD_EQ | 282 | 470 | | | |
| RD_EQ_1YR | 272 | 456 | | | |
| RD_EQ_2YR | 265 | 406 | | | |

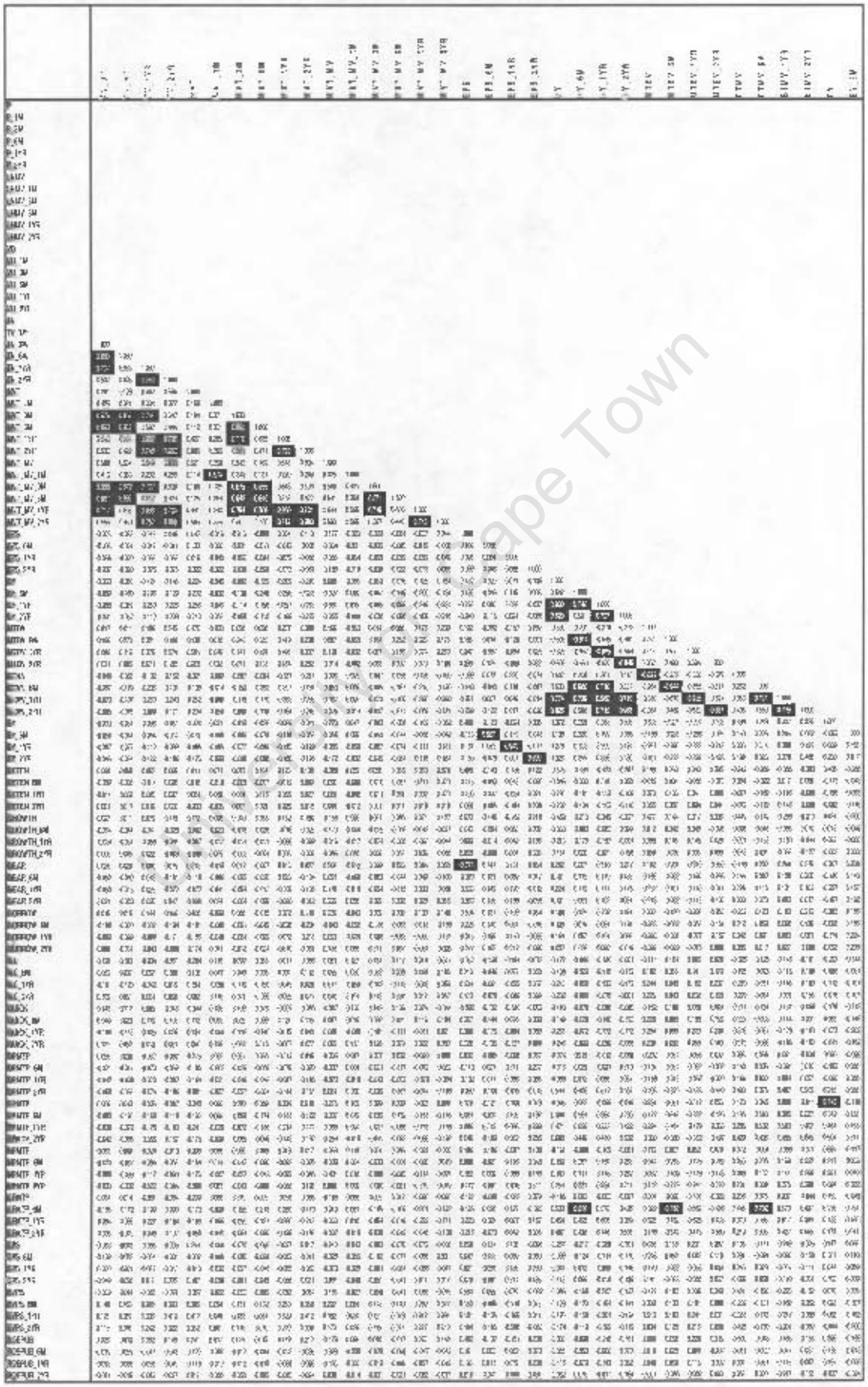
University of Cape Town

## Appendix A.5.: Pearson correlation matrix for firm-specific variables

-continued



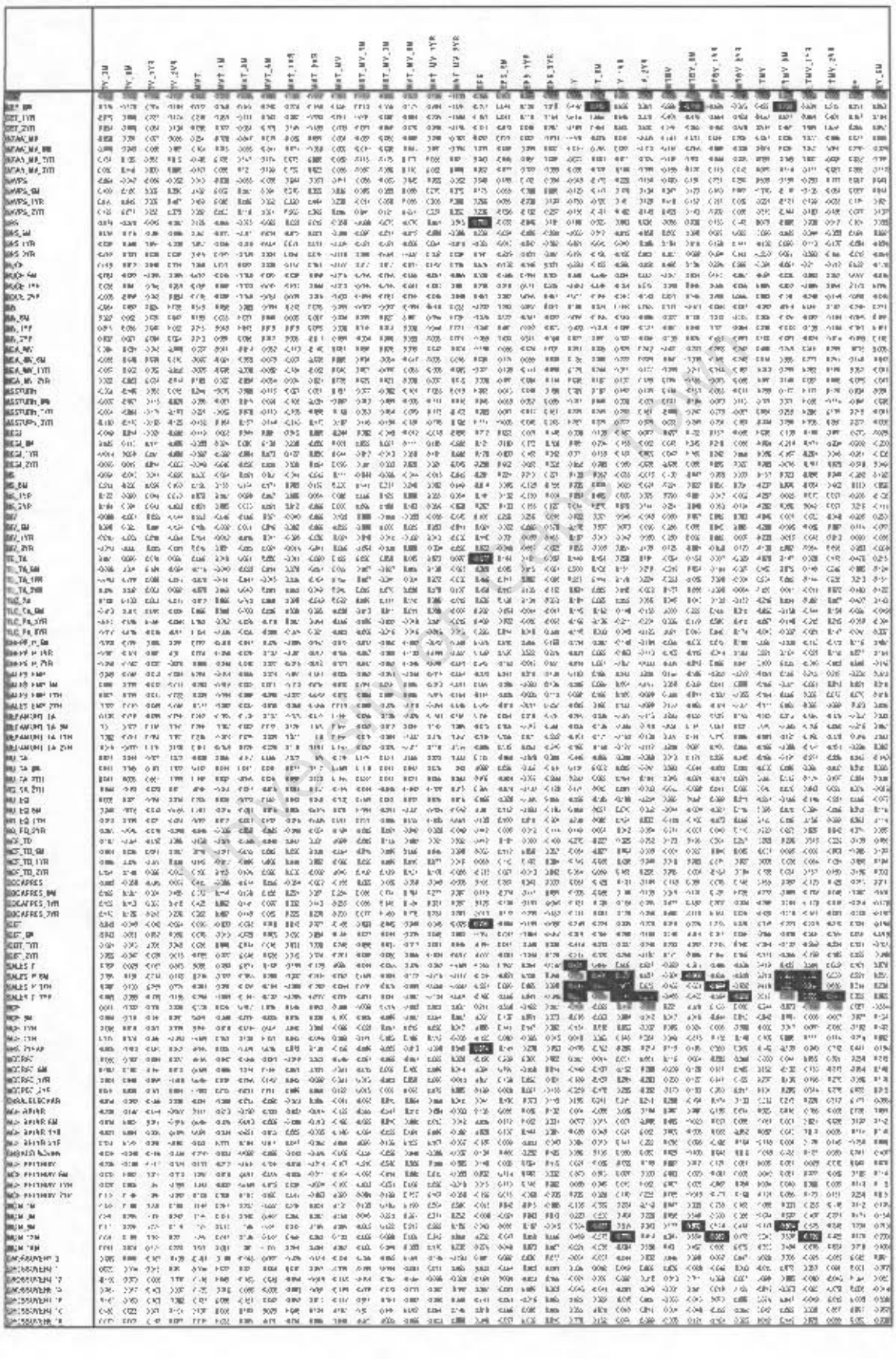
## Appendix A.5.: Pearson correlation matrix for firm-specific variables
-continued



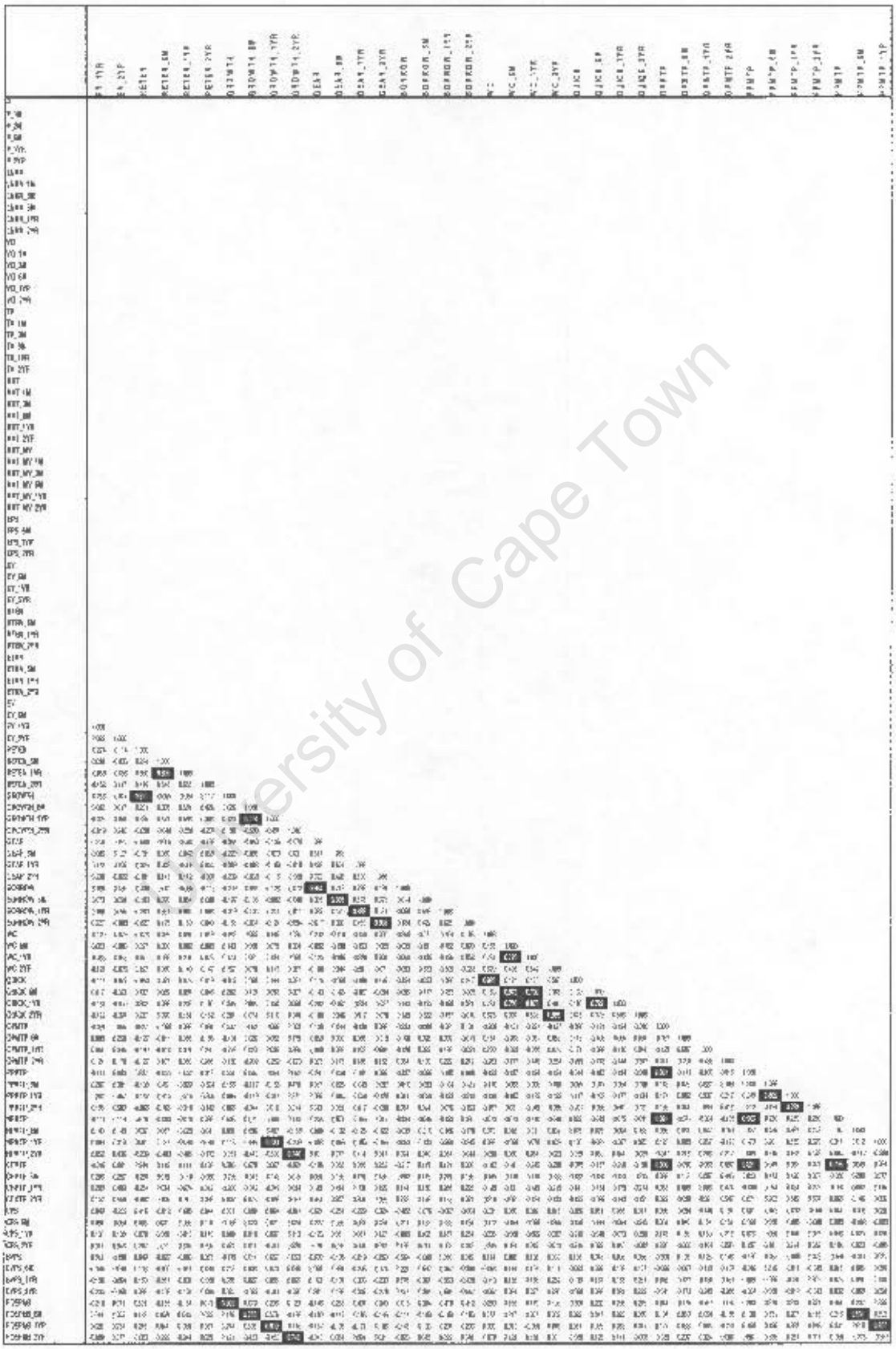
University of Cape Town

## Appendix A.5.: Pearson correlation matrix for firm-specific variables

-continued



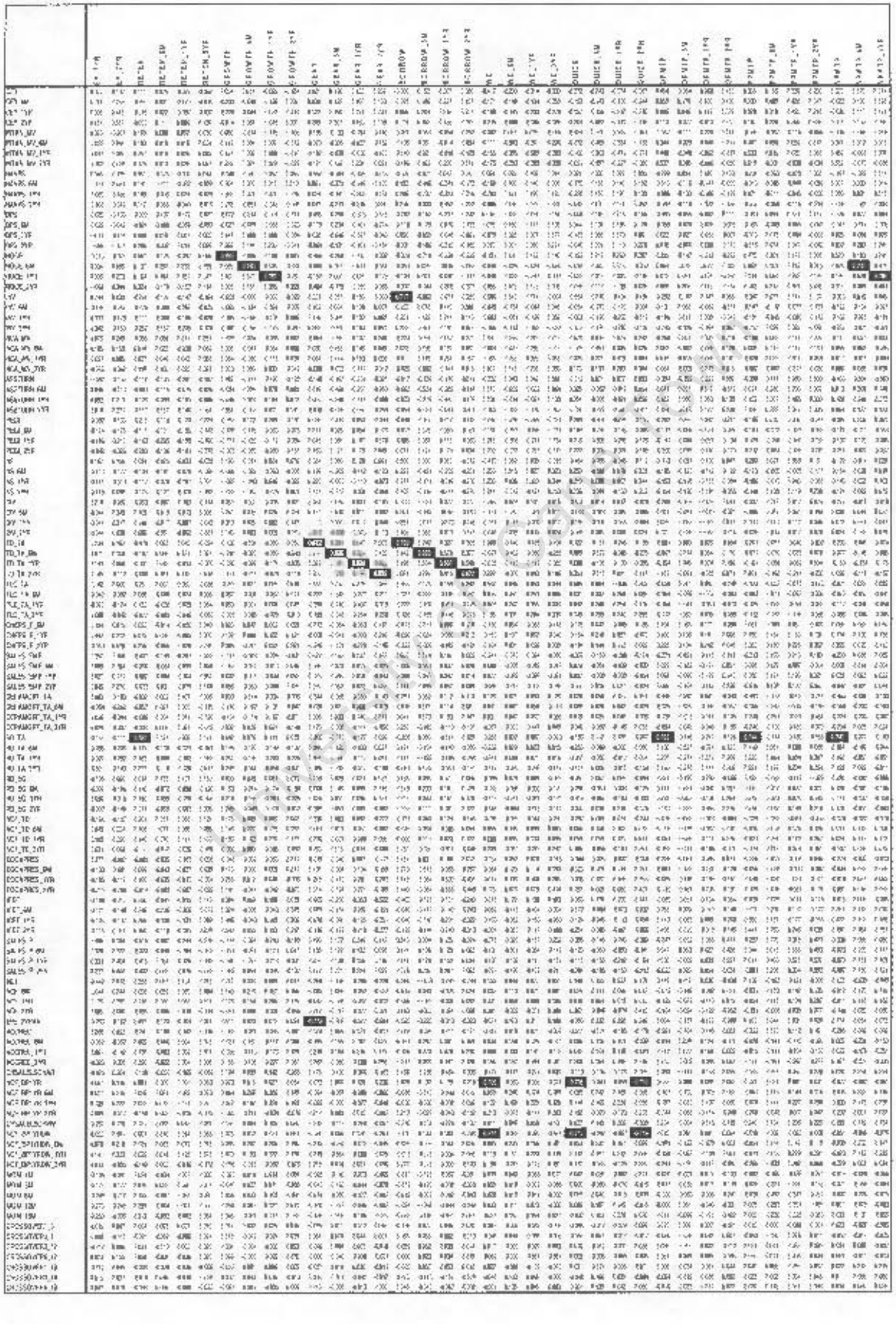
## Appendix A.5.: Pearson correlation matrix for firm-specific variables
-continued



University of Cape Town

## Appendix A.5.: Pearson correlation matrix for firm-specific variables

continued



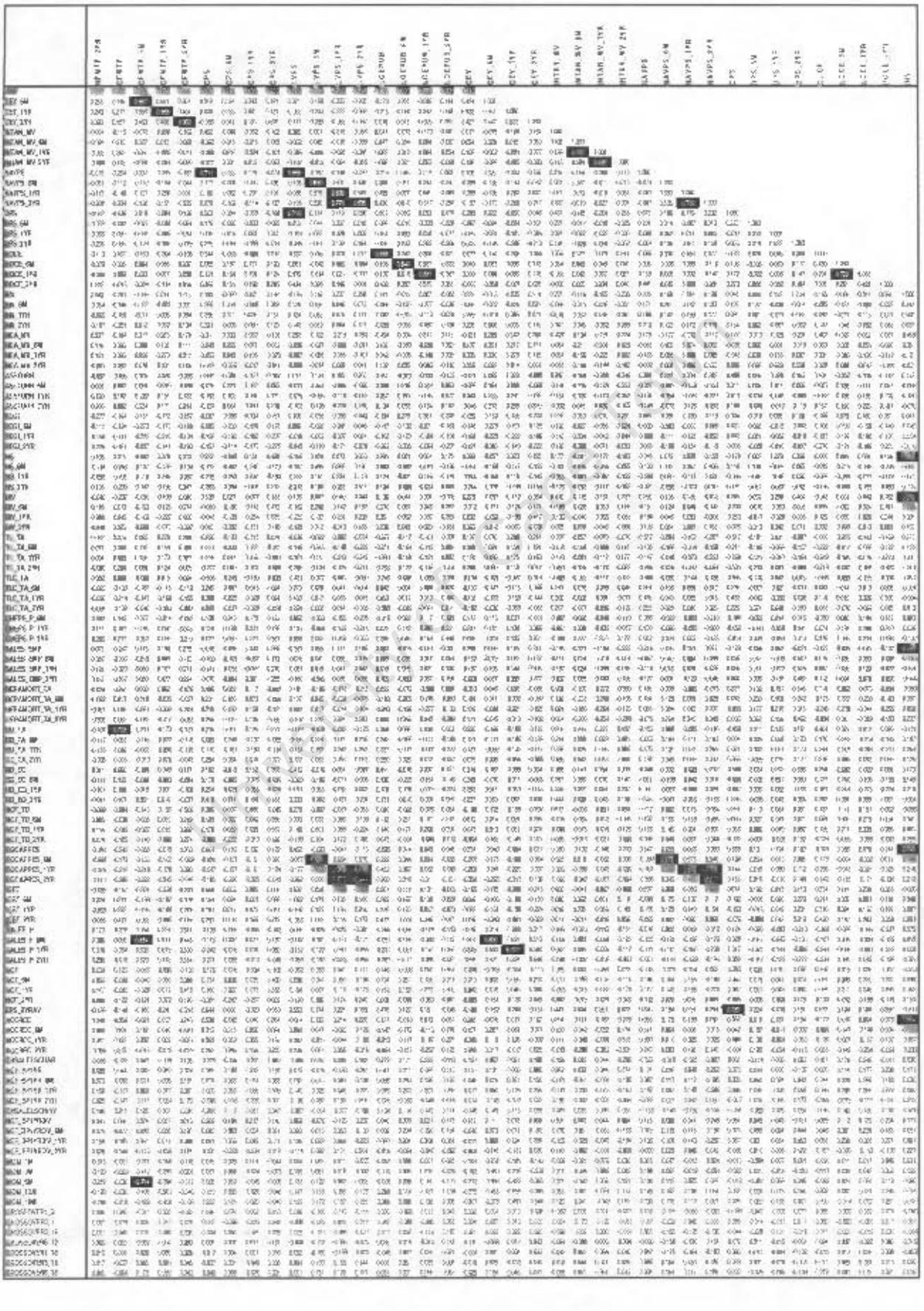
## Appendix A.5.: Pearson correlation matrix for firm-specific variables
-continued



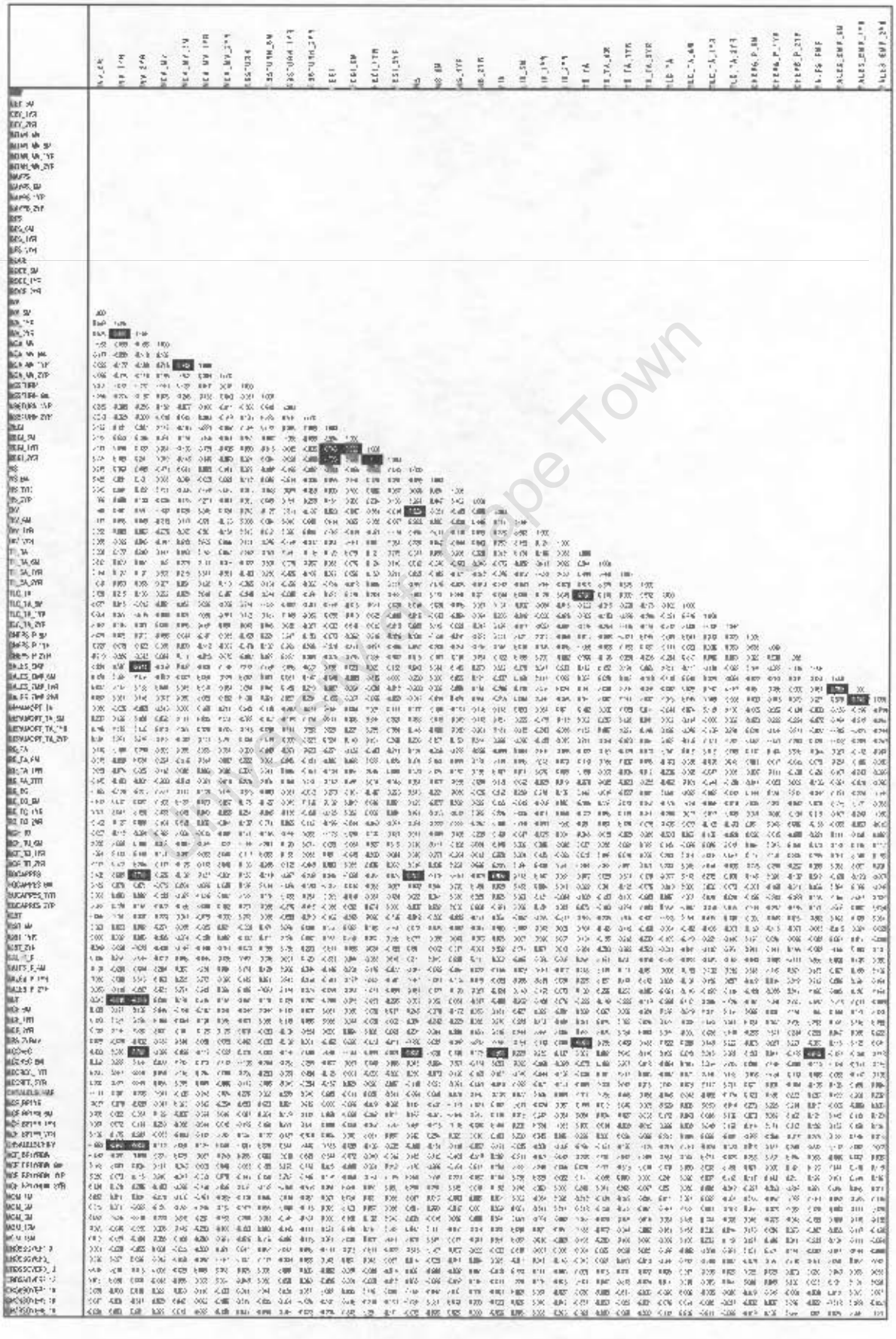
University of Cape Town

## Appendix A.5.: Pearson correlation matrix for firm-specific variables

-continued

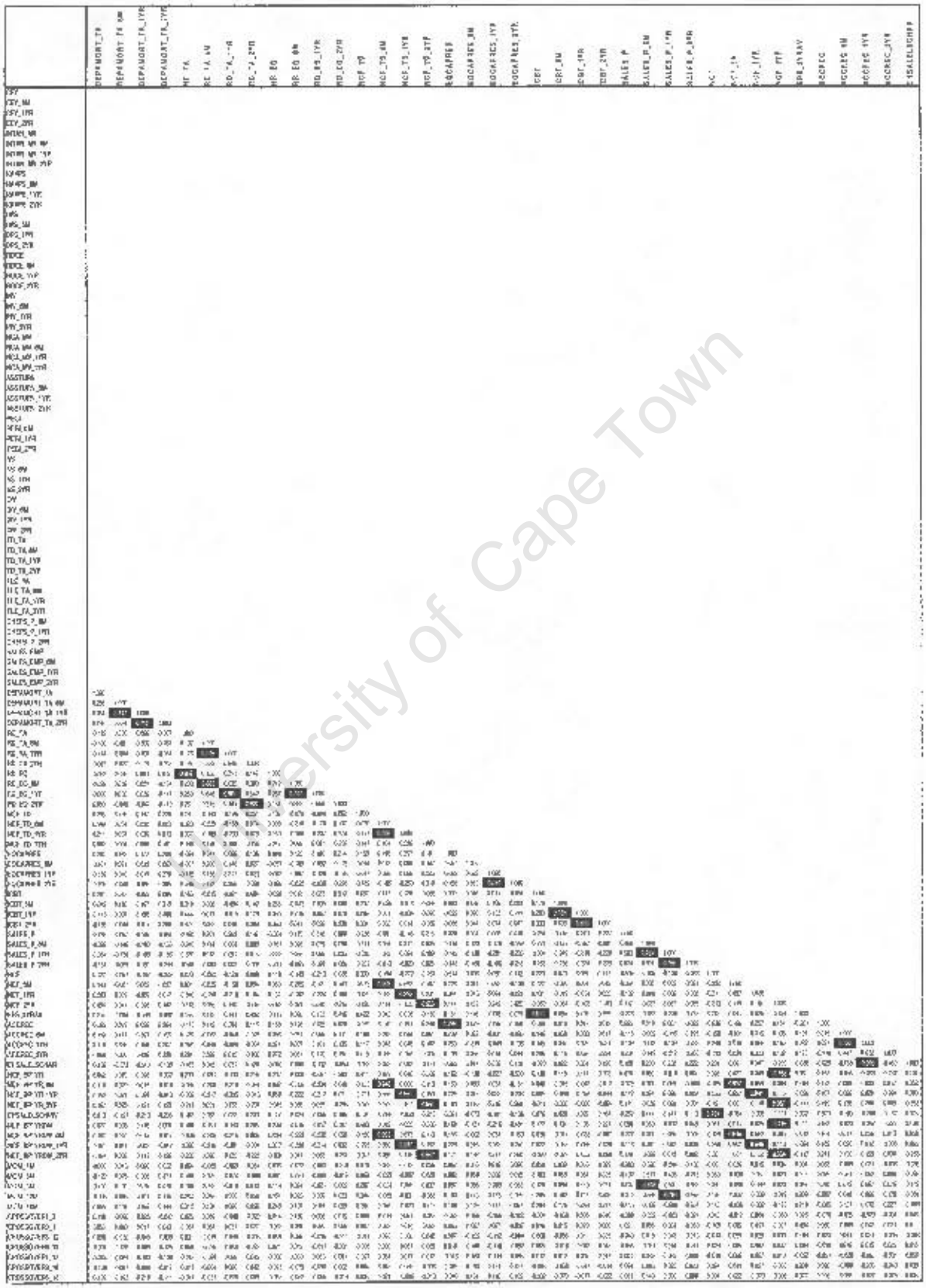


## Appendix A.5.: Pearson correlation matrix for firm-specific variables
-continued



University of Cape Town

## Appendix A.5.: Pearson correlation matrix for firm-specific variables
-continued



University of Cape Town

## Appendix A.5.: Pearson correlation matrix for firm-specific variables

-continued



University of Cape Town

# Appendix B

Appendices contained in Appendix B refer to Chapter Five, Exploratory Analysis and Market Risk Decomposition.

**Appendix B.1.: Datastream International industry classification levels**

Shows the six industry levels at which Datastream International classifies each company. Datastream International is available at the University of Cape Town.

| | |
|---|---|
| **Level 1** | Market Data |
| **Level 2** | Non-Financials<br>Non-Financials excluding Resources<br>Resources<br>Financials |
| **Level 3** | Basic Industries<br>Cyclical Consumer Goods<br>Cyclical Services<br>General Industrials<br>Information Technology<br>Non-cyclical Consumer Goods<br>Non-cyclical Services<br>Resources<br>Financials<br>Utilities |
| **Level 4** | Comprises up to 39 sectors. Based on the FTSE Actuaries system |
| **Level 5** | Comprises up to 11 FTSE Actuaries sub-sectors. Several level 4 groups are broken down at this level into more detailed descriptions used by the London Stock Exchange |
| **Level 6** | Level 6 sectors have been devised by Datastream where it is belived that more detailed descriptions than those provided at levels 4 an 5 are appropriate |

University of Cape Town

## Appendix B.2.: FTSE Actuaries classification structure

The table presents the Datastream International Tokyo Stock Exchange (TSE) sector and sub-sector indices for classification levels three to five. Levels three to five represent the FTSE Actuaries classification structure used by Datastream International while level six displays the Datastream customised classification structure. The data are obtained from Datastream International, available at the University of Cape Town.

| LEVEL 3 | | LEVEL 4 | | LEVEL 5 | | LEVEL 6 | |
|---|---|---|---|---|---|---|---|
| | | FTA Sectors | | Stock Exchange Sub-Sectors | | Datastream Sub-Sectors | |
| RESOR | Resources | Mining | MINNG | Gold Mining | GOLDS | Gold Mining | GOLDS |
| | | | | Mining Finance | MIFIN | Mining Finance | MIFIN |
| | | | | Other Mineral Extractors | MINES | Other Mineral Extractors | MINES |
| | | Oil & Gas | OILGS | Oil & Gas Exploration & Production | OILEP | Oil & Gas exploration & Production | OILEP |
| | | | | Oil Services | OILSV | Oil Services | OILSV |
| | | | | Oil Integrated | OILIN | Oil Integrated | OILIN |
| BASIC | Basic Industries | Chemicals | CHMCL | Chemicals, Commodity | CHEMS | Chemicals, Commodity | CHEMS |
| | | | | Chemicals, Advanced Materials | CHMAV | Chemicals, Advanced Materials | CHMAV |
| | | | | Chemicals Specialty | CHMSP | Chemicals, Speciality | CHMSP |
| | | Construction & Building Materials | CNSDM | Builders Merchants | BMERC | Builders Merchants | BMERC |
| | | | | Building & Construction Materials | BMATS | Building & Construction Materials | BMATS |
| | | | | House Building | HOUSE | House Building | HOUSE |
| | | | | Other Construction | OTHCN | Other Construction | OTHCN |
| | | Forestry & Paper | FSTPA | Forestry | FORST | Forestry | FORST |
| | | | | Paper | PAPER | Paper | PAPER |
| | | Steel & Other Metals | STLOM | Non-Ferrous Metals | NOFMS | Non-Ferrous Metals | NOFMS |
| | | | | Steel | STEEL | Steel | STEEL |
| GENIN | General Industrials | Aerospace & Defense | AEHSP | Aerospace | AEROS | Aerospace | AEROS |
| | | | | Defense | DEFEN | Defence | DEFEN |
| | | Diversified Industrials | DIVIN | Diversified Industrials | DIVIN | Diversified Industrials | DIVIN |
| | | Electronic & Electrical Equipment | ELTNC | Electrical Equipment | ELEQP | Electrical Equipment | ELEQP |
| | | | | Electronic Equipment | ELETR | Electronic Equipment | ELETR |
| | | Engineering & Machinery | ENGEN | Commercial Vehicles | COMMV | Commercial Vehicles | COMMV |
| | | | | Eng. Contractors | ENGCO | Eng. Contractors | ENGCO |
| | | | | Eng. Fabricators | ENGFA | Eng. Fabricators | ENGFA |
| | | | | Eng. General | ENGIN | Eng. General | ENGIN |
| CYCGD | Cyclical Consumer Goods | Automobiles & Parts | AUTMB | Automobiles | AUTOS | Automobiles | AUTOS |
| | | | | Auto Parts | AUPRT | Auto Parts | AUPRT |
| | | | | Tyres & Rubber | TYRES | Tyres & Rubber | TYRES |
| | | | | Vehicle Distribution | DSVHL | Vehicle Distribution | DSVHL |
| | | Household Goods and Textiles | HHOLD | Clothing & Footwear | CLTHG | Clothing & Footwear | CLTHG |
| | | | | Furnishings & Floor coverings | FURFL | Furnishings & Floor coverings | FURFL |
| | | | | Consumer Electronics | CNELE | Consumer Electronics | CNELE |
| | | | | Household Appliances & Housewares | HAPPL | Household Appliances & Housewares | HAPPL |
| | | | | Leisure Equipment | LSREQ | Leisure Equipment | LSREQ |
| | | | | Textiles & Leather | TEXOT | Textiles & Leather | TEXOT |
| NCYCG | Non-Cyclical Consumer Goods | Beverages | BEVES | Brewers | BREWS | Brewers | BREWS |
| | | | | Distillers & Vintners | DISTV | Distillers & Vintners | DISTV |
| | | | | Soft Drinks | SOFTD | Soft Drinks | SOFTD |
| | | Food Producers & Processors | FOODS | Farming & Fishing | FMFSH | Farming & Fishing | FMFSH |
| | | | | Food Processors | FDPRD | Food Processors | FDPRD |
| | | Health | HLTHC | Health Maintenance Organisations | HMORG | Health Maintenance Organisations | HMORG |
| | | | | Hospital Management | HOSPM | Hospital Management | HOSPM |
| | | | | Medical Equipment & Supplies | MDEQ | Medical Equipment & Supplies | MDEQ |
| | | | | Other Health Care | OTHCR | Other Health Care | OTHCR |
| | | Personal Care & Household Products | PERSH | Household Products | HSEPR | Household Products | HSEPR |
| | | | | Personal Products | PRNSL | Personal Products | PRNSL |
| | | Pharmaceuticals | PHARM | Biotechnology | BIOTC | Biotechnology | BIOTC |
| | | | | Pharmaceuticals | PHRMC | Pharmaceuticals | PHRMC |
| | | Tobacco | TOBAC | Tobacco | TOBAC | Tobacco | TOBAC |

University of Cape Town

## Appendix B.2.: FTSE Actuaries classification structure
-continued

| LEVEL 3 | | LEVEL 4 | | LEVEL 5 | | LEVEL 6 | |
|---|---|---|---|---|---|---|---|
| | | FTA Sectors | | Stock Exchange Sub-Sectors | | Datastream Sub-Sectors | |
| CYCER | Cyclical Services | Retailers | RTAIL | Discount & Super Stores & Warehouses | DSCST | Discount & Super Stores & Warehouses | DSCST |
| | | | | Retailers, E-Commerce | ERETL | Retailers, E-Commerce | ERETL |
| | | | | Retailers, Hardlines | HARDL | Retailers, Hardlines | HARDL |
| | | | | Retailers Multi Department | MULTI | Retailers Multi Department | MULTI |
| | | | | Retailers-Soft Goods | SOFTG | Retailers-Soft Goods | SOFTG |
| | | Leisure and Hotels | LESUR | Gambling | GAMNG | Gambling | GAMNG |
| | | | | Hotels | HOTEL | Hotels | HOTEL |
| | | | | Leisure Facilities | LEISR | Leisure Facilities | LEISR |
| | | | | Restaurants & Pubs | RESTS | Restaurants & Pubs | RESTS |
| | | Media and Entertainment | MEDIA | Television, Radio and Filmed Entertainment | TVRFE | Television, Radio and Filmed Entertainment | TVRFE |
| | | | | Subscription Entertainment Networks | SUBEN | Subscription Entertainment Networks | SUBEN |
| | | | | Media Agencies | MEDAG | Media Agencies | MEDAG |
| | | | | Photography | PHOTO | Photography | PHOTO |
| | | | | Publishing & Printing | PUBLS | Publishing & Printing | PUBLS |
| | | Support Services | SUPSV | Business Support Services | BUSUP | Business Support Services | BUSUP |
| | | | | Delivery Services | DELSV | Delivery Services | DELSV |
| | | | | Education, Training | EDUTR | Education , Training | EDUTR |
| | | | | Environmental Control | WASTE | Environmental Control | WASTE |
| | | | | Transaction and Payroll Services | TRPRSE | Transaction and Payroll Services | TRPRSE |
| | | | | Security & Alarm | SECAL | Security & Alarm | SECAL |
| | | Transport | TRNSP | Airlines & Airports | AIRLN | Airlines & Airports | AIRLN |
| | | | | Rail, Road & Freight | RROAD | Rail, Road & Freight | RROAD |
| | | | | Shipping & Ports | SHPNG | Shipping & Ports | SHPNG |
| NCYCR | Non-Cyclical Services | Food & Drug Retailers | FDRET | Food & Drug Retailers | FDRET | Food & Drug Retailers | FDRET |
| | | Telecom Services | TELCM | Telecom, Fixed Line | TELFL | Telecom, Fixed Line | TELFL |
| | | | | Telecom Wireless | TELWR | Telecom Wireless | TELWR |
| UTILS | Utilities | Electricity | ELECT | Electricity | ELECT | Electricity | ELECT |
| | | Utilities, Other | UTILO | Gas Distribution | GASDS | Gas Distribution | GASDS |
| | | | | Water | WATER | Water | WATER |
| ITECH | Information Technology | Information Technology, Hardware | INFOR | Computer Hardware | COMPH | Computer Hardware | COMPH |
| | | | | Semiconductors | SEMIC | Semiconductors | SEMIC |
| | | | | Telecom Equipment | TELEQ | Telecom Equipment | TELEQ |
| | | Software & Computer Services | SFTCS | Computer Services | CMPSV | Computer Services | CMPSV |
| | | | | Internet | INTNT | Internet | INTNT |
| | | | | Software | SOFTW | Software | SOFTW |
| TOTLF | Financials | Banks | BANKS | Banks | BANKS | Banks | BANKS |
| | | Insurance | INSUR | Insurance Brokers | INSBR | Insurance Brokers | INSBR |
| | | | | Insurance, Non-Life | INSNL | Insurance, Non-Life | INSNL |
| | | | | Re-Insurance | REINS | Re-Insurance | REINS |
| | | | | Other Insurance | OTHIN | Other Insurance | OTHIN |
| | | Life Assurance | LIFEA | Life Assurance | LIFEA | Life Assurance | LIFEA |
| | | Investment Companies | INVSC | Investment Companies | INVSC | Investment Companies | INVSC |
| | | | | | | Inv. Trust International | ITINT |
| | | Real Estate | REEST | Real Estate Development | RLDEV | Real Estate Development | RLDEV |
| | | | | Property Agencies | PRPAG | Property Agencies | PRPAG |
| | | | | Real Estate Inv. Trusts | REITS | Real Estate Inv. Trusts | REITS |
| | | Specialty & Other Finance | SPFIN | Asset Managers | ASSET | Asset Managers | ASSET |
| | | | | Consumer Finance | CNFIN | Consumer Finance | CNFIN |
| | | | | Investment Banks | INVBK | Investment Banks | INVBK |
| | | | | Mortgage Finance | MORTF | Mortgage Finance | MORTF |
| | | | | Other Financials | MISFI | Other Financials | MISFI |

University of Cape Town

## Appendix B.3.: TSE level six sector and sub sector indices excluded from the analysis

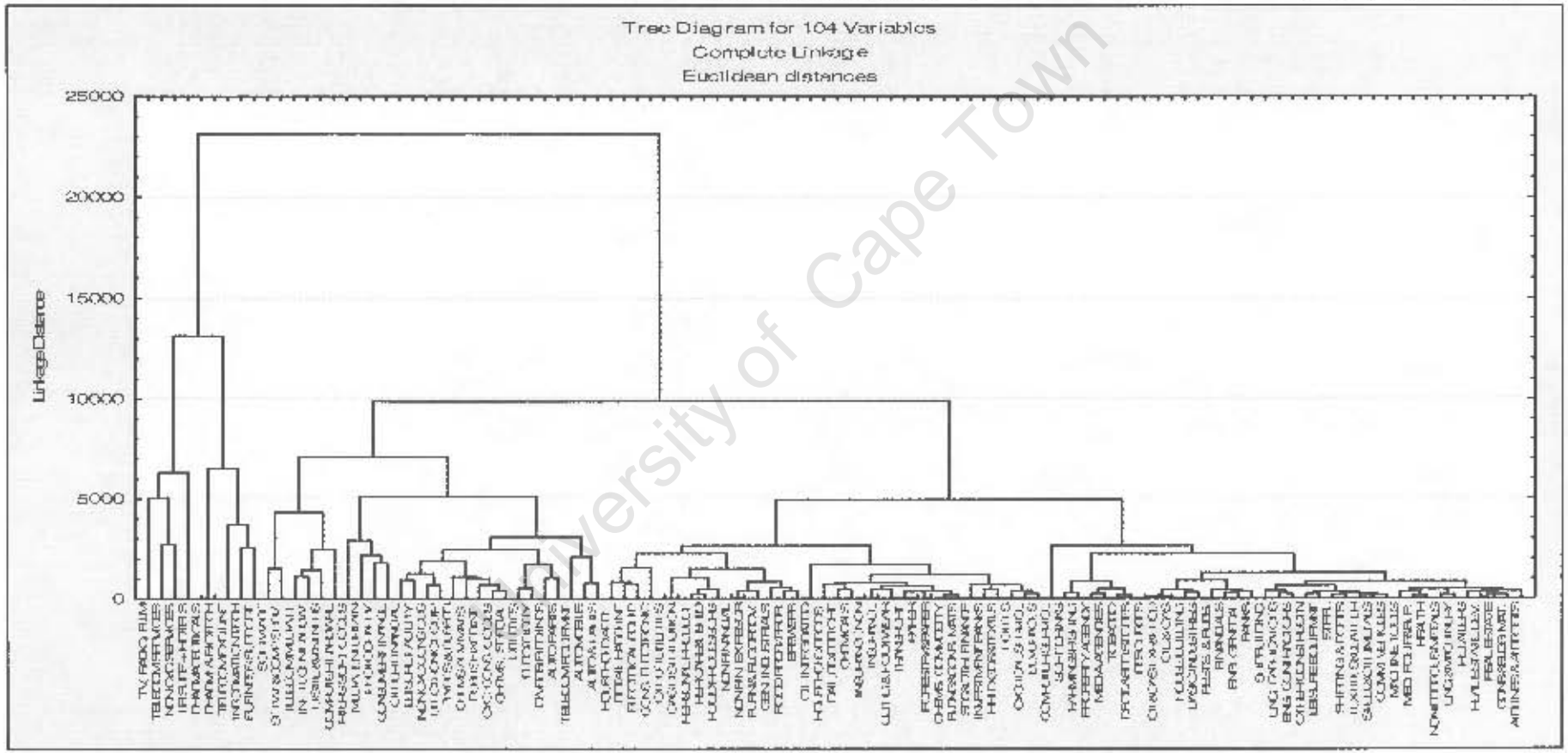
The table shows the initial 123 indices intended to be used in cluster and principle components analyses. The 15 indices removed due to lack of data and the 79 indices removed due to multicollinearity and singularity problems are also displayed.

| All Indexes | | | | Removed for Lack of Data | | Removed due to High Correlation | |
|---|---|---|---|---|---|---|---|
| AIRLINES&AIRPORTS | ELECTRICITY | LEISUREFACILITY | RESOURCES | ASSETMANAGERS | AUTO&PARTS | H'HLDGDS&TEXTLS | RESTS.&PUBS. |
| ASSETMANAGERS | ELECTRONICEQUIP | LIFEASSURANCE | RESTS.&PUBS. | BIOTECHNOLOGY | AUTOMOBILE | HOUSEBUILDING | RTLRSSOFTGOODS |
| AUTO&PARTS | ENG.&MACHINERY | MACHINETOOLS | RETAIL,GENERAL | EDUCATION&TRNG | AUTOPARTS | HOUSEHOLDAPPL. | SEMICONDUCTORS |
| AUTOMOBILE | ENG.CONTRACTORS | MED.EQUIP&SUP. | RETAILERS | ELECTR.EQUIP. | BANKS | INF.TECHN.HARDW. | SFTWR&COMP.SERV. |
| AUTOPARTS | ENG.FABRICATORS | MEDIA,ENTERTAIN | RETAILHARDLINE | INTERNET | BEVERAGES | INSURANCE | SOFTDRINKS |
| BANKS | ENG.GENERAL | MEDIAAGENCIES | RTLRSE | INVEST.COS.(6) | BREWERS | INSURANCE,NON | SOFTWARE |
| BASICINDUSTRIES | FARMING&FISHING | MORTGAGEFINANCE | RTLRSSOFTGOODS | INVESTMENTCOS. | BUSINESSSUPPORT | INVESTMENTBANKS | SPC&OTH.FINANCE |
| BEVERAGES | FINANCIALS | NONCYC.SERVICES | SECURITY&ALARM | LIFEASSURANCE | CHEMICALS | LEISURE+HOTELS | STEEL |
| BIOTECHNOLOGY | FOOD&DRUGRETLRS | NONCYCCONSGDS | SEMICONDUCTORS | MORTGAGEFINANCE | CHEMS.,SPECIAL | LEISUREEQUIPMNT | STEEL&OTH.METALS |
| BLDNG&CONS.MATS | FOODPRDR./PRCR. | NON-FERROUSMETALS | SFTWR&COMP.SERV. | OTH.HEALTHCARE | CHEMS.COMMODITY | LEISUREFACILITY | SUPPORTSERVICES |
| BREWERS | FOODPROCESSORS | NON-FIN.EXPRESOR | SHIPBUILDING | REALESTTINVTT | COMM.VEHICLES | MACHINETOOLS | TELECOM,MEDIA,IT |
| BUSINESSSUPPORT | FORESTRY&PAPER | NON-FINANCIAL | SHIPPING&PORTS | RETAIL,GENERAL | COMPUTERHARDWRE | MED.EQUIP&SUP. | TELECOMEQUIPMNT |
| CHEMICALS | FURN.&FLOORCOV. | OIL&GAS | SOFTDRINKS | RTLRSE | COMPUTERSERVICE | MEDIA,ENTERTAIN | TELECOMFXD.LINE |
| CHEMS.,SPECIAL | GASDISTRIBUTION | OIL&GASEXP&PROD | SOFTWARE | SUB.ENTERTAIN | CONS.&BLDGMAT. | MEDIAAGENCIES | TELECOMSERVICES |
| CHEMS.ADV.MATS. | GEN.INDUSTRIALS | OILINTEGRATED | SPC&OTH.FINANCE | TELECOM,WIRELESS | CONS.ELECTRONIC | NONCYC.SERVICES | TEXTILES&LEATHER |
| CHEMS.COMMODITY | HEALTH | OTH.HEALTHCARE | STEEL | | CYCLICALSERVICE | NONCYCCONSGDS | TV,RADIO,FILM |
| CLTHG.&FOOTWEAR | HHLDGDS&TEXTLS | OTHERCONSTRUCTN | STEEL&OTH.METALS | | DISTIL.&VINTNERS | NON-FERROUSMETALS | UTILITIES |
| COMM.VEHICLES | HOTELS | OTHERFINANCIAL | SUB.ENTERTAIN | | ELECTRICALEQUIP | NON-FIN.EXPRESOR | |
| COMPUTERHARDWRE | HOUSEBUILDING | OTHERUTILITIES | SUPPORTSERVICES | | ELECTRICITY | NON-FINANCIAL | |
| COMPUTERSERVICE | HOUSEHOLDAPPL. | PAPER | TELECOM,MEDIA,IT | | ELECTRONICEQUIP | OIL&GAS | |
| CONS.&BLDGMAT. | HOUSEHOLDPRODS. | PER.CARE&HSHLD | TELECOM,WIRELESS | | ENG.&MACHINERY | OIL&GASEXP&PROD | |
| CONS.ELECTRONIC | INF.TECHN.HARDW. | PERSONALPRODUCT | TELECOMEQUIPMNT | | ENG.CONTRACTORS | OILINTEGRATED | |
| CONSUMERFINANCE | INFORMATIONTECH | PHARM.&BIOTECH | TELECOMFXD.LINE | | ENG.FABRICATORS | OTHERFINANCIAL | |
| CYC.CONS.GOODS | INSURANCE | PHARMACEUTICALS | TELECOMSERVICES | | ENG.GENERAL | PAPER | |
| CYCLICALSERVICE | INSURANCE,NON | PHOTOGRAPHY | TEXTILES&LEATHER | | FARMING&FISHING | PERSONALPRODUCT | |
| DISTIL.&VINTNERS | INTERNET | PROPERTYAGENCY | TOBACCO | | FOOD&DRUGRETLRS | PHARM.&BIOTECH | |
| DIVERSIFIEDINDS | INVEST.COS.(6) | PUBLISH.&PRINT. | TRANSPORT | | FOODPROCESSORS | PHARMACEUTICALS | |
| DSCT.&SPLSTORES | INVESTMENTBANKS | RAIL,RD,FREIGHT | TV,RADIO,FILM | | FURN.&FLOORCOV. | PROPERTYAGENCY | |
| EDUCATION&TRNG | INVESTMENTCOS. | REALESTATE | TYRES&RUBBER | | GASDISTRIBUTION | RAIL,RD,FREIGHT | |
| ELECTR.EQUIP. | LEISURE+HOTELS | REALESTATEDEV. | UTILITIES | | GEN.INDUSTRIALS | REALESTATE | |
| ELECTRICALEQUIP | LEISUREEQUIPMNT | REALESTTINVTT | | | HEALTH | REALESTATEDEV. | |

University of Cape Town

## Appendix B.4.: Tree diagram for TSE sector and sub-sector indices

The vertical tree diagram displays the results of the cluster analysis using 104 sector and sub-sector indices. Initially 108 indices are used in the cluster analysis, however, due to a large linkage distance, the Security and Alarm, Semiconductors, Support Services and Food and Drug Retailers indices are removed in order to display the remaining clusters more clearly. The full cluster analysis containing all 108 indices is presented in Figure 5.2. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

## Appendix B.5.: Cluster constituents: Three clusters

The table displays the constituents of each cluster in the three cluster breakdown derived from the cluster analysis presented in Figure 5.2. The cluster analysis is performed using 108 TSE sector and sub-sector indices over the 1 January 2001 to 31 December 2004 period. The data are obtained from Datastream International at the University of Cape Town.

| Cluster 1 | Cluster 2 | Cluster 3 | | | | | |
|---|---|---|---|---|---|---|---|
| SECURITY&A_ARM | FOOD&DRUGRETLRS | AIRLINES&AIRPORTS | CONSUMERFINANCE | GEN.INDUSTRIALS | NONCYC.SERVICES | REALESTATEDEV. | TRANSPORT |
| | SEMICONDUCTORS | AUTO&PARTS | CYC.CONS.GOODS | HHLDGDS&TEXTLS | NON-FERROUSMETALS | RESOURCES | TV,RADIO,FILM |
| | SUPPORTSERVICES | AUTOPARTS | CYCLICALSERVICE | HEALTH | NON-FIN.EXRESOR | RESTS.&PUBS. | TYRES&RUBBER |
| | | AUTOMOBILE | DISTIL.&VINTNERS | HOTELS | NON-FINANCIAL | RETAILHARDLINE | UTILITIES |
| | | BANKS | DIVERSIFIEDINDS | HOUSEBUILDING | OIL&GAS | RETAILERS | |
| | | BASICINDUSTRIES | DSCT.&SPR.STORES | HOUSEHOLDAPPL. | OILINTEGRATED | RTLRSSOFTGOODS | |
| | | BEVERAGES | ELECTR.CALEQUIP | HOUSEHOLDPRODS. | OIL&GASEXP&PROD | SFTWR&COMP.SERV. | |
| | | BLDNG&CONS.MATS | ELECTRICITY | INF.TECHN.HARDW. | OTHERCONSTRUCTN | SHIPBUILDING | |
| | | BREWERS | ELECTRONICEQUIP | INFORMATIONTECH | OTHERFINANCIAL | SHIPPING&PORTS | |
| | | BUSINESSSUPPORT | ENG.CONTRACTORS | INSURANCE | OTHERUTILITIES | SOFTDRINKS | |
| | | CHEMICALS | ENG.FABRICATORS | INSURANCE,NON | PAPER | SOFTWARE | |
| | | CHEMS.COMMODITY | ENG.GENERAL | INVESTMENTBANKS | PER.CARE&HSHLD | SPC&OTH.FINANCE | |
| | | CHEMS.SPECIAL | ENG.&MACHINERY | LEISURE+HOTELS | PERSONALPRODUCT | STEEL | |
| | | CHEMS.ADV.MATS. | FARMING&FISHING | LEISUREEQUIPMNT | PHARM.&BIOTECH | STEEL&OTH.METALS | |
| | | CLTHG.&FOOTWEAR | FINANCIALS | LEISUREFACILITY | PHARMACEUTICALS | TELECOMEQUIPMNT | |
| | | COMM.VEHICLES | FOODPRDR./PRCR. | MACHINETOOLS | PHOTOGRAPHY | TELECOMFXD.LINE | |
| | | COMPUTERHARDWRE | FOODPROCESSORS | MED.EQUIP&SUP. | PROPERTYAGENCY | TELECOMSERVICES | |
| | | COMPUTERSERVICE | FORESTRY&PAPER | MEDIAAGENCIES | PUBLISH.&PRINT. | TELECOM.MEDIA,IT | |
| | | CONS.ELECTRONIC | FURN.&FLOORCOV. | MED.ENTERTAIN | RAIL,RD,FREIGHT | TEXTILES&LEATHER | |
| | | CONS.&BLDGMAT. | GASDISTRIBUTION | NONCYCCONSGDS | REAL.ESTATE | TOBACCO | |

University of Cape Town

## Appendix B.6.: Cluster constituents: Four clusters

The table displays the constituents of each cluster in the four cluster breakdown derived from the cluster analysis presented in Figure 5.2. The cluster analysis is performed using 108 TSE sector and sub-sector indices over the 1 January 2001 to 31 December 2004 period. The data are obtained from Datastream International at the University of Cape Town.

| Cluster 1 | Cluster 2 | Cluster 3 | Cluster 4 | | | | |
|---|---|---|---|---|---|---|---|
| SECURITY&ALARM | FOOD&DRUGRETLRS | BUSINESSSUPPORT | AIRLINES&AIRPORTS | CYC.CONS.GOODS | H'HLDGDS&TEXTLS | OIL&GAS | SFTWR&COMP.SERV. |
| | SEMICONDUCTORS | INFORMATIONTECH | AUTO&PARTS | CYCLICALSERVICE | HEALTH | OILINTEGRATED | SHIPBUILDING |
| | SUPPORTSERVICES | LEISURE+HOTELS | AUTOPARTS | DISTIL.&VINTNERS | HOTELS | OIL&GASEXP&PROD | SHIPPING&PORTS |
| | | NONCYC.SERVICES | AUTOMOBILE | DIVERSIFIEDINDS | HOUSEBUILDING | OTHERCONSTRUCTN | SOFTDRINKS |
| | | PHARM.&BIOTECH | BANKS | DSCT.&SPR.STORES | HOUSEHOLDAPPL. | OTHERFINANCIAL | SOFTWARE |
| | | PHARMACEUTICALS | BASICINDUSTRIES | ELECTRICALEQUIP | HOUSEHOLDPRODS. | OTHERUTILITIES | SPC&OTH.FINANCE |
| | | TELECOMFXD.LINE | BEVERAGES | ELECTRICITY | INF.TECHN.HARDW. | PAPER | STEEL |
| | | TELECOMSERVICES | BLDNG&CONS.MATS | ELECTRONICEQUIP | INSURANCE | PER.CARE&HSHLD | STEEL&OTH.METALS |
| | | TV,RADIO,FILM | BREWERS | ENG.CONTRACTORS | INSURANCE,NON | PERSONALPRODUCT | TELECOMEQUIPMNT |
| | | | CHEMICALS | ENG.FABRICATORS | INVESTMENTBANKS | PHOTOGRAPHY | TELECOM,MEDIA,IT |
| | | | CHEMS.COMMODITY | ENG.GENERAL | LEISUREEQUIPMNT | PROPERTYAGENCY | TEXTILES&LEATHER |
| | | | CHEMS.,SPECIAL | ENG.&MACHINERY | LEISUREFACILITY | PUBLISH.&PRINT. | TOBACCO |
| | | | CHEMS.ADV.MATS. | FARMING&FISHING | MACHINETOOLS | RAIL,RD,FREIGHT | TRANSPORT |
| | | | CLTHG.&FOOTWEAR | FINANCIALS | MED.EQUIP&SUP. | REALESTATE | TYRES&RUBBER |
| | | | COMM.VEHICLES | FOODPRDR./PRCR. | MEDIAAGENCIES | REALESTATEDEV. | UTILITIES |
| | | | COMPUTERHARDWRE | FOODPROCESSORS | MEDIA,ENTERTAIN | RESOURCES | |
| | | | COMPUTERSERVICE | FORESTRY&PAPER | NONCYCCONSGDS | RESTS.&PUBS. | |
| | | | CONS.ELECTRONIC | FURN.&FLOORCOV. | NON-FERROUSMETALS | RETAILHARDLINE | |
| | | | CONS.&BLDGMAT. | GASDISTRIBUTION | NON-FIN.EXRESOR | RETAILERS | |
| | | | CONSUMERFINANCE | GEN.INDUSTRIALS | NON-FINANCIAL | RTLRSSOFTGOODS | |

University of Cape Town

## Appendix B.7.: Cluster constituents: Five clusters

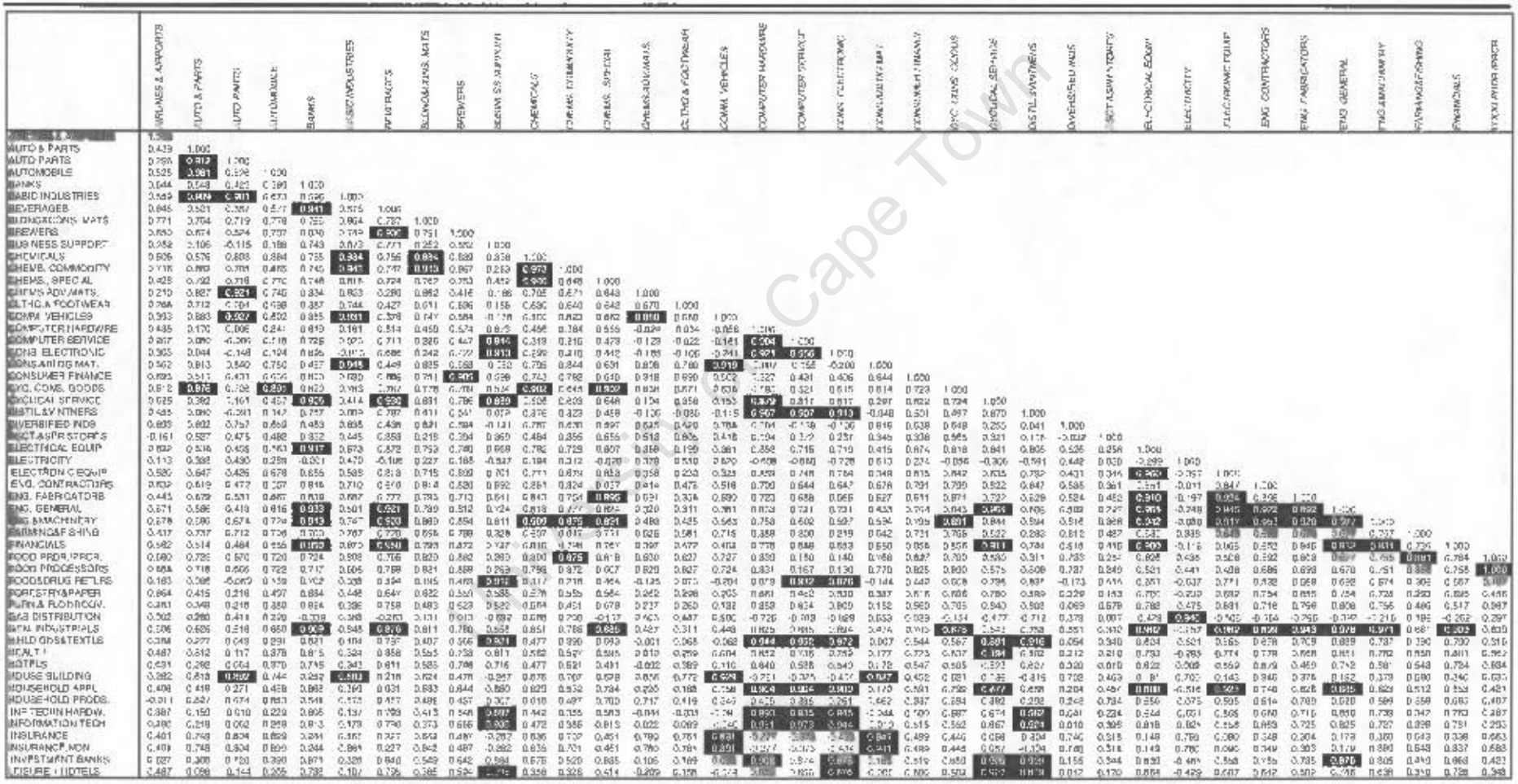
The table displays the constituents of each cluster in the five cluster breakdown derived from the cluster analysis presented in Figure 5.2. The cluster analysis is performed using 108 TSE sector and sub-sector indices over the 1 January 2001 to 31 December 2004 period. The data are obtained from Datastream International at the University of Cape Town.

| Cluster 1 | Cluster 2 | Cluster 3 | Cluster 4 | Cluster 5 | | | | |
|---|---|---|---|---|---|---|---|---|
| SECURITY&ALARM | FOOD&DRUGRETLRS | LE SURE+HOTELS | BUSINESSSUPPORT | AIRLINES&AIRPORTS | CYC.CONS.GOODS | CHLDGDS&TEXTLS | OIL&GAS | SFTWR&COMP.SERV. |
| | SEMICONDUCTORS | NONCYC.SERVICES | INFORMATIONTECH | AUTO&PARTS | CYCLICALSERVICE | HEALTH | OILINTEGRATED | SHIPBUILDING |
| | SUPPORTSERVICES | TELECOMSERVICES | PHARM.&BIOTECH | AUTOPARTS | DIST L.&VINTNERS | HOTELS | OIL&GASEXP&PROD | SHIPPING&PORTS |
| | | TV,RADIO,FILM | PHARMACEUTICALS | AUTOMOBILE | DIVERSIFIEDINDS | HOUSEBUILDING | OTHERCONSTRUCTN | SOFTDRINKS |
| | | | TELECOMFXD.LINE | BANKS | DSCT.&SPRSTORES | HOUSEHOLDAPPL. | OTHERFINANCIAL | SOFTWARE |
| | | | | BAS.INDUSTRIES | ELECTRICALEQUIP | HOUSEHOLDPRODS. | OTHERUTILITIES | SPC&OTHFINANCE |
| | | | | BEVERAGES | ELECTRICITY | INF.TECHN.HARDW. | PAPER | STEEL |
| | | | | BLDNG&CONS.MATS | ELECTRONICEQU'P | INSURANCE | PER.CARE&HSHLD | STEEL&OTH.METALS |
| | | | | BREWERS | ENG.CONTRACTORS | INSURANCE,NON | PERSONALPRODUCT | TELECOMEQUIPMNT |
| | | | | CHEMICALS | ENG.FABRICATORS | INVESTMENTBANKS | PHOTOGRAPHY | TELECOM,MEDIA,IT |
| | | | | CHEMS.COMMODITY | ENG.GENERAL | LEISUREEQUIPMNT | PROPERTYAGENCY | TEXTILES&LEATHER |
| | | | | CHEMS.,SPECIAL | ENG.&MACHINERY | LEISUREFACILITY | PUBLISH.&PRINT | TOBACCO |
| | | | | CHEMS.ADV.MATS. | FARMING&FISHING | MACHINETOOLS | RAIL,RD,FREIGHT | TRANSPORT |
| | | | | CLTHG.&FOOTWEAR | FINANCIALS | MED.EQUIP&SUP. | REALESTATE | TYRES&RUBBER |
| | | | | COMM.VEHICLES | FOODPRDR./PROR. | MEDIAAGENCIES | REALESTATEDEV. | UTILITIES |
| | | | | COMPUTERHARDWRE | FOODPROCESSORS | MEDIA,ENTERTAIN | RESOURCES | |
| | | | | COMPUTERSERVICE | FORESTRY&PAPER | NONCYCCONSGDS | RESTS.&PUBS. | |
| | | | | CONS.ELECTRONIC | FURN.&FLOORCOV. | NON-FERROUSMETALS | RETAILHARDLINE | |
| | | | | CONS.&BLDGMAT. | GASDISTRIBUTION | NON-FIN.EXPRESOR | RETAILERS | |
| | | | | CONSUMERFINANCE | GEN.INDUSTRIALS | NON-FINANCIAL | RTLRSSOFTGOODS | |

University of Cape Town

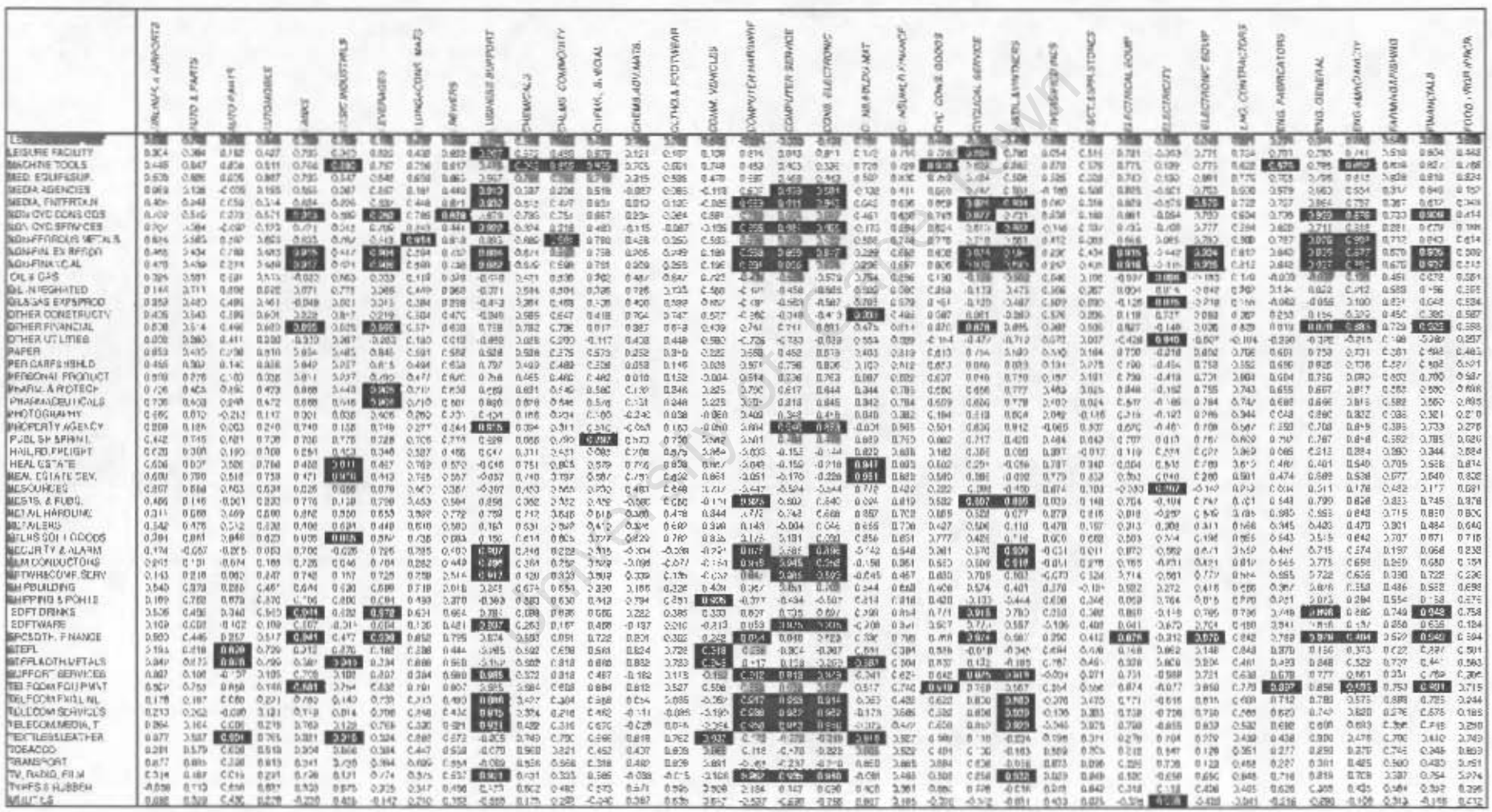
## Appendix B.8.: Pearson correlation matrix for 108 TSE level six indices

The matrix shows the Pearson correlation coefficient for 108 TSE level six sector and sub-sector indices used in the analysis. Correlations greater that 0.875 and less than -0.875 are highlighted with a black background and a white font. Initially the sample contained 123 indices, however, fifteen indices are excluded due to insufficient data. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.



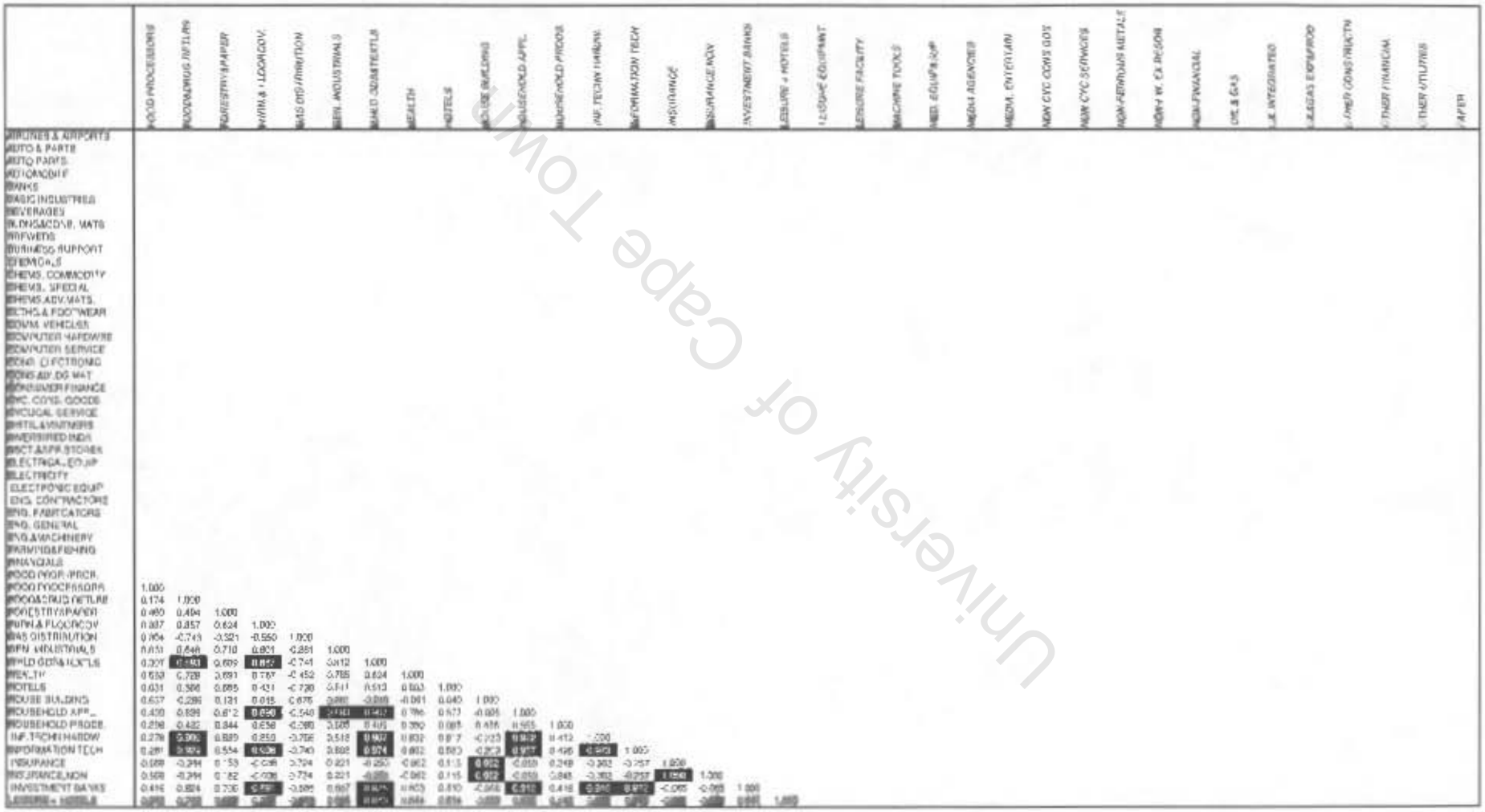
University of Cape Town

## Appendix B.8.: Pearson correlation matrix for 108 TSE level six indexes
-continued



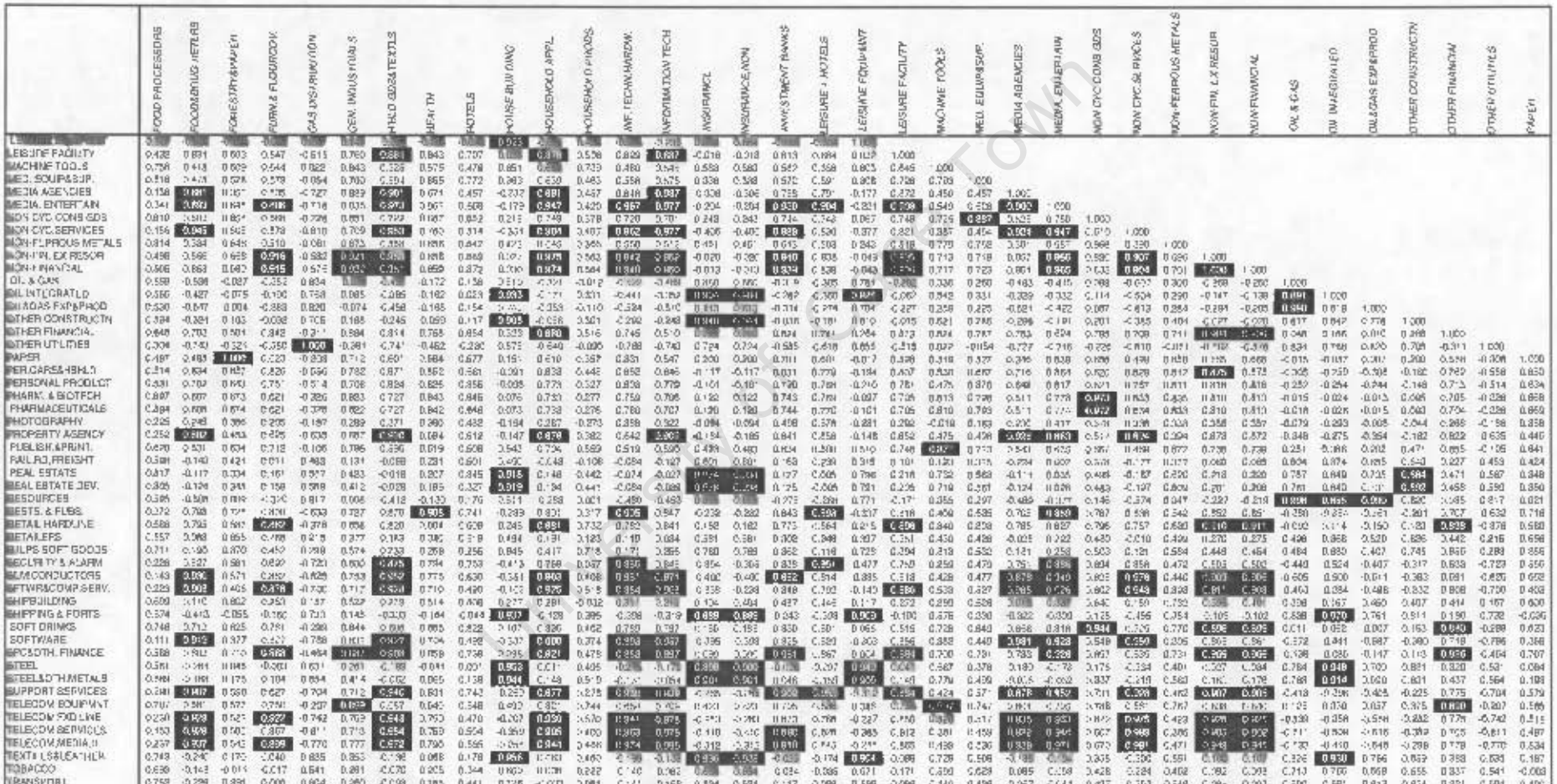
Copyright © Tehran Stock Exchange

## Appendix B.8.: Pearson correlation matrix for 108 TSE level six indexes
-continued



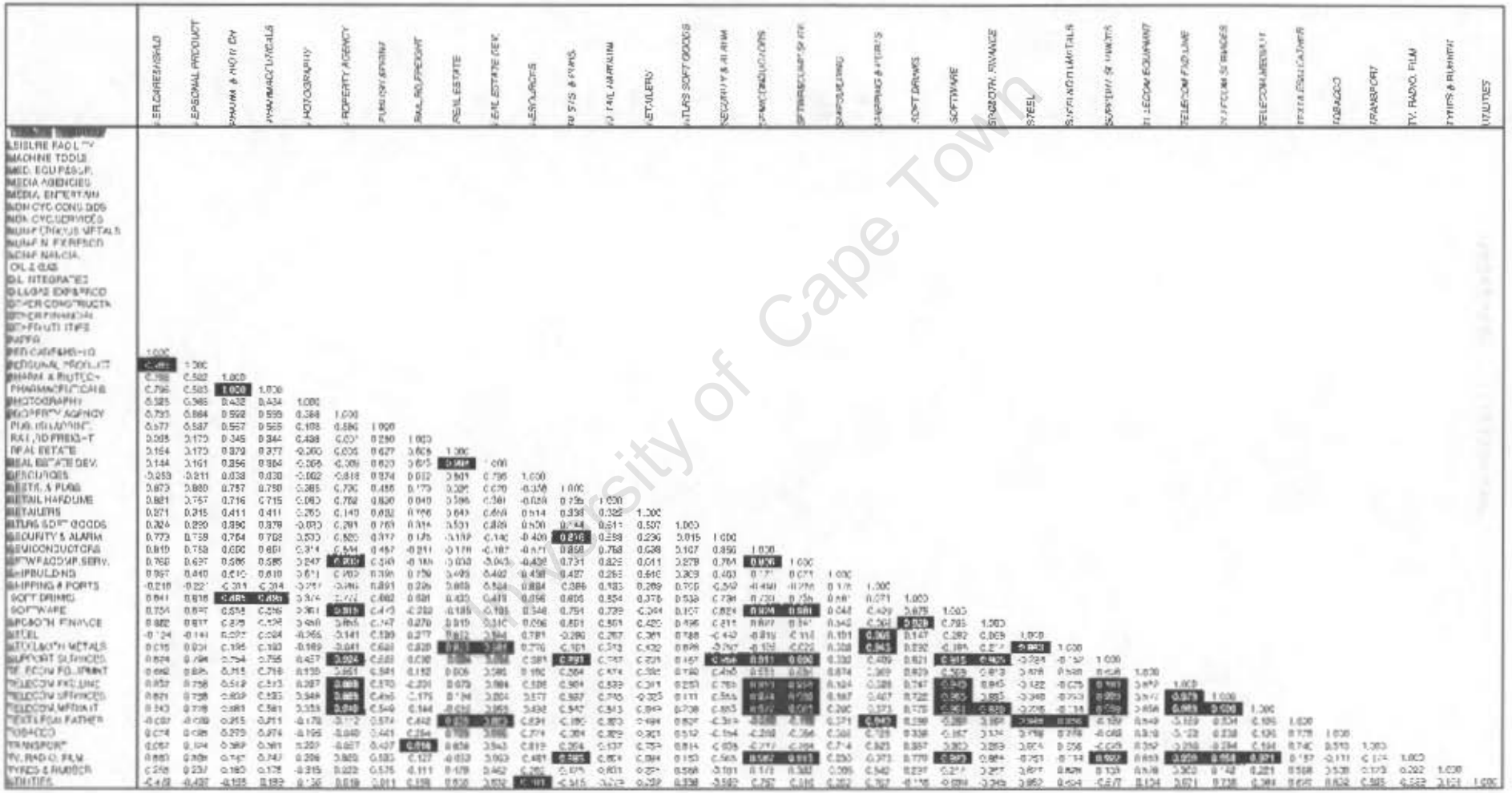
University of Cape Town

## Appendix B.8.: Pearson correlation matrix for 108 TSE level six indexes
-continued



UNIVERSITY OF CAPE TOWN

## Appendix B.8.: Pearson correlation matrix for 108 TSE level six indexes
-continued



University of Cape Town

## Appendix B.9.: Pearson correlation matrix for 29 TSE level six indices

The matrix shows the Pearson correlation coefficient for 29 TSE level six sector and sub-sector indices used in the principal components analysis. All indices have a Pearson correlation coefficient greater that 0.875 and less than -0.875 and are thus not highly correlated with one another. In total, 79 indices are removed due to a high correlation with indices which rank higher in the classification structure,. The removal procedure is performed as a result of multicollinearity and singularity problems. The analysis

| | AIRLINES & AIRPORTS | BASIC INDUSTRIES | BLDNG&CONS. MATS | CHEMS.ADV.MATS. | CLTHG.& FOOTWEAR | CONSUMER FINANCE | CYC. CONS. GOODS | DIVERSIFIED INDS | DSCT.&SPR.STORES | FINANCIALS | FOOD PROR./PROR. | FORESTRY&PAPER | HOTELS | HOUSEHOLD PRODS. | INFORMATION TECH | OTHER CONSTRUCTN | OTHER UTILITIES | PER.CARE&HSHLD | PHOTOGRAPHY | PUBLISH.&PRINT. | RESOURCES | RETAIL HARDLINE | RETAILERS | SECURITY & ALARM | SHIPBUILDING | SHIPPING & PORTS | TOBACCO | TRANSPORT | TYRES & RUBBER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AIRLINES & AIRPORTS | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BASIC INDUSTRIES | 0.583 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BLDNG&CONS. MATS | 0.775 | 0.874 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CHEMS.ADV.MATS. | 0.190 | 0.830 | 0.640 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLTHG.& FOOTWEAR | 0.252 | 0.696 | 0.461 | 0.529 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSUMER FINANCE | 0.699 | 0.659 | 0.732 | 0.266 | 0.656 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | |
| CYC. CONS. GOODS | 0.504 | 0.783 | 0.764 | 0.613 | 0.538 | 0.703 | 1.000 | | | | | | | | | | | | | | | | | | | | | | |
| DIVERSIFIED INDS | 0.755 | 0.786 | 0.832 | 0.601 | 0.269 | 0.478 | 0.529 | 1.000 | | | | | | | | | | | | | | | | | | | | | |
| DSCT.&SPR.STORES | -0.178 | 0.439 | 0.192 | 0.503 | 0.609 | 0.313 | 0.576 | -0.121 | 1.000 | | | | | | | | | | | | | | | | | | | | |
| FINANCIALS | 0.858 | 0.680 | 0.787 | 0.370 | 0.447 | 0.855 | 0.852 | 0.506 | 0.401 | 1.000 | | | | | | | | | | | | | | | | | | | |
| FOOD PROR./PROR. | 0.737 | 0.748 | 0.836 | 0.483 | 0.536 | 0.825 | 0.687 | 0.641 | 0.228 | 0.794 | 1.000 | | | | | | | | | | | | | | | | | | |
| FORESTRY&PAPER | 0.675 | 0.589 | 0.750 | 0.304 | 0.390 | 0.691 | 0.664 | 0.470 | 0.174 | 0.738 | 0.806 | 1.000 | | | | | | | | | | | | | | | | | |
| HOTELS | 0.634 | 0.266 | 0.493 | -0.168 | 0.322 | 0.838 | 0.474 | 0.234 | 0.038 | 0.716 | 0.809 | 0.646 | 1.000 | | | | | | | | | | | | | | | | |
| HOUSEHOLD PRODS. | -0.027 | 0.593 | 0.484 | 0.714 | 0.408 | 0.318 | 0.690 | 0.212 | 0.731 | 0.557 | 0.401 | 0.383 | 0.056 | 1.000 | | | | | | | | | | | | | | | |
| INFORMATION TECH | 0.305 | 0.268 | 0.419 | 0.051 | 0.126 | 0.574 | 0.705 | 0.081 | 0.419 | 0.618 | 0.406 | 0.550 | 0.633 | 0.517 | 1.000 | | | | | | | | | | | | | | |
| OTHER CONSTRUCTN | 0.396 | 0.784 | 0.567 | 0.681 | 0.705 | 0.438 | 0.336 | 0.611 | 0.266 | 0.279 | 0.499 | 0.248 | 0.025 | 0.274 | -0.224 | 1.000 | | | | | | | | | | | | | |
| OTHER UTILITIES | -0.045 | 0.225 | 0.021 | 0.339 | 0.326 | -0.110 | -0.300 | 0.191 | -0.059 | -0.381 | 0.102 | -0.295 | -0.390 | -0.160 | -0.777 | 0.654 | 1.000 | | | | | | | | | | | | |
| PER.CARE&HSHLD | 0.464 | 0.325 | 0.528 | 0.078 | 0.185 | 0.657 | 0.689 | 0.192 | 0.293 | 0.832 | 0.636 | 0.657 | 0.698 | 0.459 | 0.847 | -0.152 | -0.592 | 1.000 | | | | | | | | | | | |
| PHOTOGRAPHY | 0.597 | 0.182 | 0.372 | -0.200 | 0.157 | 0.493 | 0.259 | 0.209 | -0.099 | 0.395 | 0.410 | 0.339 | 0.564 | -0.266 | 0.310 | 0.043 | -0.065 | 0.320 | 1.000 | | | | | | | | | | |
| PUBLISH.&PRINT. | 0.436 | 0.758 | 0.683 | 0.540 | 0.686 | 0.728 | 0.653 | 0.420 | 0.637 | 0.791 | 0.581 | 0.711 | 0.470 | 0.658 | 0.655 | 0.410 | -0.271 | 0.622 | 0.191 | 1.000 | | | | | | | | | |
| RESOURCES | 0.386 | 0.567 | 0.395 | 0.445 | 0.556 | 0.330 | 0.099 | 0.533 | 0.027 | 0.219 | 0.425 | 0.108 | 0.039 | -0.089 | -0.462 | 0.804 | 0.771 | -0.286 | 0.123 | 0.133 | 1.000 | | | | | | | | |
| RETAIL HARDLINE | 0.302 | 0.522 | 0.569 | 0.345 | 0.432 | 0.684 | 0.849 | 0.197 | 0.607 | 0.866 | 0.580 | 0.644 | 0.587 | 0.732 | 0.896 | 0.047 | -0.545 | 0.869 | 0.150 | 0.820 | -0.242 | 1.000 | | | | | | | |
| RETAILERS | 0.638 | 0.632 | 0.693 | 0.318 | 0.723 | 0.716 | 0.419 | 0.510 | 0.147 | 0.477 | 0.581 | 0.673 | 0.515 | 0.110 | 0.096 | 0.640 | 0.200 | 0.275 | 0.290 | 0.627 | 0.578 | 0.314 | 1.000 | | | | | | |
| SECURITY & ALARM | 0.505 | 0.070 | 0.349 | -0.305 | 0.036 | 0.636 | 0.446 | 0.073 | 0.038 | 0.721 | 0.377 | 0.575 | 0.838 | 0.082 | 0.845 | -0.275 | -0.730 | 0.777 | 0.519 | 0.456 | -0.383 | 0.654 | 0.258 | 1.000 | | | | | |
| SHIPBUILDING | 0.855 | 0.527 | 0.718 | 0.123 | 0.290 | 0.675 | 0.386 | 0.588 | -0.145 | 0.572 | 0.720 | 0.644 | 0.598 | -0.050 | 0.237 | 0.386 | 0.288 | 0.414 | 0.701 | 0.369 | 0.432 | 0.238 | 0.618 | 0.444 | 1.000 | | | | |
| SHIPPING & PORTS | 0.133 | 0.737 | 0.437 | 0.831 | 0.560 | 0.192 | 0.391 | 0.570 | 0.334 | 0.102 | 0.401 | 0.029 | -0.244 | 0.402 | -0.315 | 0.790 | 0.657 | -0.228 | -0.191 | 0.284 | 0.748 | 0.004 | 0.294 | -0.550 | 0.106 | 1.000 | | | |
| TOBACCO | 0.370 | 0.596 | 0.466 | 0.412 | 0.556 | 0.576 | 0.409 | 0.515 | 0.179 | 0.401 | 0.645 | 0.224 | 0.263 | 0.253 | 0.022 | 0.543 | 0.368 | 0.244 | 0.091 | 0.401 | 0.556 | 0.270 | 0.468 | -0.017 | 0.324 | 0.590 | 1.000 | | |
| TRANSPORT | 0.684 | 0.695 | 0.677 | 0.448 | 0.659 | 0.660 | 0.332 | 0.630 | 0.066 | 0.403 | 0.722 | 0.455 | 0.394 | 0.038 | -0.130 | 0.812 | 0.551 | 0.087 | 0.396 | 0.370 | 0.831 | 0.074 | 0.772 | 0.021 | 0.719 | 0.567 | 0.538 | 1.000 | |
| TYRES & RUBBER | -0.105 | 0.480 | 0.248 | 0.536 | 0.520 | 0.284 | 0.635 | 0.086 | 0.649 | 0.315 | 0.253 | 0.250 | 0.069 | 0.670 | 0.339 | 0.172 | -0.156 | 0.338 | -0.239 | 0.639 | 0.040 | 0.607 | 0.214 | -0.035 | -0.177 | 0.422 | 0.360 | 0.203 | 1.000 |

University of Cape Town

## Appendix B.10.: TSE share indices' un-rotated loadings for five factors

The table displays the results of the principal components analysis using 29 sector and sub-sector indices for the period 1 January 2001 to 31 December 2004. The indices are sorted according to the absolute value of the associated factor loading. Initially 123 indices are included, 15 are removed due to insufficient data and 79 are removed due to multicollinearity and singularity problems. The data are obtained from Datastream International at the University of Cape Town.

| Factor 1 | | Factor 2 | | Factor 3 | | Factor 4 | | Factor 5 | |
|---|---|---|---|---|---|---|---|---|---|
| Index | Loading | Index | Loading | Index | Loading | Index | Loading | Index | Loading |
| BLDNG&CONS. MATS | 0.903 | OTHER UTILITIES | -0.926 | HOUSEHOLD PRODS. | -0.742 | CLTHG.& FOOTWEAR | -0.543 | TOBACCO | 0.592 |
| CONSUMER FINANCE | 0.902 | RESOURCES | -0.838 | TYRES & RUBBER | -0.733 | DIVERSIFIED INDS | 0.540 | FORESTRY&PAPER | -0.292 |
| FINANCIALS | 0.898 | SHIPPING & PORTS | -0.798 | DSCT.&SPR.STORES | -0.726 | DSCT.&SPR.STORES | -0.347 | FOOD PRDR./PRCR. | 0.292 |
| FOOD PRDR./PRCR. | 0.882 | INFORMATION TECH | 0.772 | SHIPBUILDING | 0.625 | BLDNG&CONS. MATS | 0.336 | RETAILERS | -0.291 |
| BASIC INDUSTRIES | 0.880 | SECURITY & ALARM | 0.769 | PHOTOGRAPHY | 0.617 | CHEMS.ADV.MATS. | 0.329 | PUBLISH.&PRINT. | -0.222 |
| CYC. CONS. GOODS | 0.865 | OTHER CONSTRUCTN | -0.744 | AIRLINES & AIRPORTS | 0.581 | RETAILERS | -0.310 | PER.CARE&HSHLD | 0.218 |
| PUBLISH.&PRINT. | 0.858 | PER.CARE&HSHLD | 0.630 | CHEMS.ADV.MATS. | -0.529 | HOTELS | -0.279 | OTHER CONSTRUCTN | -0.153 |
| FORESTRY&PAPER | 0.806 | TRANSPORT | -0.571 | HOTELS | 0.420 | CONSUMER FINANCE | -0.265 | SHIPPING & PORTS | 0.125 |
| RETAIL HARDLINE | 0.748 | RETAIL HARDLINE | 0.530 | TRANSPORT | 0.376 | AIRLINES & AIRPORTS | 0.232 | OTHER UTILITIES | 0.116 |
| AIRLINES & AIRPORTS | 0.729 | CHEMS.ADV.MATS. | -0.493 | RETAIL HARDLINE | -0.367 | BASIC INDUSTRIES | 0.183 | HOTELS | 0.111 |
| RETAILERS | 0.727 | HOTELS | 0.441 | SHIPPING & PORTS | -0.360 | HOUSEHOLD PRODS. | 0.171 | CLTHG.& FOOTWEAR | -0.107 |
| CLTHG.& FOOTWEAR | 0.679 | DIVERSIFIED INDS | -0.363 | SECURITY & ALARM | 0.326 | TOBACCO | -0.171 | CONSUMER FINANCE | 0.106 |
| SHIPBUILDING | 0.678 | FINANCIALS | 0.357 | PUBLISH.&PRINT. | -0.319 | RESOURCES | -0.164 | BASIC INDUSTRIES | -0.084 |
| PER.CARE&HSHLD | 0.676 | BASIC INDUSTRIES | -0.356 | CYC. CONS. GOODS | -0.313 | TYRES & RUBBER | -0.160 | DSCT.&SPR.STORES | -0.081 |
| TRANSPORT | 0.674 | TOBACCO | -0.349 | RETAILERS | 0.250 | OTHER UTILITIES | -0.151 | FINANCIALS | 0.064 |
| DIVERSIFIED INDS | 0.661 | CLTHG.& FOOTWEAR | -0.348 | CLTHG.& FOOTWEAR | -0.231 | TRANSPORT | -0.149 | BLDNG&CONS. MATS | -0.058 |
| HOTELS | 0.658 | RETAILERS | -0.276 | RESOURCES | 0.227 | PHOTOGRAPHY | -0.145 | SHIPBUILDING | -0.056 |
| TOBACCO | 0.590 | FORESTRY&PAPER | 0.209 | DIVERSIFIED INDS | 0.221 | CYC. CONS. GOODS | 0.133 | CHEMS.ADV.MATS. | -0.053 |
| INFORMATION TECH | 0.577 | CYC. CONS. GOODS | 0.203 | CONSUMER FINANCE | 0.201 | SHIPPING & PORTS | 0.132 | AIRLINES & AIRPORTS | -0.052 |
| CHEMS.ADV.MATS. | 0.569 | PHOTOGRAPHY | 0.179 | BASIC INDUSTRIES | -0.185 | PUBLISH.&PRINT. | -0.106 | RETAIL HARDLINE | 0.045 |
| OTHER CONSTRUCTN | 0.555 | PUBLISH.&PRINT. | 0.160 | FOOD PRDR./PRCR. | 0.172 | SECURITY & ALARM | -0.090 | TYRES & RUBBER | 0.044 |
| HOUSEHOLD PRODS. | 0.541 | CONSUMER FINANCE | 0.127 | INFORMATION TECH | -0.167 | FINANCIALS | 0.086 | TRANSPORT | -0.043 |
| SECURITY & ALARM | 0.500 | BLDNG&CONS. MATS | -0.115 | FORESTRY&PAPER | 0.141 | FORESTRY&PAPER | 0.082 | SECURITY & ALARM | -0.025 |
| TYRES & RUBBER | 0.425 | HOUSEHOLD PRODS. | 0.098 | BLDNG&CONS. MATS | 0.106 | SHIPBUILDING | 0.079 | HOUSEHOLD PRODS. | 0.024 |
| DSCT.&SPR.STORES | 0.422 | SHIPBUILDING | -0.072 | OTHER UTILITIES | 0.097 | OTHER CONSTRUCTN | -0.068 | RESOURCES | 0.024 |
| PHOTOGRAPHY | 0.402 | FOOD PRDR./PRCR. | -0.063 | OTHER CONSTRUCTN | -0.029 | FOOD PRDR./PRCR. | 0.061 | DIVERSIFIED INDS | 0.019 |
| SHIPPING & PORTS | 0.387 | TYRES & RUBBER | 0.055 | PER.CARE&HSHLD | -0.020 | INFORMATION TECH | 0.049 | PHOTOGRAPHY | -0.016 |
| RESOURCES | 0.362 | DSCT.&SPR.STORES | 0.045 | TOBACCO | -0.007 | RETAIL HARDLINE | -0.040 | INFORMATION TECH | 0.009 |
| OTHER UTILITIES | -0.090 | AIRLINES & AIRPORTS | -0.018 | FINANCIALS | -0.006 | PER.CARE&HSHLD | 0.033 | CYC. CONS. GOODS | -0.002 |
| Expl.Var | 13.102 | Expl.Var | 6.281 | Expl.Var | 4.284 | Expl.Var | 1.525 | Expl.Var | 0.828 |
| Prp.Totl | 0.452 | Prp.Totl | 0.217 | Prp.Totl | 0.148 | Prp.Totl | 0.053 | Prp.Totl | 0.029 |

University of Cape Town

## Appendix B.11.: TSE share indices' varimax rotated loadings for five factors

The table displays the results of the principal components analysis using 29 sector and sub-sector indices for the period 1 January 2001 to 31 December 2004. The indices are sorted according to the absolute value of the associated factor loading. The loadings are varimax rotated. Initially 123 indices are included, 15 are removed due to insufficient data and 79 are removed due to multicollinearity and singularity problems. The data are obtained from Datastream International at the University of Cape Town.

| Factor 1 | | Factor 2 | | Factor 3 | | Factor 4 | | Factor 5 | |
|---|---|---|---|---|---|---|---|---|---|
| Index | Loading | Index | Loading | Index | Loading | Index | Loading | Index | Loading |
| HOTELS | 0.930 | RESOURCES | 0.912 | DSCT.&SPR.STORES | 0.686 | DIVERSIFIED INDS | 0.849 | TOBACCO | 0.684 |
| SECURITY & ALARM | 0.881 | OTHER CONSTRUCTN | 0.845 | HOUSEHOLD PRODS. | 0.671 | BLDNG&CONS. MATS | 0.717 | FOOD PRDR./PRCR. | 0.378 |
| CONSUMER FINANCE | 0.824 | TRANSPORT | 0.812 | TYRES & RUBBER | 0.654 | CHEMS.ADV.MATS. | 0.628 | SHIPPING & PORTS | 0.246 |
| SHIPBUILDING | 0.740 | OTHER UTILITIES | 0.806 | RETAIL HARDLINE | 0.775 | BASIC INDUSTRIES | 0.620 | FORESTRY&PAPER | -0.232 |
| AIRLINES & AIRPORTS | 0.739 | CLTHG.& FOOTWEAR | 0.714 | PUBLISH.&PRINT. | 0.759 | AIRLINES & AIRPORTS | 0.549 | PER.CARE&HSHLD | 0.227 |
| FINANCIALS | 0.731 | SHIPPING & PORTS | 0.679 | CYC. CONS. GOODS | 0.710 | SHIPPING & PORTS | 0.450 | OTHER UTILITIES | 0.191 |
| PHOTOGRAPHY | 0.720 | RETAILERS | 0.659 | CHEMS.ADV.MATS. | 0.592 | FOOD PRDR./PRCR. | 0.446 | CONSUMER FINANCE | 0.187 |
| PER.CARE&HSHLD | 0.712 | INFORMATION TECH | -0.501 | CLTHG.& FOOTWEAR | 0.581 | CYC. CONS. GOODS | 0.429 | RETAILERS | -0.187 |
| FORESTRY&PAPER | 0.690 | BASIC INDUSTRIES | 0.497 | INFORMATION TECH | 0.549 | SHIPBUILDING | 0.409 | RESOURCES | 0.135 |
| INFORMATION TECH | 0.629 | TOBACCO | 0.481 | BASIC INDUSTRIES | 0.518 | FORESTRY&PAPER | 0.390 | PUBLISH.&PRINT. | -0.133 |
| FOOD PRDR./PRCR. | 0.629 | CHEMS.ADV.MATS. | 0.403 | FINANCIALS | 0.502 | FINANCIALS | 0.376 | HOTELS | 0.130 |
| RETAILERS | 0.567 | SECURITY & ALARM | -0.399 | PER.CARE&HSHLD | 0.443 | OTHER CONSTRUCTN | 0.362 | FINANCIALS | 0.121 |
| RETAIL HARDLINE | 0.542 | PER.CARE&HSHLD | -0.349 | CONSUMER FINANCE | 0.364 | HOUSEHOLD PRODS. | 0.327 | TYRES & RUBBER | 0.111 |
| BLDNG&CONS. MATS | 0.524 | SHIPBUILDING | 0.337 | FORESTRY&PAPER | 0.336 | TRANSPORT | 0.316 | DIVERSIFIED INDS | 0.098 |
| PUBLISH.&PRINT. | 0.489 | DIVERSIFIED INDS | 0.328 | SHIPPING & PORTS | 0.332 | PUBLISH.&PRINT. | 0.236 | HOUSEHOLD PRODS. | 0.091 |
| CYC. CONS. GOODS | 0.460 | CONSUMER FINANCE | 0.308 | BLDNG&CONS. MATS | 0.300 | RESOURCES | 0.221 | RETAIL HARDLINE | 0.086 |
| TRANSPORT | 0.426 | FOOD PRDR./PRCR. | 0.303 | FOOD PRDR./PRCR. | 0.267 | TOBACCO | 0.165 | CYC. CONS. GOODS | 0.075 |
| OTHER UTILITIES | -0.395 | BLDNG&CONS. MATS | 0.276 | OTHER UTILITIES | -0.259 | PER.CARE&HSHLD | 0.163 | TRANSPORT | 0.071 |
| SHIPPING & PORTS | -0.339 | AIRLINES & AIRPORTS | 0.241 | PHOTOGRAPHY | -0.248 | DSCT.&SPR.STORES | -0.157 | CHEMS.ADV.MATS. | 0.061 |
| CLTHG.& FOOTWEAR | 0.290 | RETAIL HARDLINE | -0.238 | TOBACCO | 0.238 | RETAIL HARDLINE | 0.147 | SECURITY & ALARM | -0.052 |
| BASIC INDUSTRIES | 0.275 | PUBLISH.&PRINT. | 0.172 | OTHER CONSTRUCTN | 0.208 | CONSUMER FINANCE | 0.135 | BASIC INDUSTRIES | 0.041 |
| DIVERSIFIED INDS | 0.265 | DSCT.&SPR.STORES | 0.154 | RETAILERS | 0.195 | RETAILERS | 0.135 | BLDNG&CONS. MATS | 0.034 |
| TOBACCO | 0.258 | PHOTOGRAPHY | 0.122 | SHIPBUILDING | -0.190 | INFORMATION TECH | 0.103 | OTHER CONSTRUCTN | -0.022 |
| CHEMS.ADV.MATS. | -0.217 | FORESTRY&PAPER | 0.108 | AIRLINES & AIRPORTS | -0.146 | CLTHG.& FOOTWEAR | -0.100 | CLTHG.& FOOTWEAR | 0.019 |
| TYRES & RUBBER | -0.061 | HOUSEHOLD PRODS. | -0.074 | SECURITY & ALARM | 0.129 | OTHER UTILITIES | 0.049 | PHOTOGRAPHY | -0.008 |
| HOUSEHOLD PRODS. | -0.047 | TYRES & RUBBER | 0.056 | RESOURCES | -0.112 | HOTELS | -0.048 | DSCT.&SPR.STORES | -0.007 |
| OTHER CONSTRUCTN | 0.028 | FINANCIALS | -0.050 | HOTELS | 0.102 | PHOTOGRAPHY | 0.034 | SHIPBUILDING | -0.002 |
| RESOURCES | 0.019 | CYC. CONS. GOODS | 0.018 | TRANSPORT | -0.030 | SECURITY & ALARM | -0.028 | INFORMATION TECH | 0.002 |
| DSCT.&SPR.STORES | -0.018 | HOTELS | -0.001 | DIVERSIFIED INDS | 0.001 | TYRES & RUBBER | -0.001 | AIRLINES & AIRPORTS | 0.000 |
| Expl.Var | 6.386 | Expl.Var | 6.122 | Expl.Var | 6.533 | Expl.Var | 3.969 | Expl.Var | 1.009 |
| Prp.Totl | 0.289 | Prp.Totl | 0.211 | Prp.Totl | 0.225 | Prp.Totl | 0.137 | Prp.Totl | 0.035 |

University of Cape Town

## Appendix B.12.: Factors identified in principal components analysis

Displays the TSE sector and sub-sector indices used as a proxy for each of the five identified factors. Selection is based on the promax rotated factor loadings for the period 1 January 2001 to 31 December 2004. The index chosen to proxy for the associated factor is the index with the highest promax rotated facto loading on the respective factor. In addition, closely related indices for each factor are displayed. The data are obtained from DataStream International at the University of Cape Town.

| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| Index chosen as a factor proxy | HOTELS | DSCTSPRSTORES | RESOURCES | DIVERSIFIEDINDS | FOODPRDRPRCR |
| Closely associated sectors | SECURITYALARM<br>CONSUMERFINANCE<br>PERCAREHSHLD<br>FINANCIALS<br>PHOTOGRAPHY<br>SHIPBUILDING<br>FOODPRDRPRCR<br>INFORMATIONTECH<br>AIRLINESAIRPORTS | TYRESRUBBER<br>HOUSEHOLDPRODS<br>RETAILHARDLINE<br>PUBLISHPRINT<br>CYCCONSGOODS | OTHERUTILITIES<br>TRANSPORT<br>CLTHGFOOTWEAR<br>OTHERCONSTRUCTN<br>RETAILERS<br>SHIPPINGPORTS | BLDNGCONSMATS | |

University of Cape Town

# Appendix C

Appendices contained in Appendix C refer to Chapter Six, Firm-Specific Attributes and the Cross-Section of Equity Returns.

## Appendix C.1.: Univariate cross-sectional regression results

The table shows the absolute values of the t-statistic, mean coefficient, information coefficient and the number of observations in the final month of analysis for all firm-specific attributes. Results are obtained from the monthly cross-sectional regressions and the data are standardised and adjusted for thin-trading and outliers. The mean information coefficient measures the average monthly correlation between expected and realised returns. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. The variables are arranged in descending order if the absolute value of the t-statistic. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| Characteristic | T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| AssTurn_6m | 4.4507 | 0.0022 | 0.0499 | 651 |
| PEGI_2yr | -4.4409 | -0.0025 | 0.0614 | 635 |
| ICBT_6m | 4.1690 | 0.0026 | 0.0581 | 638 |
| VO_1yr | 3.9401 | 0.0040 | 0.0881 | 645 |
| MVT_MV_1yr | 3.9228 | 0.0040 | 0.0883 | 582 |
| PEGI_1yr | -3.9059 | -0.0020 | 0.0495 | 636 |
| AssTurn_2yr | 3.8863 | 0.0024 | 0.0579 | 651 |
| NCA_MV_2yr | 3.5994 | 0.0027 | 0.0642 | 602 |
| MVT_MV_6m | 3.5674 | 0.0037 | 0.0877 | 583 |
| VO_3m | 3.5523 | 0.0034 | 0.0760 | 636 |
| MVT_MV_3m | 3.5162 | 0.0034 | 0.0755 | 651 |
| TV_1yr | 3.5173 | 0.0036 | 0.0882 | 651 |
| VO_6m | 3.5125 | 0.0036 | 0.0876 | 650 |
| Crossover6_18 | 3.4541 | 0.0014 | 0.0406 | 494 |
| TV_6m | 3.4511 | 0.0036 | 0.0901 | 651 |
| PEGI | -3.4078 | -0.0018 | 0.0573 | 637 |
| TV_3m | 3.4025 | 0.0034 | 0.0787 | 651 |
| Reten | 3.2851 | 0.0034 | 0.0815 | 638 |
| Reten_1yr | 3.1569 | 0.0017 | 0.0505 | 638 |
| MOM_1m | -2.9986 | -0.0041 | 0.1268 | 618 |
| ICBT_2yr | 2.8150 | 0.0026 | 0.0858 | 587 |
| ChSalesInv | 2.8000 | 0.0012 | 0.0407 | 649 |
| INV_1yr | -2.7538 | -0.0015 | 0.0585 | 637 |
| Crossover6_12 | 2.7409 | 0.0013 | 0.0446 | 503 |
| AssTurn_1yr | 2.7262 | 0.0015 | 0.0557 | 639 |
| RD_TA | 2.6915 | 0.0025 | 0.0781 | 540 |
| ICBT_1yr | 2.6752 | 0.0024 | 0.0812 | 589 |
| AccRec_6m | 2.6640 | 0.0020 | 0.0635 | 651 |
| Crossover3_12 | 2.6314 | 0.0012 | 0.0422 | 651 |
| Reten_6m | 2.5772 | 0.0012 | 0.0446 | 638 |
| MVT_MV_1m | 2.5596 | 0.0019 | 0.0655 | 587 |
| VO_1m | 2.5503 | 0.0019 | 0.0656 | 651 |
| P_1m | -2.4335 | -0.0046 | 0.1463 | 573 |
| TV_1m | 2.4184 | 0.0019 | 0.0658 | 651 |
| MVT_3m | 2.3693 | 0.0028 | 0.0921 | 597 |
| CPS_6m | 2.3508 | 0.0014 | 0.0536 | 650 |
| LnMV_1m | -2.3361 | -0.0045 | 0.1463 | 637 |
| Crossover3_18 | 2.2283 | 0.0010 | 0.0433 | 543 |
| RD_EQ | 2.2146 | 0.0016 | 0.0653 | 423 |
| Sales_Emp | -2.1948 | -0.0014 | 0.0582 | 583 |
| NCA_MV_1yr | 2.0662 | 0.0019 | 0.0731 | 600 |
| TD_TA_6m | -2.1102 | -0.0010 | 0.0415 | 599 |
| PEGI_6m | -2.1052 | -0.0022 | 0.0747 | 636 |
| DIV_6m | 2.0884 | 0.0017 | 0.0723 | 626 |
| NCF_BP1yr | 2.0560 | 0.0021 | 0.0923 | 587 |
| NS_6m | 1.9853 | 0.0010 | 0.0495 | 611 |
| MVT_6m | 1.9735 | 0.0030 | 0.1167 | 583 |
| BTMV_2yr | 1.9602 | 0.0041 | 0.1475 | 651 |
| TD_TA_2yr | -1.9188 | -0.0008 | 0.0402 | 172 |
| MVT_MV_2yr | 1.8926 | 0.0020 | 0.0928 | 569 |

University of Cape Town

**Appendix C.1.: Univariate cross-sectional regression results**
-continued

| Characteristic | T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| VO_2yr | 1.8392 | 0.0020 | 0.0934 | 647 |
| CEY | 1.7991 | 0.0019 | 0.0853 | 649 |
| DepAmort_TA_6m | 1.7353 | 0.0027 | 0.1203 | 582 |
| BTMV_1yr | 1.7181 | 0.0038 | 0.1536 | 651 |
| TLC_TA | 1.6534 | 0.0008 | 0.0425 | 629 |
| BTMV | 1.6398 | 0.0030 | 0.1266 | 651 |
| MVT_MV | 1.6190 | 0.0017 | 0.0909 | 587 |
| TV_2yr | 1.6065 | 0.0017 | 0.0934 | 651 |
| MTBV_2yr | -1.5595 | -0.0035 | 0.1566 | 631 |
| Reton_2yr | 1.5446 | 0.0008 | 0.0465 | 636 |
| Crossover1_16 | 1.5263 | 0.0007 | 0.0429 | 650 |
| DY_2yr | 1.4977 | 0.0024 | 0.1166 | 503 |
| EY | 1.4776 | 0.0017 | 0.1037 | 611 |
| Quick_1yr | 1.4539 | 0.0008 | 0.0486 | 274 |
| Growth | 1.4509 | 0.0029 | 0.1344 | 590 |
| PPMtP_1yr | 1.4443 | 0.0008 | 0.0512 | 16 |
| TV | 1.4393 | 0.0016 | 0.0942 | 183 |
| DIV_1yr | 1.4228 | 0.0014 | 0.1006 | 638 |
| TD_TA | 1.4049 | 0.0011 | 0.0725 | 528 |
| ROCE_1yr | 1.3965 | 0.0011 | 0.0794 | 627 |
| MTBV_1yr | -1.3939 | -0.0033 | 0.1663 | 604 |
| ICBT | 1.3637 | 0.0010 | 0.0665 | 589 |
| EqCapRes_6m | 1.3616 | 0.0013 | 0.0791 | 638 |
| WC | 1.3552 | 0.0013 | 0.0796 | 650 |
| ROCE_6m | 1.3493 | 0.0008 | 0.0505 | 638 |
| NCF_TD | 1.3393 | 0.0013 | 0.0883 | 401 |
| Growth_6m | 1.3357 | 0.0006 | 0.0389 | 589 |
| AccRec_1yr | 1.2889 | 0.0013 | 0.0890 | 651 |
| NCA_MV | 1.2859 | 0.0008 | 0.0597 | 632 |
| TLC_TA_2yr | -1.2804 | -0.0004 | 0.0372 | 556 |
| BTMV_6m | 1.2764 | 0.0032 | 0.1738 | 639 |
| CPS | 1.2626 | 0.0014 | 0.1040 | 636 |
| ChEPS_P_6m | 1.2619 | 0.0008 | 0.0601 | 650 |
| MVT_1yr | 1.2377 | 0.0022 | 0.1191 | 605 |
| Quick | 1.2115 | 0.0012 | 0.0801 | 423 |
| NCF_2yr | 1.1729 | 0.2128 | 0.1764 | 587 |
| WC_1yr | 1.1690 | 0.0007 | 0.0472 | 644 |
| ROEpub | 1.1629 | 0.0018 | 0.1326 | 637 |
| NCF_6m | -1.1006 | -0.0011 | 0.1015 | 586 |
| BVpS | 1.0903 | 0.0013 | 0.1083 | 650 |
| AssTurn | 1.0580 | 0.0006 | 0.0535 | 651 |
| NCF_BP1yr_2yr | -1.0506 | -0.0022 | 0.1816 | 638 |
| NCF_TD_6m | -1.0490 | -0.0009 | 0.0929 | 638 |
| NCA_MV_6m | 1.0452 | 0.0021 | 0.1386 | 600 |
| EPS_6m | 1.0424 | 0.0009 | 0.0801 | 633 |
| NS_2yr | 1.0235 | 0.0006 | 0.0490 | 638 |
| MTBV | 1.0166 | -0.0020 | 0.1231 | 630 |
| Borrow_1yr | -1.0160 | 0.0006 | 0.0463 | 651 |
| Borrow_2yr | -1.0126 | -0.0006 | 0.0475 | 651 |
| NCF_1yr | 1.0011 | 0.0300 | 0.1111 | 598 |
| Sales_P_2yr | 1.0006 | 0.0024 | 0.1679 | 583 |
| NAVpS | 0.9976 | 0.0011 | 0.0932 | 575 |
| TD_TA_1yr | -0.9890 | -0.0004 | 0.0406 | 127 |
| MTBV_6m | 0.9882 | 0.0025 | 0.1792 | 620 |
| EqCapRes_2yr | 0.9860 | 0.0013 | 0.1195 | 603 |
| NAVpS_6m | 0.9749 | 0.0009 | 0.0773 | 635 |
| EPS_2yrAV | 0.9741 | 0.0013 | 0.1183 | 634 |
| Gear_2yr | -0.9676 | -0.0005 | 0.0446 | 610 |
| PPMtP_6m | 0.9664 | 0.0020 | 0.1273 | 441 |
| AccRec_2yr | 0.9446 | 0.0011 | 0.1032 | 651 |

University of Cape Town

**Appendix C.1.: Univariate cross-sectional regression results**
-continued

| Characteristic | T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| NS_1yr | 0.9378 | 0.0005 | 0.0561 | 585 |
| EPS | 0.9375 | 0.0012 | 0.1138 | 638 |
| EqCapRes_1yr | 0.9321 | 0.0013 | 0.1160 | 630 |
| ROCF | 0.9220 | 0.0015 | 0.1468 | 627 |
| Intan_MV | 0.9133 | 0.0008 | 0.0613 | 636 |
| MVT_1m | 0.9066 | 0.0008 | 0.0692 | 500 |
| Borrow_6m | -0.9045 | -0.0005 | 0.0410 | 639 |
| NCF_BP1yr_1yr | 0.9035 | 0.0010 | 0.1045 | 576 |
| NCF_BP1yrDiv_2yr | -0.8955 | -0.0018 | 0.1940 | 483 |
| Crossover3_1 | 0.8894 | 0.0006 | 0.0613 | 636 |
| Crossover1_3 | -0.8801 | -0.0005 | 0.0465 | 649 |
| OPMtP_6m | 0.8209 | 0.0018 | 0.1413 | 574 |
| CEY_2yr | 0.8141 | 0.0008 | 0.0768 | 637 |
| VO | 0.8138 | 0.0007 | 0.0807 | 651 |
| EY_2yr | 0.8090 | 0.0008 | 0.0859 | 610 |
| NCF_BP1yrDiv | 0.7940 | 0.0008 | 0.0948 | 637 |
| OPMtP | 0.7809 | 0.0008 | 0.0814 | 606 |
| CEY_6m | 0.7733 | 0.0018 | 0.1434 | 637 |
| DoV_2yr | 0.7653 | 0.0009 | 0.1168 | 638 |
| Growth_1yr | 0.7649 | 0.0004 | 0.0489 | 589 |
| NPMtP_6m | 0.7626 | 0.0015 | 0.1163 | 567 |
| FPMtP_2yr | 0.7614 | 0.0005 | 0.0648 | 18 |
| EPS_1yr | 0.7519 | 0.0007 | 0.0858 | 638 |
| NPMtP_1yr | 0.7352 | 0.0004 | 0.0489 | 618 |
| Sales_Emp_1yr | -0.7281 | -0.0005 | 0.0663 | 583 |
| CPS_1yr | 0.7256 | 0.0005 | 0.0699 | 650 |
| DtV | 0.7234 | 0.0009 | 0.1250 | 638 |
| ChEPS_P_1yr | 0.7186 | 0.0006 | 0.0695 | 650 |
| CFMtP_6m | 0.7133 | 0.0017 | 0.1427 | 613 |
| NCF_BP1yrDiv_1yr | 0.6932 | 0.0007 | 0.0982 | 635 |
| DY_6m | 0.6919 | 0.0014 | 0.1295 | 494 |
| TLC_TA_6m | 0.6908 | -0.0002 | 0.0374 | 135 |
| Gear | -0.6854 | -0.0007 | 0.0869 | 611 |
| Quick_6m | 0.6829 | 0.0003 | 0.0430 | 441 |
| ChSalesChAR | -0.6803 | -0.0003 | 0.0413 | 650 |
| NCF_TD_2yr | 0.6727 | 0.0014 | 0.1886 | 638 |
| LnMV_2yr | -0.6709 | -0.0018 | 0.2008 | 631 |
| PPMtP | 0.6692 | 0.0005 | 0.0789 | 88 |
| NCF | 0.6555 | 0.0007 | 0.0867 | 600 |
| WC_2yr | 0.6518 | 0.0004 | 0.0489 | 644 |
| BVpS_6m | 0.6491 | 0.0006 | 0.0806 | 650 |
| MVT | 0.6473 | 0.0011 | 0.1181 | 502 |
| DY_1yr | 0.6290 | 0.0011 | 0.1179 | 543 |
| CPS_2yr | 0.6011 | 0.0007 | 0.1092 | 638 |
| Borrow | -0.5945 | -0.0004 | 0.0608 | 651 |
| INV_6m | -0.5727 | -0.0003 | 0.0491 | 638 |
| RD_EQ_2yr | -0.5681 | -0.0004 | 0.0697 | 290 |
| CPS | 0.5659 | 0.0006 | 0.0873 | 638 |
| EqCapRes | 0.5568 | 0.0008 | 0.1172 | 633 |
| CPS_2yr | 0.5451 | 0.0005 | 0.0812 | 650 |
| CEY_1yr | 0.5379 | 0.0006 | 0.0811 | 636 |
| RD_EQ_1yr | 0.5363 | -0.0003 | 0.0499 | 274 |
| Gear_1yr | -0.5296 | -0.0003 | 0.0436 | 606 |
| CFMtP_2yr | 0.5048 | 0.0005 | 0.0777 | 627 |
| LnMV | -0.5012 | -0.0010 | 0.1545 | 637 |
| DPS_6m | 0.4971 | 0.0004 | 0.0750 | 626 |
| Quick_2yr | 0.4945 | 0.0003 | 0.0494 | 290 |
| P_2yr | -0.4918 | -0.0013 | 0.2002 | 645 |

University of Cape Town

**Appendix C.1.: Univariate cross-sectional regression results**
-continued

| Characteristic | T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| Sales_P_1yr | 0.4636 | 0.0013 | 0.1745 | 627 |
| DPS_1yr | 0.4634 | 0.0006 | 0.0942 | 638 |
| DY | 0.4631 | 0.0007 | 0.1099 | 651 |
| NAVpS_2yr | 0.4763 | 0.0007 | 0.1280 | 635 |
| MOM_3m | -0.4670 | 0.0007 | 0.1334 | 633 |
| ROEpub_6m | 0.4624 | 0.0002 | 0.0409 | 605 |
| LnMV_1yr | -0.4619 | -0.0013 | 0.1680 | 625 |
| Growth_2yr | 0.4617 | 0.0002 | 0.0497 | 587 |
| NPMtP | 0.4610 | 0.0004 | 0.0831 | 632 |
| BVpS_2yr | 0.4536 | 0.0006 | 0.1208 | 650 |
| BVpS_1yr | 0.4478 | 0.0006 | 0.1145 | 650 |
| Gear_6m | -0.4418 | -0.0002 | 0.0392 | 590 |
| DepAmort_TA_1yr | 0.4207 | 0.0003 | 0.1323 | 583 |
| RD_TA_1yr | -0.4108 | -0.0002 | 0.0485 | 130 |
| CFMtP_1yr | 0.4068 | 0.0005 | 0.0811 | 637 |
| MVT_2yr | 0.4048 | 0.0007 | 0.1372 | 603 |
| NAVpS_1yr | 0.4039 | 0.0005 | 0.1163 | 582 |
| Intan_MV_1yr | -0.4025 | -0.0005 | 0.0613 | 636 |
| WC_6m | 0.3984 | 0.0002 | 0.0440 | 644 |
| NCF_TD_1yr | 0.3916 | 0.0004 | 0.1069 | 378 |
| MOM_18m | -0.3844 | -0.0003 | 0.1498 | 632 |
| Intan_MV_2yr | 0.3774 | 0.0001 | 0.0671 | 623 |
| NS | -0.3706 | -0.0004 | 0.1004 | 586 |
| P | 0.3432 | 0.0005 | 0.1175 | 671 |
| P_1yr | -0.3420 | -0.0009 | 0.1891 | 650 |
| DepAmort_TA_2yr | 0.3391 | 0.0006 | 0.1151 | 574 |
| INV | 0.3146 | -0.0002 | 0.0737 | 636 |
| EY_6m | 0.3136 | 0.0004 | 0.0894 | 633 |
| NPMtP_2yr | 0.3127 | 0.0002 | 0.0539 | 629 |
| MOM_12m | -0.3087 | -0.0006 | 0.1450 | 638 |
| INV_2yr | -0.2979 | -0.0002 | 0.0677 | 625 |
| Sales_P_6m | 0.2583 | 0.0007 | 0.1890 | 567 |
| ROEpub_2yr | 0.2460 | 0.0001 | 0.0569 | 617 |
| EY_1yr | 0.2447 | 0.0002 | 0.0862 | 606 |
| Intan_MV_6m | 0.2371 | 0.0005 | 0.1369 | 638 |
| NCF_BP1yrDiv_6m | -0.1970 | -0.0002 | 0.0867 | 470 |
| LnMV_3m | -0.1790 | -0.0004 | 0.1744 | 619 |
| TLC_TA_1yr | -0.1663 | -0.0001 | 0.0374 | 600 |
| AccRec | -0.1631 | -0.0001 | 0.0769 | 651 |
| Sales_Emp_2yr | -0.1599 | -0.0001 | 0.0730 | 563 |
| MOM_6m | -0.1545 | -0.0003 | 0.1364 | 633 |
| OPMtP_2yr | -0.1440 | -0.0001 | 0.0710 | 638 |
| P_3m | -0.1307 | -0.0003 | 0.1766 | 633 |
| CFMtP | 0.1126 | 0.0001 | 0.0886 | 637 |
| OPMtP_1yr | 0.1117 | 0.0001 | 0.0725 | 610 |
| ROEpub_1yr | 0.1070 | 0.0001 | 0.0503 | 631 |
| P_6m | 0.1030 | 0.0003 | 0.1891 | 638 |
| RD_TA_2yr | -0.1017 | 0.0001 | 0.0600 | 175 |
| NCF_BP1yr_6m | -0.1010 | -0.0001 | 0.0899 | 637 |
| Sales_Emp_6m | 0.0786 | 0.0001 | 0.0525 | 582 |
| RD_TA_6m | -0.0589 | 0.0000 | 0.0454 | 638 |
| ChEPS_P_2yr | 0.0509 | 0.0000 | 0.0844 | 650 |
| Sales_P | 0.0436 | -0.0001 | 0.1278 | 638 |
| RD_FO_6m | -0.0296 | 0.0000 | 0.0492 | 580 |
| DepAmort_TA | -0.0219 | 0.0000 | 0.1234 | 651 |
| ROCE_2yr | 0.0165 | 0.0000 | 0.0869 | 620 |
| LnMV_6m | 0.0036 | 0.0000 | 0.1863 | 505 |
| EPS_2yr | -0.0001 | 0.0000 | 0.0923 | 638 |

University of Cape Town

## Appendix C.2.: Cross-sectional univariate regression results by year

The table shows the mean slope and t-statistic for all firm-specific attributes in each year of the analysis. The mean slope and t-statistic for the entire period is displayed in the final column. Results are obtained from the monthly cross-sectional regressions and the data are standardised and adjusted for thin-trading and outliers. The variables are arranged in descending order if the absolute value of the total t-statistic. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **AssTurn_6m** | | | | | | | | | |
| Mean Slope | 0.0029 | -0.0012 | 0.0025 | 0.0002 | -0.0017 | 0.0042 | 0.0042 | 0.0025 | 0.0022 |
| T-Statistic | 1.9194 | -2.0780 | 2.2193 | 0.1988 | -1.0014 | 3.9431 | 3.9431 | 1.5034 | 4.4507 |
| **PEGI_2yr** | | | | | | | | | |
| Mean Slope | -0.0002 | 0.0011 | 0.0006 | -0.0021 | -0.0052 | -0.0054 | -0.0039 | -0.0015 | -0.0025 |
| T-Statistic | -0.1055 | 1.1243 | 0.4352 | -1.8858 | -3.4022 | -5.3854 | -3.1014 | -0.6624 | -4.4409 |
| **ICBT_6m** | | | | | | | | | |
| Mean Slope | 0.0029 | 0.0016 | 0.0034 | 0.0027 | 0.0062 | 0.0026 | -0.0011 | 0.0019 | 0.0026 |
| T-Statistic | 1.7392 | 2.3378 | 2.5656 | 2.7751 | 2.1257 | 1.3964 | 0.8299 | 1.0524 | 4.1090 |
| **VO_1yr** | | | | | | | | | |
| Mean Slope | 0.0026 | 0.0007 | 0.0002 | -0.0014 | 0.0061 | 0.0036 | 0.0162 | 0.0021 | 0.0040 |
| T-Statistic | 1.6177 | 0.4522 | 0.1166 | -1.2109 | 2.6902 | 1.0423 | 4.4092 | 0.7806 | 3.9401 |
| **MVT_MV_1yr** | | | | | | | | | |
| Mean Slope | 0.0027 | 0.0009 | 0.0002 | -0.0015 | 0.0061 | 0.0032 | 0.0160 | 0.0026 | 0.0040 |
| T-Statistic | 1.6909 | 0.4665 | 0.1504 | -1.2515 | 2.6913 | 0.8864 | 4.3406 | 0.9414 | 3.9728 |
| **PEGI_1yr** | | | | | | | | | |
| Mean Slope | 0.0001 | 0.0016 | -0.0011 | -0.0013 | -0.0034 | -0.0038 | -0.0038 | -0.0036 | -0.0020 |
| T-Statistic | 0.0398 | 1.8364 | -1.3478 | -1.3060 | -2.8576 | -10.6236 | -8.6275 | -1.2646 | -3.9059 |
| **AssTurn_2yr** | | | | | | | | | |
| Mean Slope | -0.0004 | -0.0020 | 0.0021 | 0.0000 | 0.0008 | 0.0071 | 0.0059 | 0.0021 | 0.0024 |
| T-Statistic | -0.2406 | -2.8973 | 1.8089 | 0.0232 | 0.3625 | 6.1782 | 4.5985 | 0.9521 | 3.8383 |
| **NCA_MV_2yr** | | | | | | | | | |
| Mean Slope | 0.0015 | 0.0016 | 0.0009 | 0.0010 | 0.0003 | 0.0007 | 0.0007 | 0.0003 | 0.0027 |
| T-Statistic | 0.7192 | 2.7744 | 1.3602 | 1.0868 | 0.0056 | 0.3686 | 0.3686 | 1.9728 | 3.5394 |
| **MVT_MV_6m** | | | | | | | | | |
| Mean Slope | 0.0017 | 0.0017 | 0.0008 | 0.0013 | 0.0068 | 0.0034 | 0.0129 | 0.0007 | 0.0037 |
| T-Statistic | 0.6314 | 0.9746 | 0.4605 | 0.7954 | 2.0396 | 1.0083 | 3.2515 | 0.2582 | 3.5574 |
| **VO_3m** | | | | | | | | | |
| Mean Slope | 0.0036 | -0.0004 | 0.0009 | -0.0001 | 0.0079 | 0.0026 | 0.0107 | 0.0018 | 0.0034 |
| T-Statistic | 1.6253 | -0.3343 | 0.5731 | -0.0839 | 2.1456 | 1.1297 | 2.6540 | 0.6491 | 3.5623 |
| **MVT_MV_3m** | | | | | | | | | |
| Mean Slope | 0.0036 | -0.0005 | 0.0009 | -0.0002 | 0.0079 | 0.0025 | 0.0108 | 0.0019 | 0.0034 |
| T-Statistic | 1.6213 | -0.4222 | 0.6805 | -0.1212 | 2.1601 | 1.0907 | 2.6413 | 0.6985 | 3.5462 |
| **TV_1yr** | | | | | | | | | |
| Mean Slope | 0.0023 | 0.0003 | 0.0002 | 0.0017 | 0.0076 | 0.0028 | 0.0152 | 0.0021 | 0.0036 |
| T-Statistic | 1.6722 | 0.1715 | 0.0685 | -1.5072 | 2.3746 | 0.7226 | 4.2212 | 0.7885 | 3.5173 |
| **VO_6m** | | | | | | | | | |
| Mean Slope | 0.0016 | 0.0016 | 0.0008 | 0.0014 | 0.0065 | 0.0035 | 0.0131 | 0.0004 | 0.0036 |
| T-Statistic | 0.6135 | 0.9354 | 0.4553 | 0.7815 | 2.0065 | 1.0371 | 3.2616 | 0.1597 | 3.5125 |
| **Crossover5_18** | | | | | | | | | |
| Mean Slope | 0.0007 | 0.0020 | 0.0021 | -0.0013 | 0.0006 | 0.0007 | 0.0041 | 0.0021 | 0.0014 |
| T-Statistic | 0.6006 | 1.9024 | 1.6214 | -2.4329 | 0.5496 | 0.7222 | 3.5793 | 1.6628 | 3.4541 |
| **TV_6m** | | | | | | | | | |
| Mean Slope | 0.0015 | 0.0013 | 0.0007 | 0.0010 | 0.0057 | 0.0034 | 0.0135 | 0.0016 | 0.0036 |
| T-Statistic | 0.6085 | 0.7468 | 0.3644 | 0.5737 | 1.6939 | 0.9590 | 3.5201 | 0.5758 | 3.4511 |
| **PEGI** | | | | | | | | | |
| Mean Slope | 0.0000 | 0.0006 | -0.0003 | -0.0005 | -0.0056 | -0.0043 | -0.0041 | 0.0013 | -0.0018 |
| T-Statistic | 0.0114 | 0.5761 | -0.1873 | -0.7719 | -3.4102 | -3.9053 | -2.8209 | 0.6953 | -3.4078 |
| **TV_3m** | | | | | | | | | |
| Mean Slope | 0.0037 | -0.0005 | 0.0007 | -0.0001 | 0.0073 | 0.0022 | 0.0112 | 0.0023 | 0.0034 |
| T-Statistic | 1.6947 | -0.4047 | 0.5279 | -0.0619 | 1.8192 | 0.8775 | 2.7031 | 0.8097 | 3.4025 |
| **Reten** | | | | | | | | | |
| Mean Slope | 0.0000 | 0.0002 | -0.0029 | 0.0025 | 0.0077 | 0.0013 | 0.0162 | -0.0038 | 0.0034 |
| T-Statistic | -0.0106 | 0.1729 | 1.8789 | 2.4467 | 3.4706 | 0.4305 | 4.0398 | -1.0709 | 3.2851 |
| **Reten_1yr** | | | | | | | | | |
| Mean Slope | 0.0010 | 0.0011 | 0.0018 | -0.0002 | 0.0041 | 0.0002 | 0.0019 | 0.0039 | 0.0017 |
| T-Statistic | 0.4864 | 1.1195 | 2.1063 | -0.1750 | 1.0962 | 0.0977 | 1.2821 | 2.6885 | 3.1569 |
| **MOM_1m** | | | | | | | | | |
| Mean Slope | -0.0040 | -0.0014 | 0.0065 | -0.0053 | -0.0093 | -0.0043 | 0.0043 | -0.0024 | -0.0041 |
| T-Statistic | 1.7261 | -3.4416 | -2.5533 | -2.1132 | -1.7981 | -1.1628 | 0.7618 | -0.4664 | -2.9986 |
| **ICBT_2yr** | | | | | | | | | |
| Mean Slope | 0.0002 | 0.0019 | 0.0027 | 0.0021 | 0.0054 | 0.0054 | 0.0076 | -0.0003 | 0.0026 |
| T-Statistic | 0.0484 | 1.6364 | 1.6904 | 1.9983 | 1.6491 | 1.3493 | 3.3628 | -0.2073 | 2.8150 |

University of Cape Town

## Appendix C.2.: Cross-sectional univariate regression results by year

-continued

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **ChSalelsChInv** | | | | | | | | | |
| Mean Slope | 0.0017 | 0.0004 | 0.0025 | 0.0008 | 0.0015 | -0.0005 | 0.0020 | 0.0009 | 0.0012 |
| T-Statistic | 1.2090 | 0.4561 | 2.6566 | 1.4444 | 1.5099 | -0.3581 | 1.2065 | 0.6300 | 2.8000 |
| **INV_1yr** | | | | | | | | | |
| Mean Slope | -0.0014 | -0.0036 | -0.0058 | 0.0007 | 0.0011 | 0.0024 | 0.0024 | -0.0052 | -0.0015 |
| T-Statistic | -0.7926 | -3.4897 | -0.5149 | 0.4550 | 0.5547 | 1.6973 | 1.8830 | -2.6281 | -2.7538 |
| **Crossover6_12** | | | | | | | | | |
| Mean Slope | -0.0007 | 0.0002 | 0.0010 | 0.0005 | 0.0027 | 0.0033 | 0.0023 | 0.0009 | 0.0013 |
| T-Statistic | -0.8023 | 0.1811 | 0.5245 | 0.4238 | 1.7954 | 2.3271 | 1.8462 | 1.1900 | 2.7409 |
| **AssTurn_1yr** | | | | | | | | | |
| Mean Slope | 0.0009 | -0.0014 | 0.0022 | -0.0004 | -0.0011 | 0.0052 | 0.0053 | 0.0008 | 0.0015 |
| T-Statistic | 0.4565 | -2.2729 | 1.7064 | -0.3346 | -0.5821 | 5.6503 | 5.4772 | 0.3519 | 2.7262 |
| **RD_TA** | | | | | | | | | |
| Mean Slope | 0.0003 | -0.0013 | 0.0014 | 0.0045 | 0.0048 | 0.0038 | 0.0039 | 0.0027 | 0.0025 |
| T-Statistic | 0.2023 | -0.8315 | 0.9782 | 2.7827 | 1.1736 | 1.7078 | 1.5900 | 0.6098 | 2.6915 |
| **ICBT_1yr** | | | | | | | | | |
| Mean Slope | -0.0002 | -0.0004 | 0.0021 | 0.0034 | 0.0069 | 0.0042 | 0.0029 | 0.0003 | 0.0024 |
| T-Statistic | -0.0829 | -0.4242 | 1.0178 | 3.1439 | 1.4696 | 1.3146 | 1.8675 | 0.1932 | 2.6752 |
| **AccRec_6m** | | | | | | | | | |
| Mean Slope | 0.0015 | -0.0030 | 0.0028 | -0.0009 | 0.0029 | 0.0043 | 0.0076 | -0.0001 | 0.0020 |
| T-Statistic | 0.6750 | -3.8677 | 2.2091 | -0.4105 | 2.3936 | 2.1436 | 2.2732 | -0.0261 | 2.6640 |
| **Crossover3_12** | | | | | | | | | |
| Mean Slope | 0.0001 | -0.0009 | 0.0016 | -0.0003 | 0.0020 | 0.0032 | 0.0010 | 0.0028 | 0.0012 |
| T-Statistic | 0.2246 | -1.0406 | 1.1365 | -0.4901 | 1.0535 | 2.7712 | 0.8077 | 2.1276 | 2.6314 |
| **Roten_6m** | | | | | | | | | |
| Mean Slope | 0.0005 | 0.0015 | -0.0002 | 0.0002 | 0.0028 | -0.0005 | 0.0018 | 0.0038 | 0.0012 |
| T-Statistic | 0.7102 | 2.2627 | -0.2846 | 0.1964 | 1.9454 | -0.2675 | 1.4042 | 2.2854 | 2.5772 |
| **MVT_MV_1m** | | | | | | | | | |
| Mean Slope | 0.0014 | -0.0009 | 0.0032 | -0.0016 | 0.0040 | 0.0053 | 0.0045 | -0.0007 | 0.0019 |
| T-Statistic | 1.0358 | -0.6816 | 1.6912 | -1.4972 | 1.3660 | 2.7229 | 1.6510 | -0.2831 | 2.5596 |
| **VO_1m** | | | | | | | | | |
| Mean Slope | 0.0014 | -0.0007 | 0.0032 | -0.0016 | 0.0040 | 0.0054 | 0.0046 | -0.0009 | 0.0019 |
| T-Statistic | 1.0351 | -0.6360 | 1.6839 | -1.5107 | 1.3522 | 2.7741 | 1.6834 | -0.3951 | 2.5503 |
| **P_1m** | | | | | | | | | |
| Mean Slope | -0.0016 | -0.0062 | -0.0062 | -0.0046 | -0.0130 | -0.0055 | 0.0086 | -0.0076 | -0.0046 |
| T-Statistic | -0.4572 | -2.7808 | -2.0819 | -1.9873 | -1.4247 | -1.1118 | 1.4901 | -1.2241 | -2.4335 |
| **TV_1m** | | | | | | | | | |
| Mean Slope | 0.0012 | -0.0009 | 0.0030 | -0.0018 | 0.0037 | 0.0055 | 0.0046 | -0.0004 | 0.0019 |
| T-Statistic | 0.9332 | -0.7867 | 1.5991 | -1.6206 | 1.2601 | 2.5000 | 1.6625 | -0.1568 | 2.4194 |
| **MVT_3m** | | | | | | | | | |
| Mean Slope | 0.0025 | -0.0006 | 0.0000 | -0.0001 | 0.0055 | -0.0010 | 0.0155 | 0.0005 | 0.0028 |
| T-Statistic | 1.0390 | -0.4744 | -0.0338 | -0.0958 | 1.6015 | -0.3404 | 3.1589 | 0.1248 | 2.3693 |
| **CPS_6m** | | | | | | | | | |
| Mean Slope | 0.0004 | -0.0005 | 0.0008 | 0.0007 | 0.0038 | 0.0022 | 0.0011 | 0.0023 | 0.0014 |
| T-Statistic | 0.1872 | -0.6609 | 0.4884 | 0.7746 | 2.0279 | 1.4975 | 0.4856 | 1.7871 | 2.3508 |
| **LnMV_1m** | | | | | | | | | |
| Mean Slope | -0.0010 | -0.0080 | -0.0059 | -0.0046 | -0.0135 | -0.0057 | 0.0084 | -0.0078 | -0.0045 |
| T-Statistic | -0.2749 | -2.6598 | -1.9827 | -2.0651 | -1.3193 | -1.1434 | 1.4871 | -1.2561 | -2.3361 |
| **Crossover3_18** | | | | | | | | | |
| Mean Slope | 0.0017 | 0.0008 | 0.0032 | -0.0016 | -0.0001 | -0.0008 | 0.0016 | 0.0032 | 0.0010 |
| T-Statistic | 1.3091 | 0.9369 | 2.3246 | -2.8185 | -0.1112 | -0.5793 | 1.6177 | 1.9196 | 2.2293 |
| **RO_EQ** | | | | | | | | | |
| Mean Slope | -0.0009 | 0.0009 | 0.0020 | 0.0029 | 0.0028 | 0.0010 | 0.0012 | 0.0039 | 0.0016 |
| T-Statistic | -0.6527 | 0.1879 | 1.5357 | 2.1004 | 1.3309 | 0.3821 | 0.5105 | 1.1834 | 2.2146 |
| **Sales_Emp** | | | | | | | | | |
| Mean Slope | -0.0017 | -0.0014 | -0.0015 | -0.0019 | -0.0032 | -0.0002 | -0.0002 | -0.0013 | -0.0014 |
| T-Statistic | -0.9424 | -0.7608 | -1.3796 | -1.8657 | -1.0218 | -0.0928 | -0.1713 | -0.5602 | -2.1948 |
| **TD_TA_6m** | | | | | | | | | |
| Mean Slope | -0.0018 | -0.0002 | -0.0011 | -0.0007 | 0.0000 | -0.0028 | -0.0032 | 0.0019 | -0.0010 |
| T-Statistic | -1.4775 | -0.3026 | -1.4483 | -1.1234 | 0.0087 | -2.5928 | -2.2001 | 0.8075 | -2.1102 |
| **PEGI_6m** | | | | | | | | | |
| Mean Slope | -0.0019 | 0.0009 | -0.0023 | -0.0004 | -0.0052 | -0.0030 | -0.0035 | -0.0032 | -0.0022 |
| T-Statistic | -0.9840 | 1.2196 | -1.7124 | -0.5206 | -0.9171 | -3.0806 | -2.5274 | -0.5342 | -2.1052 |
| **DIV_6m** | | | | | | | | | |
| Mean Slope | -0.0005 | -0.0022 | 0.0007 | -0.0005 | 0.0026 | 0.0080 | 0.0084 | -0.0047 | 0.0017 |
| T-Statistic | -0.2329 | -1.3697 | 0.3300 | -0.5460 | 1.2537 | 5.3264 | 5.4400 | -1.6894 | 2.0684 |
| **NCA_MV_1yr** | | | | | | | | | |
| Mean Slope | 0.0021 | 0.0022 | 0.0018 | 0.0013 | -0.0003 | 0.0039 | 0.0039 | 0.0033 | 0.0019 |
| T-Statistic | 1.6950 | 1.8697 | 1.4493 | 2.5480 | -0.0519 | 2.7208 | 2.7208 | 0.9241 | 2.0662 |

University of Cape Town

## Appendix C.2.: Cross-sectional univariate regression results by year

-continued

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **NCF_BP1yr** | | | | | | | | | |
| Mean Slope | 0.0073 | 0.0030 | 0.0009 | 0.0002 | 0.0054 | 0.0014 | 0.0067 | -0.0017 | 0.0021 |
| T-Statistic | 0.4302 | 1.7078 | -0.7796 | 0.2745 | 1.7900 | 0.7425 | 1.8626 | 0.7550 | 2.0560 |
| **NS 6m** | | | | | | | | | |
| Mean Slope | 0.0006 | -0.0016 | 0.0004 | -0.0013 | 0.0033 | 0.0042 | 0.0049 | -0.0016 | 0.0010 |
| T-Statistic | 0.0879 | -2.4646 | 0.3314 | -1.5923 | 1.6759 | 3.4743 | 3.4305 | -0.8720 | 1.9853 |
| **MVT_6m** | | | | | | | | | |
| Mean Slope | -0.0002 | 0.0013 | 0.0005 | 0.0016 | 0.0039 | 0.0005 | 0.0183 | -0.0005 | 0.0030 |
| T-Statistic | -0.0517 | 0.6710 | -0.7873 | 0.7334 | 0.6093 | 0.1490 | 3.1851 | -0.0937 | 1.9726 |
| **BTMV_2yr** | | | | | | | | | |
| Mean Slope | 0.0078 | 0.0051 | 0.0052 | 0.0076 | -0.0010 | 0.0024 | 0.0084 | 0.0141 | 0.0041 |
| T Statistic | 1.6442 | 1.8383 | 2.8566 | 1.6421 | -0.0866 | 0.9560 | 1.1468 | 1.9230 | 1.9602 |
| **TD TA 2yr** | | | | | | | | | |
| Mean Slope | 0.0005 | -0.0006 | -0.0011 | -0.0013 | -0.0023 | -0.0076 | 0.0036 | 0.0033 | -0.0006 |
| T-Statistic | 0.4395 | -0.7014 | -1.9933 | -2.5831 | -1.8012 | -2.7166 | -2.7032 | 1.9128 | -1.9188 |
| **MVT MV 2yr** | | | | | | | | | |
| Mean Slope | 0.0019 | 0.0021 | 0.0015 | -0.0002 | 0.0076 | 0.0022 | 0.0111 | -0.0022 | 0.0020 |
| T-Statistic | 0.7813 | 1.0762 | 0.7131 | -0.1691 | 3.1257 | 0.9227 | 3.1212 | -0.4761 | 1.9926 |
| **VO 2yr** | | | | | | | | | |
| Mean Slope | 0.0016 | 0.0022 | 0.0014 | -0.0003 | 0.0075 | 0.0024 | 0.0116 | -0.0030 | 0.0020 |
| T-Statistic | 0.7264 | 1.0962 | 0.7158 | -0.2104 | 3.1170 | 1.0848 | 3.2075 | -0.6788 | 1.8092 |
| **CEY** | | | | | | | | | |
| Mean Slope | 0.0092 | 0.0008 | 0.0041 | 0.0020 | 0.0044 | 0.0011 | -0.0062 | 0.0067 | 0.0010 |
| T-Statistic | 1.2812 | 0.5497 | 2.1977 | 1.9426 | 0.9308 | 0.4219 | -2.0796 | 1.5544 | 1.7001 |
| **DepAmort TA 6m** | | | | | | | | | |
| Mean Slope | 0.0026 | 0.0012 | -0.0022 | -0.0028 | -0.0028 | 0.0010 | 0.0169 | 0.0008 | 0.0007 |
| T-Statistic | 1.6097 | 0.6617 | -0.7257 | -1.7857 | -0.6985 | 0.2906 | 2.5114 | 1.5009 | 1.7053 |
| **BTMV 1yr** | | | | | | | | | |
| Mean Slope | 0.0064 | 0.0013 | 0.0107 | 0.0058 | -0.0014 | 0.0086 | -0.0101 | 0.0100 | 0.0038 |
| T-Statistic | 2.2214 | 0.8784 | 4.1824 | 3.7721 | -0.1084 | 1.2719 | -1.9019 | 1.2429 | 1.7181 |
| **TLC TA** | | | | | | | | | |
| Mean Slope | 0.0007 | 0.0001 | 0.0005 | 0.0008 | 0.0000 | -0.0003 | -0.0029 | 0.0035 | 0.0008 |
| T-Statistic | 0.4684 | 0.0960 | 0.8208 | 0.9814 | -0.0080 | -0.2566 | -2.2899 | 1.3804 | 1.6534 |
| **BTMV** | | | | | | | | | |
| Mean Slope | 0.0081 | 0.0062 | 0.0056 | 0.0012 | -0.0005 | 0.0076 | -0.0114 | 0.0129 | 0.0030 |
| T-Statistic | 2.5620 | 4.0024 | 3.3984 | 0.9059 | -0.0540 | 0.6459 | -2.1451 | 1.6603 | 1.6098 |
| **MVT_MV** | | | | | | | | | |
| Mean Slope | -0.0011 | -0.0021 | 0.0019 | -0.0013 | 0.0063 | 0.0007 | 0.0126 | -0.0028 | 0.0017 |
| T-Statistic | -0.6102 | -1.2235 | 0.8293 | -1.1481 | 2.7065 | 0.1214 | 3.7878 | -0.5823 | 1.6190 |
| **TV_7yr** | | | | | | | | | |
| Mean Slope | -0.0022 | -0.0023 | 0.0016 | -0.0006 | 0.0070 | 0.0021 | 0.0102 | -0.0024 | 0.0017 |
| T-Statistic | -0.9599 | -1.2938 | 0.7463 | -0.4333 | 2.5842 | 0.8439 | 2.9801 | -0.5791 | 1.6084 |
| **MTBV_2yr** | | | | | | | | | |
| Mean Slope | -0.0079 | -0.0052 | -0.0049 | -0.0024 | 0.0029 | -0.0037 | 0.0106 | -0.0179 | -0.0038 |
| T-Statistic | -1.8096 | -1.7322 | -2.6351 | -1.5647 | 0.2494 | -0.5819 | 1.8778 | -2.2010 | 1.5696 |
| **Reten_2yr** | | | | | | | | | |
| Mean Slope | -0.0011 | 0.0013 | 0.0011 | 0.0011 | 0.0021 | -0.0006 | 0.0004 | 0.0076 | 0.0006 |
| T-Statistic | -0.5538 | 1.1116 | 2.8715 | 1.3951 | 1.8112 | -0.4862 | 0.2114 | 1.2173 | 1.5446 |
| **Crossover1_16** | | | | | | | | | |
| Mean Slope | 0.0011 | -0.0019 | 0.0028 | -0.0010 | -0.0001 | 0.0011 | 0.0005 | 0.0041 | 0.0007 |
| T-Statistic | 1.1796 | -1.7104 | 2.8415 | -1.3136 | -0.0455 | 1.1747 | 0.4958 | 1.7788 | 1.5203 |
| **DY_2yr** | | | | | | | | | |
| Mean Slope | 0.0050 | 0.0011 | 0.0013 | 0.0008 | -0.0002 | 0.0016 | -0.0033 | 0.0096 | 0.0024 |
| T-Statistic | 1.4950 | 0.4600 | 1.1019 | 0.4746 | -0.0171 | 1.0384 | -0.7783 | 1.8393 | 1.4977 |
| **EY** | | | | | | | | | |
| Mean Slope | 0.0015 | -0.0026 | 0.0010 | 0.0026 | 0.0052 | 0.0019 | -0.0009 | 0.0010 | 0.0017 |
| T-Statistic | 0.3463 | -0.9112 | 0.3382 | 1.4746 | 1.7815 | 1.8491 | -0.2388 | 0.4788 | 1.4776 |
| **Quick 1yr** | | | | | | | | | |
| Mean Slope | 0.0003 | -0.0001 | 0.0016 | 0.0015 | 0.0016 | -0.0009 | 0.0057 | -0.0031 | 0.0008 |
| T-Statistic | 0.2981 | -0.1765 | 1.6965 | 1.1811 | 1.2082 | -0.7341 | 2.4707 | -1.3154 | 1.4509 |
| **Growth** | | | | | | | | | |
| Mean Slope | 0.0001 | -0.0041 | 0.0007 | 0.0041 | 0.0085 | 0.0043 | 0.0121 | -0.0075 | 0.0023 |
| T-Statistic | 0.0057 | -1.7417 | 0.1986 | 2.2946 | 1.3753 | 0.9198 | 3.1681 | -1.4390 | 1.4509 |
| **PPMtP_1yr** | | | | | | | | | |
| Mean Slope | 0.0009 | 0.0015 | 0.0015 | 0.0019 | 0.0000 | 0.0041 | -0.0035 | 0.0026 | 0.0008 |
| T-Statistic | 0.6491 | 1.4468 | 1.4048 | 1.6499 | -0.0298 | 2.1347 | -2.0539 | 1.8333 | 1.4449 |
| **TV** | | | | | | | | | |
| Mean Slope | -0.0006 | -0.0020 | 0.0005 | -0.0013 | 0.0062 | -0.0001 | 0.0134 | -0.0033 | 0.0015 |
| T Statistic | 0.3468 | 1.2498 | 0.2322 | -0.9463 | 2.1010 | -0.0486 | 3.8951 | -0.6386 | 1.4383 |
| **DIV_1yr** | | | | | | | | | |
| Mean Slope | 0.0010 | 0.0014 | 0.0004 | 0.0021 | 0.0032 | 0.0068 | 0.0056 | -0.0061 | 0.0014 |
| T-Statistic | -0.1252 | -1.7960 | -0.1529 | 1.0650 | 1.1842 | 2.6900 | 1.7762 | -1.5472 | 1.4294 |

University of Cape Town

## Appendix C.2.: Cross-sectional univariate regression results by year
-continued

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **TD_TA** | | | | | | | | | |
| Mean Slope | -0.0004 | 0.0007 | 0.0017 | -0.0009 | 0.0020 | 0.0006 | -0.0031 | 0.0049 | 0.0011 |
| T-Statistic | -0.1747 | 0.6401 | 0.8448 | -0.7082 | 0.7091 | 0.2551 | -1.0537 | 1.4106 | 1.4049 |
| **ROCE_1yr** | | | | | | | | | |
| Mean Slope | -0.0016 | -0.0030 | -0.0002 | 0.0009 | 0.0036 | 0.0016 | 0.0016 | 0.0008 | 0.0011 |
| T-Statistic | -0.5310 | -2.0299 | -0.1088 | 0.8110 | 0.9513 | 0.5933 | 0.5933 | 0.5343 | 1.3985 |
| **MTBV_1yr** | | | | | | | | | |
| Mean Slope | -0.0063 | -0.0024 | -0.0113 | -0.0001 | 0.0034 | -0.0050 | 0.0137 | -0.0126 | -0.0033 |
| T-Statistic | -2.4563 | -0.8634 | -4.0232 | -4.0689 | 0.2591 | 0.8700 | 2.1961 | 1.4299 | -1.3939 |
| **ICBT** | | | | | | | | | |
| Mean Slope | 0.0004 | -0.0010 | -0.0003 | 0.0016 | 0.0025 | 0.0012 | 0.0071 | -0.0025 | 0.0010 |
| T-Statistic | 0.1519 | -1.0843 | -0.1525 | 1.4120 | 0.8701 | 0.6194 | 2.7316 | -1.1887 | 1.3637 |
| **EqCapRes_6m** | | | | | | | | | |
| Mean Slope | -0.0007 | -0.0034 | 0.0022 | -0.0009 | 0.0044 | 0.0056 | 0.0075 | 0.0040 | 0.0013 |
| T Statistic | -0.2465 | -2.4259 | 1.1522 | -0.8579 | 1.3962 | 2.3138 | 2.3229 | -1.0720 | 1.3616 |
| **WC** | | | | | | | | | |
| Mean Slope | 0.0023 | -0.0012 | -0.0006 | 0.0019 | 0.0033 | 0.0006 | 0.0082 | -0.0041 | 0.0013 |
| T-Statistic | 1.4927 | -0.9961 | -0.2949 | 1.2707 | 0.8800 | 0.2422 | 2.9259 | -1.2446 | 1.3552 |
| **ROCE_6m** | | | | | | | | | |
| Mean Slope | 0.0002 | -0.0017 | 0.0014 | 0.0006 | 0.0016 | 0.0008 | 0.0007 | 0.0027 | 0.0008 |
| T Statistic | 0.0673 | -2.1172 | 1.3021 | 0.7983 | 0.6077 | 0.5649 | 0.5146 | 1.4244 | 1.3493 |
| **NCF_TD** | | | | | | | | | |
| Mean Slope | 0.0007 | 0.0027 | -0.0017 | 0.0016 | 0.0025 | 0.0018 | 0.0060 | -0.0032 | 0.0013 |
| T-Statistic | 0.1891 | 1.1091 | -0.8337 | 1.4114 | 0.9312 | 0.7364 | 1.3577 | -2.1016 | 1.3393 |
| **Growth_6m** | | | | | | | | | |
| Mean Slope | -0.0003 | 0.0005 | 0.0006 | -0.0001 | 0.0003 | 0.0027 | 0.0013 | 0.0009 | 0.0006 |
| T-Statistic | -0.2443 | -0.5751 | 0.5564 | 0.1901 | 0.1461 | 1.6663 | 1.0763 | 0.6398 | 1.3367 |
| **AccRec_1yr** | | | | | | | | | |
| Mean Slope | 0.0009 | -0.0037 | 0.0013 | 0.0019 | 0.0023 | 0.0049 | 0.0089 | -0.0062 | 0.0013 |
| T-Statistic | 0.3014 | -3.2672 | 0.6896 | 1.3206 | 1.1591 | 1.5783 | 2.1492 | -1.7491 | 1.2868 |
| **NCA_MV** | | | | | | | | | |
| Mean Slope | 0.0034 | 0.0019 | 0.0004 | 0.0005 | 0.0002 | 0.0028 | 0.0028 | 0.0040 | 0.0008 |
| T-Statistic | 1.4027 | 1.4291 | 0.2666 | 0.5989 | 0.0828 | 2.2372 | 2.2372 | 1.9278 | 1.2659 |
| **TLC_TA_2yr** | | | | | | | | | |
| Mean Slope | 0.0008 | -0.0015 | 0.0006 | -0.0013 | -0.0009 | -0.0017 | -0.0037 | 0.0000 | -0.0004 |
| T-Statistic | 0.6125 | -2.4927 | 0.9202 | -1.6054 | -1.4291 | -1.7894 | -3.9625 | 0.0166 | -1.2804 |
| **BTMV_6m** | | | | | | | | | |
| Mean Slope | 0.0093 | 0.0020 | 0.0108 | 0.0008 | 0.0020 | 0.0101 | -0.0133 | 0.0029 | 0.0032 |
| T-Statistic | 2.1167 | 0.9889 | 3.5950 | 0.2738 | 0.1448 | 1.7429 | -2.0442 | 0.3414 | 1.2764 |
| **CPS** | | | | | | | | | |
| Mean Slope | 0.0011 | -0.0008 | 0.0009 | 0.0045 | 0.0052 | 0.0014 | 0.0070 | -0.0051 | 0.0014 |
| T-Statistic | 0.2547 | 2.0470 | 0.4132 | 2.1803 | 1.3383 | 0.5963 | 2.3714 | -1.3592 | 1.2626 |
| **ChEPS_P_6m** | | | | | | | | | |
| Mean Slope | -0.0008 | -0.0023 | 0.0031 | 0.0003 | 0.0026 | 0.0001 | 0.0047 | -0.0012 | 0.0006 |
| T-Statistic | -0.3210 | -2.3828 | 1.9632 | 0.2439 | 1.2126 | 0.0468 | 2.0792 | -0.9380 | 1.2619 |
| **MVT_1yr** | | | | | | | | | |
| Mean Slope | 0.0006 | -0.0002 | -0.0017 | -0.0016 | 0.0069 | 0.0016 | 0.0182 | -0.0059 | 0.0022 |
| T-Statistic | 0.4057 | -0.0727 | -0.8520 | -1.2428 | 0.7154 | 0.4888 | 3.4015 | -0.9203 | 1.2877 |
| **Quick** | | | | | | | | | |
| Mean Slope | 0.0019 | -0.0014 | -0.0008 | 0.0019 | 0.0036 | 0.0002 | 0.0082 | 0.0042 | 0.0012 |
| T-Statistic | 1.2107 | -1.1293 | -0.3526 | 1.2795 | 0.8730 | 0.0615 | 2.7469 | -1.1541 | 1.2115 |
| **NCF_2yr** | | | | | | | | | |
| Mean Slope | 17.7723 | -0.0663 | 0.0015 | -0.0022 | -0.0024 | 0.0017 | -0.0044 | 0.0025 | 2.2128 |
| T-Statistic | 1.1961 | -0.0395 | 0.4604 | -0.9015 | -0.5432 | 0.6303 | -1.8402 | 0.7644 | 1.1729 |
| **WC_1yr** | | | | | | | | | |
| Mean Slope | 0.0005 | 0.0000 | 0.0011 | 0.0017 | 0.0012 | -0.0006 | 0.0056 | -0.0042 | 0.0007 |
| T-Statistic | 0.4536 | 0.0007 | 0.9682 | 1.4985 | 1.0064 | -0.5848 | 2.7218 | -1.6273 | 1.1680 |
| **ROEpub** | | | | | | | | | |
| Mean Slope | -0.0006 | -0.0040 | 0.0003 | 0.0037 | 0.0075 | 0.0042 | 0.0113 | -0.0077 | 0.0018 |
| T-Statistic | -0.1282 | -1.8240 | 0.0770 | 2.1895 | 1.3065 | 0.8986 | 3.0240 | -1.4850 | 1.1529 |
| **NCF_6m** | | | | | | | | | |
| Mean Slope | -0.0072 | -0.0004 | -0.0017 | 0.0034 | 0.0069 | -0.0025 | -0.0057 | -0.0014 | -0.0011 |
| T-Statistic | -1.6532 | -0.4114 | -0.8589 | 2.6723 | 4.5498 | -0.9591 | -1.8330 | -0.4773 | -1.1006 |
| **BVpS** | | | | | | | | | |
| Mean Slope | 0.0034 | -0.0030 | -0.0003 | 0.0024 | 0.0047 | 0.0016 | 0.0079 | -0.0058 | 0.0013 |
| T-Statistic | 0.8698 | -1.5871 | -0.0686 | 1.1605 | 1.1043 | 0.6035 | 2.2124 | -1.4592 | 1.0903 |
| **AssTurn** | | | | | | | | | |
| Mean Slope | -0.0009 | 0.0003 | 0.0009 | -0.0001 | -0.0027 | 0.0031 | 0.0031 | -0.0019 | 0.0006 |
| T-Statistic | -0.4329 | 0.2494 | 1.1181 | -0.0793 | -1.1406 | 3.6267 | 3.6267 | -1.6852 | 1.0580 |
| **NCF_6P1yr_2yr** | | | | | | | | | |
| Mean Slope | -0.0103 | 0.0027 | 0.0017 | -0.0008 | -0.0009 | 0.0018 | -0.0061 | 0.0001 | -0.0022 |
| T-Statistic | -1.2214 | 0.4116 | 0.3481 | -0.2867 | -0.2322 | 0.7104 | -3.1633 | 0.0192 | -1.0506 |

University of Cape Town

## Appendix C.2.: Cross-sectional univariate regression results by year
-continued

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **NCF_TD_6m** | | | | | | | | | |
| Mean Slope | -0.0064 | -0.0017 | -0.0015 | 0.0031 | 0.0040 | -0.0030 | -0.0018 | -0.0001 | -0.0009 |
| T-Statistic | -1.7094 | -0.8515 | -0.6960 | 2.0811 | 2.1416 | -1.1224 | -0.8340 | -0.0294 | -1.0480 |
| **NCA_MV_6m** | | | | | | | | | |
| Mean Slope | 0.0055 | 0.0020 | 0.0059 | -0.0025 | 0.0036 | 0.0048 | 0.0048 | -0.0015 | 0.0021 |
| T-Statistic | 1.3167 | 1.1313 | 3.0437 | -1.1456 | 0.2739 | 1.5039 | 1.5039 | -0.1876 | 1.0452 |
| **EPS_6m** | | | | | | | | | |
| Mean Slope | -0.0025 | -0.0035 | 0.0026 | 0.0002 | 0.0022 | 0.0025 | 0.0062 | -0.0004 | 0.0009 |
| T-Statistic | -0.6180 | -3.6101 | 1.4467 | 0.1350 | 0.6527 | 0.8381 | 2.3087 | -0.1827 | 1.0424 |
| **NS_2yr** | | | | | | | | | |
| Mean Slope | 0.0001 | -0.0023 | -0.0010 | 0.0007 | 0.0021 | 0.0037 | 0.0040 | -0.0042 | 0.0006 |
| T-Statistic | 0.0847 | -2.4333 | -0.9625 | 0.9010 | 2.3660 | 2.3091 | 2.3427 | 1.5368 | 1.0235 |
| **MTBV** | | | | | | | | | |
| Mean Slope | -0.0084 | -0.0035 | 0.0046 | -0.0014 | 0.0001 | -0.0012 | 0.0165 | -0.0172 | -0.0020 |
| T-Statistic | -2.7710 | -2.9435 | 2.7113 | -1.2981 | 0.0135 | -0.3575 | 2.7363 | -2.1008 | -1.0168 |
| **Borrow_1yr** | | | | | | | | | |
| Mean Slope | -0.0009 | -0.0002 | -0.0002 | -0.0016 | -0.0022 | -0.0018 | -0.0005 | 0.0030 | -0.0006 |
| T-Statistic | -0.8213 | -0.1993 | -0.1700 | -2.6992 | -1.0714 | -0.7030 | -0.3603 | 1.8667 | 1.0160 |
| **Borrow_2yr** | | | | | | | | | |
| Mean Slope | 0.0005 | -0.0009 | -0.0005 | -0.0013 | -0.0027 | 0.0011 | 0.0001 | 0.0015 | -0.0006 |
| T-Statistic | 0.5135 | -0.8470 | -0.7110 | -2.3696 | -1.6587 | 0.4824 | 0.0400 | 0.6606 | -1.0126 |
| **NCF_1yr** | | | | | | | | | |
| Mean Slope | 0.2374 | 0.0015 | 0.0007 | 0.0013 | 0.0050 | 0.0009 | -0.0028 | -0.0036 | 0.0300 |
| T-Statistic | 0.9907 | 0.5672 | 0.2687 | 1.1005 | 3.1707 | 0.1727 | -0.9931 | -0.8627 | 1.0011 |
| **Sales_P_2yr** | | | | | | | | | |
| Mean Slope | 0.0064 | 0.0039 | 0.0047 | 0.0004 | -0.0046 | 0.0031 | -0.0062 | 0.0134 | 0.0024 |
| T-Statistic | 1.5392 | 1.3685 | 2.2373 | 0.1680 | -0.3486 | 0.4241 | -1.3710 | 1.6162 | 1.0000 |
| **NAVpS** | | | | | | | | | |
| Mean Slope | 0.0034 | 0.0030 | -0.0004 | 0.0020 | 0.0031 | 0.0014 | 0.0067 | -0.0050 | 0.0011 |
| T-Statistic | 0.8281 | -1.0729 | -0.2062 | 1.5099 | 0.9736 | 0.6073 | 2.0337 | -1.3696 | 0.9976 |
| **TD_TA_1yr** | | | | | | | | | |
| Mean Slope | -0.0015 | 0.0002 | -0.0001 | -0.0015 | -0.0012 | -0.0024 | 0.0031 | 0.0052 | 0.0004 |
| T-Statistic | 1.3925 | 0.2240 | 0.1774 | -2.3039 | -0.9223 | -2.2530 | -2.1403 | 2.2970 | -0.9830 |
| **MTBV_6m** | | | | | | | | | |
| Mean Slope | -0.0092 | -0.0024 | -0.0103 | -0.0007 | 0.0000 | -0.0094 | 0.0167 | -0.0046 | 0.0025 |
| T-Statistic | -2.1745 | -0.8576 | -3.1989 | -0.2495 | 0.0024 | -1.6997 | 2.3422 | -0.5181 | -0.9892 |
| **EqCapRes_2yr** | | | | | | | | | |
| Mean Slope | -0.0019 | -0.0038 | -0.0010 | 0.0019 | 0.0064 | 0.0051 | 0.0135 | 0.0097 | 0.0013 |
| T-Statistic | -0.5229 | 1.6084 | -0.9378 | 1.3264 | 1.7035 | 1.3761 | 3.7910 | 2.0730 | 0.9860 |
| **NAVpS_6m** | | | | | | | | | |
| Mean Slope | -0.0007 | -0.0031 | 0.0006 | -0.0013 | 0.0047 | 0.0034 | 0.0067 | -0.0030 | 0.0009 |
| T-Statistic | 0.2695 | -1.9223 | 0.3486 | -1.1631 | 1.3202 | 1.6462 | 2.1939 | -0.8719 | 0.9749 |
| **EPS_2yrAV** | | | | | | | | | |
| Mean Slope | 0.0012 | -0.0046 | -0.0008 | 0.0026 | 0.0059 | 0.0023 | 0.0104 | -0.0068 | 0.0013 |
| T-Statistic | 0.2691 | -2.3043 | -0.2534 | 1.2855 | 1.2086 | 0.7583 | 2.9840 | -1.7290 | 0.9741 |
| **Gear_2yr** | | | | | | | | | |
| Mean Slope | 0.0008 | -0.0008 | -0.0000 | -0.0012 | -0.0024 | -0.0015 | -0.0015 | 0.0035 | -0.0005 |
| T-Statistic | 0.7326 | -0.7128 | -1.6689 | -2.6474 | -1.8709 | -0.7524 | -0.6843 | 1.9240 | -0.9678 |
| **PPMIP_6m** | | | | | | | | | |
| Mean Slope | 0.0059 | 0.0001 | 0.0046 | -0.0025 | 0.0046 | 0.0115 | -0.0083 | 0.0004 | 0.0020 |
| T-Statistic | 1.4326 | 0.0349 | 3.0956 | -1.1504 | 0.3990 | 2.0755 | -1.4072 | 0.0524 | 0.9664 |
| **Sales_1yr** | | | | | | | | | |
| Mean Slope | 0.0005 | -0.0055 | 0.0024 | 0.0018 | 0.0049 | 0.0045 | 0.0117 | 0.0089 | 0.0013 |
| T-Statistic | -0.1172 | 3.6464 | 0.7591 | 0.6938 | 1.4314 | 1.3501 | 2.3935 | 2.1644 | 0.9636 |
| **AccRec_2yr** | | | | | | | | | |
| Mean Slope | 0.0012 | -0.0042 | -0.0003 | 0.0014 | 0.0030 | 0.0043 | 0.0113 | -0.0079 | 0.0011 |
| T-Statistic | 0.3851 | -2.3516 | -0.1536 | 0.8745 | 1.1316 | 1.3029 | 2.3968 | -2.1282 | 0.9449 |
| **NS_1yr** | | | | | | | | | |
| Mean Slope | 0.0002 | -0.0019 | 0.0000 | -0.0002 | 0.0036 | 0.0017 | 0.0017 | -0.0020 | 0.0005 |
| T-Statistic | 0.1445 | -2.3103 | 0.0089 | -0.2951 | 1.8294 | 1.0773 | 0.7842 | -0.8645 | 0.9378 |
| **EPS** | | | | | | | | | |
| Mean Slope | 0.0011 | -0.0050 | -0.0002 | 0.0023 | 0.0057 | 0.0020 | 0.0110 | -0.0071 | 0.0012 |
| T-Statistic | 0.2460 | -3.0085 | -0.0714 | 1.1479 | 1.3123 | 0.7049 | 3.0423 | -1.4635 | 0.9375 |
| **EqCapRes_1yr** | | | | | | | | | |
| Mean Slope | -0.0012 | -0.0043 | 0.0000 | 0.0029 | 0.0056 | 0.0044 | 0.0108 | -0.0082 | 0.0013 |
| T-Statistic | -0.2741 | -2.1539 | 0.0140 | 2.0841 | 1.4686 | 1.0535 | 2.7608 | -1.7194 | 0.9321 |
| **ROCE** | | | | | | | | | |
| Mean Slope | -0.0017 | -0.0045 | -0.0008 | 0.0035 | 0.0081 | 0.0051 | 0.0131 | -0.0105 | 0.0015 |
| T-Statistic | -0.3925 | -1.7511 | -0.2459 | 1.7090 | 1.3522 | 1.0662 | 3.0400 | -1.9572 | 0.9220 |
| **Intan_MV** | | | | | | | | | |
| Mean Slope | 0.0022 | 0.0008 | 0.0024 | 0.0002 | 0.0023 | 0.0005 | -0.0057 | 0.0041 | 0.0008 |
| T-Statistic | 2.2019 | 0.7303 | 2.4157 | 0.2023 | 0.6030 | 0.2102 | -2.3289 | 0.9236 | 0.9139 |

University of Cape Town

## Appendix C.2.: Cross-sectional univariate regression results by year
-continued

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **MVT_1m** | | | | | | | | | |
| Mean Slope | 0.0010 | -0.0013 | 0.0023 | 0.0019 | -0.0010 | 0.0037 | 0.0058 | -0.0024 | 0.0008 |
| T-Statistic | 0.7961 | -1.0706 | 1.1496 | 1.4503 | -0.3938 | 1.6267 | 1.8680 | 0.6636 | 0.9066 |
| **Borrow 6m** | | | | | | | | | |
| Mean Slope | -0.0011 | 0.0004 | 0.0006 | -0.0005 | -0.0009 | -0.0020 | 0.0010 | 0.0000 | -0.0005 |
| T-Statistic | -0.8272 | -0.5334 | -0.6833 | 0.9646 | 0.4017 | -1.2048 | 0.6311 | 0.4055 | -0.9045 |
| **NCF_BP1yr_1yr** | | | | | | | | | |
| Mean Slope | 0.0017 | 0.0010 | 0.0011 | 0.0007 | 0.0030 | 0.0025 | 0.0003 | -0.0020 | 0.0010 |
| T-Statistic | 0.2371 | 0.4594 | 0.4041 | 0.9339 | 2.1939 | 1.3799 | 0.1226 | -0.5936 | 0.9035 |
| **NCF_BP1yrDiv_2yr** | | | | | | | | | |
| Mean Slope | -0.0107 | 0.0019 | 0.0014 | -0.0007 | -0.0009 | 0.0008 | -0.0073 | 0.0012 | -0.0018 |
| T-Statistic | -0.6470 | 0.3402 | 0.3098 | -0.2669 | -0.2057 | 0.3211 | -2.9906 | 0.3255 | 0.8955 |
| **Crossover3_1** | | | | | | | | | |
| Mean Slope | -0.0008 | 0.0014 | 0.0005 | 0.0011 | -0.0004 | 0.0005 | 0.0045 | 0.0002 | 0.0006 |
| T-Statistic | -0.3903 | 1.4777 | 0.5281 | -1.1720 | -0.1060 | 0.3967 | 2.4477 | 0.1373 | 0.8494 |
| **Crossover1_3** | | | | | | | | | |
| Mean Slope | -0.0003 | 0.0004 | 0.0003 | -0.0014 | 0.0011 | -0.0026 | 0.0008 | -0.0020 | -0.0005 |
| T-Statistic | -0.2155 | 0.4872 | 0.1906 | -1.8807 | 0.4840 | -1.9282 | 0.4937 | -1.2743 | -0.8601 |
| **OPMtP_6m** | | | | | | | | | |
| Mean Slope | 0.0064 | 0.0001 | 0.0032 | -0.0024 | 0.0004 | 0.0096 | -0.0105 | 0.0019 | 0.0018 |
| T-Statistic | 1.4858 | 0.0616 | 1.4332 | -1.0896 | 0.5152 | 1.5939 | -1.7103 | 0.2953 | 0.8209 |
| **CEY_2yr** | | | | | | | | | |
| Mean Slope | 0.0015 | -0.0006 | 0.0013 | 0.0008 | 0.0019 | 0.0009 | -0.0025 | 0.0029 | 0.0008 |
| T-Statistic | 0.7008 | -0.2186 | 1.1853 | 0.9515 | 0.4112 | 0.3107 | -1.2707 | 0.7702 | 0.8141 |
| **VO** | | | | | | | | | |
| Mean Slope | -0.0025 | -0.0005 | 0.0011 | 0.0002 | 0.0040 | -0.0011 | 0.0002 | 0.0041 | 0.0007 |
| T-Statistic | -0.8826 | -0.2554 | 0.7679 | 0.1085 | 1.1163 | -0.3994 | 0.0952 | 2.0143 | 0.9138 |
| **EY_2yr** | | | | | | | | | |
| Mean Slope | 0.0020 | -0.0037 | 0.0025 | 0.0011 | 0.0015 | 0.0030 | 0.0032 | 0.0031 | 0.0008 |
| T Statistic | 0.5848 | -1.6628 | 1.6485 | 0.8406 | 0.3648 | 1.4040 | -1.4990 | 0.8223 | 0.8090 |
| **NCF_BP1yrDiv** | | | | | | | | | |
| Mean Slope | -0.0025 | 0.0036 | -0.0021 | 0.0018 | 0.0050 | 0.0009 | 0.0025 | -0.0028 | 0.0008 |
| T-Statistic | -0.5661 | 1.3043 | -1.0374 | 2.3155 | 1.6068 | 0.3520 | 0.7894 | -1.2964 | 0.7940 |
| **OPMtP** | | | | | | | | | |
| Mean Slope | 0.0002 | -0.0020 | 0.0000 | 0.0006 | 0.0013 | 0.0020 | -0.0059 | 0.0069 | 0.0008 |
| T-Statistic | 0.1286 | -0.8330 | -0.0184 | 0.4986 | 1.0647 | 1.2401 | -1.8750 | 1.8300 | 0.7809 |
| **CEY_6m** | | | | | | | | | |
| Mean Slope | 0.0060 | 0.0021 | 0.0064 | -0.0032 | 0.0065 | 0.0091 | -0.0116 | 0.0011 | 0.0018 |
| T-Statistic | 1.2977 | 1.0811 | 2.3482 | -1.2281 | 0.4210 | 1.5121 | -1.9670 | 0.1340 | 0.7733 |
| **DIV_2yr** | | | | | | | | | |
| Mean Slope | 0.0000 | -0.0044 | -0.0023 | 0.0025 | 0.0054 | 0.0059 | 0.0051 | -0.0089 | 0.0009 |
| T Statistic | -0.0008 | -2.2874 | -0.7655 | 1.4376 | 1.3110 | 2.5095 | 1.6665 | -1.8819 | 0.7893 |
| **Growth_1yr** | | | | | | | | | |
| Mean Slope | 0.0001 | 0.0022 | 0.0012 | 0.0008 | 0.0023 | 0.0011 | 0.0005 | -0.0002 | 0.0004 |
| T-Statistic | 0.0557 | 1.6934 | 0.8132 | 0.8771 | 0.8346 | 0.5858 | 0.4923 | -0.1018 | 0.7649 |
| **NPMtP_6m** | | | | | | | | | |
| Mean Slope | 0.0048 | 0.0003 | 0.0043 | -0.0026 | 0.0038 | 0.0100 | -0.0083 | -0.0002 | 0.0015 |
| T-Statistic | 1.2517 | 0.1570 | 2.9023 | -1.2890 | 0.3491 | 1.6357 | -1.4269 | -0.0274 | 0.7626 |
| **PPMtP_2yr** | | | | | | | | | |
| Mean Slope | 0.0006 | -0.0023 | 0.0017 | 0.0014 | -0.0003 | 0.0024 | -0.0008 | 0.0011 | 0.0005 |
| T-Statistic | 0.1662 | 1.4101 | 1.8656 | 2.8732 | -0.1552 | 1.9036 | -0.6317 | 0.5694 | 0.7614 |
| **EPS_1yr** | | | | | | | | | |
| Mean Slope | -0.0004 | 0.0042 | 0.0009 | 0.0002 | 0.0038 | 0.0013 | 0.0088 | -0.0026 | 0.0007 |
| T-Statistic | -0.1250 | 3.7854 | 0.4630 | 0.1579 | 1.6314 | 0.4449 | 2.1057 | -1.1058 | 0.7519 |
| **NPMtP_1yr** | | | | | | | | | |
| Mean Slope | 0.0009 | -0.0019 | 0.0013 | 0.0014 | 0.0014 | 0.0016 | -0.0024 | 0.0005 | 0.0004 |
| T-Statistic | 0.6292 | -1.7408 | 0.9476 | 1.2268 | 1.1482 | 1.0486 | -1.6069 | 0.3262 | 0.7352 |
| **Sales Emp 1yr** | | | | | | | | | |
| Mean Slope | -0.0010 | -0.0034 | 0.0027 | 0.0007 | 0.0001 | 0.0014 | 0.0003 | -0.0047 | -0.0005 |
| T-Statistic | -0.3129 | -2.9624 | 1.4630 | 0.4719 | -0.0845 | 0.8519 | 0.2351 | -1.9543 | -0.7281 |
| **CPS_1yr** | | | | | | | | | |
| Mean Slope | 0.0010 | -0.0023 | 0.0024 | 0.0016 | 0.0044 | -0.0002 | -0.0003 | -0.0003 | 0.0009 |
| T-Statistic | -0.3991 | -1.7811 | 1.4200 | 0.9662 | 1.4509 | -0.0921 | -0.1933 | -0.1313 | 0.7256 |
| **DIV** | | | | | | | | | |
| Mean Slope | 0.0001 | -0.0015 | 0.0002 | 0.0033 | 0.0051 | -0.0007 | -0.0008 | 0.0011 | 0.0009 |
| T-Statistic | 0.0273 | -0.6275 | 0.0814 | 1.5878 | 0.7320 | -0.4160 | -0.3289 | 0.2460 | 0.7234 |
| **ChEPS P 1yr** | | | | | | | | | |
| Mean Slope | 0.0004 | -0.0037 | 0.0013 | 0.0005 | 0.0037 | 0.0004 | 0.0041 | -0.0023 | 0.0008 |
| T-Statistic | 0.1171 | -3.1110 | 0.7761 | 0.3226 | 1.2961 | 0.2954 | 1.4706 | 1.3859 | 0.7186 |
| **CFMtP_6m** | | | | | | | | | |
| Mean Slope | 0.0062 | 0.0025 | 0.0046 | -0.0030 | 0.0049 | 0.0086 | -0.0120 | 0.0014 | 0.0017 |
| T-Statistic | 1.3571 | 1.2178 | 2.0589 | -1.1596 | 0.3764 | 1.4307 | -2.0037 | 0.1753 | 0.7133 |

University of Cape Town

## Appendix C.2.: Cross-sectional univariate regression results by year
-continued

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **NCF_BP1yrDiv_1yr** | | | | | | | | | |
| Mean Slope | -0.0009 | 0.0000 | 0.0009 | 0.0012 | 0.0040 | 0.0019 | -0.0011 | -0.0035 | 0.0007 |
| T-Statistic | -0.1802 | 0.4022 | 0.3199 | 1.2014 | 2.5184 | 1.1351 | -0.5079 | -1.0057 | 0.0992 |
| **DY_6m** | | | | | | | | | |
| Mean Slope | 0.0063 | -0.0008 | 0.0059 | -0.0007 | 0.0011 | 0.0072 | -0.0082 | 0.0005 | 0.0014 |
| T-Statistic | 2.4972 | -0.3092 | 2.5861 | -0.3467 | 0.0971 | 1.4940 | -1.5836 | 0.0707 | 0.8919 |
| **1LC_TA_6m** | | | | | | | | | |
| Mean Slope | 0.0003 | 0.0007 | 0.0013 | 0.0008 | -0.0010 | -0.0022 | -0.0028 | -0.0005 | -0.0002 |
| T-Statistic | 0.2698 | 0.9657 | 1.2693 | 0.8071 | -0.8502 | -4.3464 | -4.0061 | -0.4036 | -0.6009 |
| **Gear** | | | | | | | | | |
| Mean Slope | -0.0006 | 0.0012 | 0.0012 | -0.0012 | -0.0032 | -0.0032 | -0.0052 | 0.0052 | -0.0007 |
| T-Statistic | -0.2192 | 0.9360 | 0.5048 | -0.8225 | -0.9111 | -0.8053 | -1.6936 | 1.3211 | -0.6854 |
| **Quick_6m** | | | | | | | | | |
| Mean Slope | -0.0001 | -0.0002 | 0.0010 | 0.0008 | 0.0010 | -0.0009 | 0.0028 | -0.0016 | 0.0003 |
| T-Statistic | -0.1173 | -0.2448 | 1.1552 | 0.8556 | 0.6522 | -0.7886 | 1.2430 | -0.8382 | 0.6823 |
| **ChSalelsChAR** | | | | | | | | | |
| Mean Slope | -0.0009 | 0.0003 | 0.0005 | -0.0004 | 0.0011 | -0.0029 | -0.0021 | 0.0013 | 0.0003 |
| T-Statistic | -0.9743 | 0.5586 | 0.4049 | -0.4927 | 0.8475 | -1.3449 | -1.3218 | 0.7913 | -0.6803 |
| **NCF_TD_2yr** | | | | | | | | | |
| Mean Slope | 0.0100 | 0.0062 | 0.0016 | -0.0018 | -0.0015 | 0.0016 | -0.0070 | 0.0018 | 0.0014 |
| T-Statistic | 0.7576 | 1.3179 | 0.3604 | -0.6379 | -0.3526 | 0.6383 | -3.1486 | 0.5399 | 0.8727 |
| **LnMV_2yr** | | | | | | | | | |
| Mean Slope | -0.0076 | -0.0073 | -0.0038 | 0.0008 | 0.0075 | -0.0008 | 0.0135 | -0.0165 | -0.0018 |
| T-Statistic | -1.2904 | -2.3367 | -1.3859 | 0.2100 | 0.5320 | -0.1156 | 1.9042 | -1.9544 | -0.6709 |
| **PPMtP** | | | | | | | | | |
| Mean Slope | -0.0002 | -0.0025 | -0.0002 | 0.0014 | 0.0040 | 0.0034 | -0.0003 | -0.0014 | 0.0005 |
| T-Statistic | -0.0510 | -1.1271 | -0.1009 | 1.3440 | 2.6181 | 1.5348 | -0.2034 | -0.5090 | 0.6892 |
| **NCF** | | | | | | | | | |
| Mean Slope | -0.0046 | 0.0019 | -0.0001 | 0.0019 | 0.0016 | -0.0001 | 0.0087 | -0.0040 | 0.0007 |
| T-Statistic | -1.6087 | 0.7587 | -0.0677 | 1.5284 | 0.5548 | -0.0801 | 1.8985 | -1.9162 | 0.6555 |
| **WC_2yr** | | | | | | | | | |
| Mean Slope | 0.0011 | 0.0004 | -0.0002 | 0.0018 | 0.0009 | -0.0001 | 0.0037 | -0.0046 | 0.0004 |
| T-Statistic | 1.2443 | 0.5281 | -0.1973 | 1.4788 | 0.7802 | -0.0452 | 2.2877 | -1.5686 | 0.6518 |
| **BVpS_6m** | | | | | | | | | |
| Mean Slope | -0.0011 | -0.0037 | 0.0007 | -0.0010 | 0.0081 | 0.0038 | 0.0022 | -0.0021 | 0.0006 |
| T-Statistic | -0.4003 | -2.5153 | 0.3451 | -0.9097 | 1.6693 | 1.4076 | 0.7038 | -0.6626 | 0.6491 |
| **MVT** | | | | | | | | | |
| Mean Slope | -0.0029 | -0.0027 | 0.0008 | 0.0024 | 0.0085 | 0.0003 | 0.0098 | -0.0082 | 0.0011 |
| T-Statistic | -0.6379 | -1.8048 | 0.3574 | 0.9939 | 0.9432 | 0.1090 | 1.6344 | -1.4005 | 0.6473 |
| **DY_1yr** | | | | | | | | | |
| Mean Slope | 0.0037 | -0.0014 | 0.0058 | 0.0027 | -0.0028 | 0.0047 | -0.0078 | 0.0042 | 0.0011 |
| T-Statistic | 1.2392 | -0.6768 | 3.3645 | 1.7726 | -0.2656 | 0.8953 | -1.9836 | 0.7653 | 0.6290 |
| **DPS_2yr** | | | | | | | | | |
| Mean Slope | -0.0002 | -0.0039 | -0.0015 | 0.0020 | 0.0030 | 0.0025 | 0.0096 | -0.0066 | 0.0007 |
| T-Statistic | -0.0499 | -2.0948 | -0.5442 | 1.0351 | 0.9366 | 0.7900 | 2.5547 | -1.6338 | 0.6011 |
| **Borrow** | | | | | | | | | |
| Mean Slope | 0.0001 | 0.0002 | 0.0008 | -0.0007 | -0.0022 | -0.0018 | -0.0011 | 0.0013 | -0.0004 |
| T-Statistic | 0.0358 | 0.2341 | 0.4462 | -0.6530 | -0.7619 | -0.6135 | -0.8340 | 0.7237 | -0.5945 |
| **INV_6m** | | | | | | | | | |
| Mean Slope | 0.0000 | -0.0023 | 0.0012 | -0.0016 | 0.0028 | 0.0042 | 0.0042 | -0.0018 | -0.0003 |
| T-Statistic | 0.0366 | -1.7827 | 1.1539 | -2.0475 | 2.2805 | 3.0197 | 3.6197 | -0.8713 | -0.5797 |
| **RD_EQ_2yr** | | | | | | | | | |
| Mean Slope | 0.0011 | -0.0018 | 0.0006 | 0.0007 | -0.0020 | 0.0006 | -0.0034 | 0.0010 | -0.0004 |
| T-Statistic | 0.8208 | -1.5867 | 0.5480 | 0.7619 | -0.5160 | 0.1974 | -2.5350 | 0.6174 | -0.5681 |
| **DPS** | | | | | | | | | |
| Mean Slope | 0.0016 | -0.0029 | 0.0005 | 0.0015 | 0.0046 | 0.0007 | 0.0046 | -0.0060 | 0.0006 |
| T-Statistic | 0.5436 | -1.8833 | 0.2200 | 1.1429 | 1.2951 | 0.3046 | 1.3663 | -1.6344 | 0.5959 |
| **EqCapRes** | | | | | | | | | |
| Mean Slope | 0.0004 | -0.0013 | 0.0005 | 0.0036 | 0.0059 | 0.0004 | -0.0037 | 0.0005 | 0.0008 |
| T-Statistic | 0.1029 | -0.6687 | 0.2325 | 1.6658 | 0.7712 | 0.1388 | -0.7925 | 0.1285 | 0.5568 |
| **CPS_2yr** | | | | | | | | | |
| Mean Slope | -0.0020 | -0.0027 | 0.0010 | 0.0014 | 0.0046 | 0.0012 | 0.0051 | -0.0037 | 0.0005 |
| T-Statistic | -0.9637 | -1.3801 | 0.6840 | 1.0408 | 1.4055 | 0.8022 | 1.6304 | -1.1550 | 0.5451 |
| **CEY_1yr** | | | | | | | | | |
| Mean Slope | 0.0015 | -0.0015 | 0.0038 | 0.0019 | 0.0028 | 0.0011 | -0.0086 | 0.0037 | 0.0006 |
| T-Statistic | 0.8178 | -0.9827 | 2.0132 | 1.3208 | 0.4905 | 0.4693 | -3.3403 | 1.1412 | 0.5373 |
| **RD_EQ_1yr** | | | | | | | | | |
| Mean Slope | 0.0013 | -0.0001 | 0.0013 | -0.0006 | 0.0001 | 0.0018 | -0.0051 | -0.0001 | -0.0003 |
| T-Statistic | 1.2775 | -0.0493 | 1.2370 | -0.8980 | 0.0366 | 0.7169 | -3.9833 | -0.0362 | 0.5363 |

University of Cape Town

## Appendix C.2.: Cross-sectional univariate regression results by year
-continued

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Gear_1yr** | | | | | | | | | |
| Mean Slope | -0.0007 | -0.0001 | 0.0000 | -0.0010 | -0.0013 | -0.0020 | -0.0015 | 0.0052 | -0.0003 |
| T-Statistic | -0.7122 | -0.1725 | 0.0014 | -2.0024 | -1.0783 | -0.9014 | -1.0634 | 2.3202 | -0.5206 |
| **CFMtP_2yr** | | | | | | | | | |
| Mean Slope | 0.0016 | 0.0004 | 0.0011 | 0.0002 | 0.0011 | 0.0002 | -0.0035 | 0.0029 | 0.0005 |
| T-Statistic | 0.6132 | 0.1506 | 1.1920 | 0.2177 | 0.2907 | 0.0622 | -1.5822 | 0.7604 | 0.5046 |
| **LnMV** | | | | | | | | | |
| Mean Slope | -0.0046 | -0.0038 | -0.0020 | 0.0029 | 0.0054 | -0.0011 | 0.0030 | -0.0001 | -0.0010 |
| T-Statistic | -0.9112 | -1.3201 | -0.7633 | 1.1019 | 0.4041 | -0.2560 | 0.4241 | -1.3794 | -0.5012 |
| **DPS_6m** | | | | | | | | | |
| Mean Slope | 0.0006 | -0.0020 | 0.0001 | 0.0005 | 0.0026 | 0.0009 | 0.0057 | -0.0049 | 0.0004 |
| T-Statistic | 0.1074 | -1.7665 | 0.0431 | 0.4359 | 0.7865 | 0.3076 | 3.1082 | -1.4444 | 0.4971 |
| **Quick_2yr** | | | | | | | | | |
| Mean Slope | 0.0012 | 0.0002 | 0.0000 | 0.0017 | 0.0011 | -0.0006 | 0.0033 | -0.0046 | 0.0003 |
| T-Statistic | 1.3325 | 0.2324 | 0.0069 | 1.3932 | 1.1699 | -0.3958 | 1.6151 | -1.5946 | 0.4945 |
| **P_2yr** | | | | | | | | | |
| Mean Slope | -0.0075 | -0.0072 | -0.0032 | 0.0012 | 0.0090 | -0.0008 | 0.0151 | -0.0169 | -0.0013 |
| T-Statistic | -1.3024 | -2.3399 | -0.9136 | 0.4032 | 0.6692 | -0.1157 | 2.0277 | -2.0874 | -0.4918 |
| **Sales_P_1yr** | | | | | | | | | |
| Mean Slope | 0.0045 | 0.0007 | 0.0101 | 0.0034 | -0.0054 | 0.0040 | -0.0152 | 0.0079 | 0.0013 |
| T-Statistic | 1.7807 | 0.2536 | 3.3647 | 1.8415 | -0.3575 | 0.5479 | -2.3647 | 0.8977 | 0.4836 |
| **DPS_1yr** | | | | | | | | | |
| Mean Slope | 0.0001 | -0.0039 | 0.0002 | 0.0017 | 0.0025 | 0.0015 | 0.0073 | -0.0055 | 0.0005 |
| T-Statistic | 0.0390 | -2.9724 | 0.1058 | 1.1465 | 0.5846 | 0.4977 | 2.9459 | -1.6423 | 0.4834 |
| **DY** | | | | | | | | | |
| Mean Slope | 0.0093 | 0.0073 | 0.0013 | 0.0005 | -0.0007 | 0.0014 | -0.0139 | 0.0113 | 0.0007 |
| T-Statistic | 1.7911 | 0.9093 | 0.7094 | 0.8462 | -0.1039 | 0.4337 | -3.0671 | 1.8639 | 0.4831 |
| **NAVpS_2yr** | | | | | | | | | |
| Mean Slope | -0.0020 | -0.0040 | -0.0015 | 0.0017 | 0.0061 | 0.0034 | 0.0103 | -0.0087 | 0.0007 |
| T-Statistic | -0.5112 | -1.4596 | -0.5467 | 0.9786 | 0.9825 | 0.9476 | 2.6610 | -2.4377 | 0.4763 |
| **MOM_3m** | | | | | | | | | |
| Mean Slope | -0.0025 | -0.0037 | -0.0063 | -0.0009 | 0.0000 | -0.0052 | 0.0112 | 0.0014 | -0.0007 |
| T-Statistic | -0.6710 | -1.7212 | -2.4703 | -0.3227 | 0.0025 | -1.3921 | 1.7501 | 0.2961 | -0.4670 |
| **ROEpub_6m** | | | | | | | | | |
| Mean Slope | -0.0001 | -0.0011 | 0.0007 | -0.0001 | -0.0008 | 0.0014 | -0.0001 | 0.0019 | 0.0002 |
| T-Statistic | -0.0941 | -1.2946 | 0.6563 | -0.2128 | -0.3749 | 0.9994 | -0.1433 | 0.9785 | 0.4624 |
| **LnMV_1yr** | | | | | | | | | |
| Mean Slope | -0.0057 | -0.0027 | -0.0094 | -0.0031 | 0.0068 | -0.0024 | 0.0177 | -0.0113 | -0.0013 |
| T-Statistic | -1.5967 | -0.8490 | -2.6798 | -1.4362 | 0.4518 | -0.3288 | 2.5557 | -1.2089 | -0.4619 |
| **Growth_2yr** | | | | | | | | | |
| Mean Slope | -0.0013 | -0.0020 | 0.0014 | 0.0021 | 0.0005 | 0.0004 | 0.0020 | -0.0010 | 0.0002 |
| T-Statistic | -0.5180 | -2.1958 | 1.3946 | 2.3130 | 0.3999 | 0.2772 | 1.9611 | -0.6119 | 0.4617 |
| **NPMtP** | | | | | | | | | |
| Mean Slope | -0.0007 | -0.0026 | -0.0001 | 0.0015 | 0.0040 | 0.0028 | 0.0005 | -0.0022 | 0.0004 |
| T-Statistic | -0.1998 | -1.3096 | -0.0462 | 1.3829 | 1.9510 | 1.0389 | 0.3267 | -0.7677 | 0.4610 |
| **BVpS_2yr** | | | | | | | | | |
| Mean Slope | -0.0025 | -0.0035 | -0.0018 | 0.0010 | 0.0060 | 0.0029 | 0.0075 | -0.0065 | 0.0006 |
| T-Statistic | -0.7045 | -1.2620 | -0.6218 | 1.1412 | 1.2276 | 0.7096 | 2.6875 | -1.9905 | 0.4536 |
| **BVpS_1yr** | | | | | | | | | |
| Mean Slope | -0.0015 | -0.0041 | -0.0006 | 0.0029 | 0.0060 | 0.0030 | 0.0050 | -0.0068 | 0.0006 |
| T-Statistic | -0.3303 | -1.7905 | -0.2591 | 1.7044 | 1.3528 | 0.7354 | 1.5981 | -2.0209 | 0.4478 |
| **Gear_6m** | | | | | | | | | |
| Mean Slope | -0.0010 | -0.0002 | -0.0006 | -0.0008 | -0.0001 | -0.0022 | 0.0003 | 0.0027 | -0.0002 |
| T-Statistic | -0.0150 | -0.3272 | -0.7580 | -1.2709 | -0.0682 | -1.4653 | 0.1741 | 1.1190 | -0.4418 |
| **DepAmort_TA_1yr** | | | | | | | | | |
| Mean Slope | 0.0011 | -0.0009 | -0.0017 | -0.0019 | 0.0002 | 0.0021 | 0.0176 | -0.0102 | 0.0008 |
| T-Statistic | 0.6529 | -0.4106 | -0.6764 | -0.8047 | 0.0626 | 0.6036 | 2.7730 | -0.9308 | 0.4207 |
| **RD_TA_1yr** | | | | | | | | | |
| Mean Slope | 0.0010 | 0.0001 | 0.0004 | -0.0008 | 0.0012 | 0.0008 | -0.0030 | -0.0007 | -0.0002 |
| T-Statistic | 1.3507 | 0.0749 | 0.3269 | -1.0705 | 0.5764 | 0.3405 | -2.2628 | -0.2926 | -0.4108 |
| **CFMtP_1yr** | | | | | | | | | |
| Mean Slope | 0.0019 | -0.0009 | 0.0034 | 0.0014 | 0.0024 | 0.0005 | -0.0001 | 0.0042 | 0.0005 |
| T-Statistic | 1.0660 | -0.7073 | 1.0922 | 1.1279 | 0.3593 | 0.1935 | -0.4270 | 1.2169 | 0.4068 |
| **MVT_2yr** | | | | | | | | | |
| Mean Slope | -0.0040 | -0.0033 | 0.0010 | 0.0003 | 0.0074 | 0.0008 | 0.0140 | -0.0112 | 0.0007 |
| T-Statistic | -1.2353 | -1.3762 | 0.4224 | 0.2011 | 0.8342 | 0.2047 | 2.8132 | -1.6107 | 0.4048 |

University of Cape Town

## Appendix C.2.: Cross-sectional univariate regression results by year
-continued

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **NAVpS_1yr** | | | | | | | | | |
| Mean Slope | -0.0016 | -0.0043 | -0.0012 | 0.0026 | 0.0056 | 0.0020 | 0.0091 | -0.0087 | 0.0005 |
| T-Statistic | -0.3993 | -1.7904 | -0.5177 | 1.4448 | 1.2031 | 0.7676 | 2.3019 | -2.4136 | 0.4099 |
| **Intan_MV_1yr** | | | | | | | | | |
| Mean Slope | 0.0010 | -0.0006 | 0.0014 | 0.0005 | -0.0023 | 0.0030 | -0.0087 | 0.0005 | -0.0005 |
| T-Statistic | 0.7213 | -0.4815 | 1.3769 | 0.4966 | -0.2728 | 1.2744 | -2.7461 | 0.1188 | -0.4025 |
| **WC_6m** | | | | | | | | | |
| Mean Slope | 0.0001 | 0.0000 | 0.0010 | 0.0008 | 0.0006 | -0.0006 | 0.0024 | -0.0026 | 0.0002 |
| T-Statistic | 0.1539 | 0.0042 | 1.0474 | 0.9222 | 0.3118 | -0.5824 | 1.0516 | -1.2555 | 0.3984 |
| **NCF_TD_1yr** | | | | | | | | | |
| Mean Slope | -0.0022 | 0.0014 | 0.0006 | 0.0011 | 0.0044 | 0.0010 | 0.0003 | -0.0032 | 0.0004 |
| T-Statistic | -0.3263 | 0.5844 | 0.2197 | 0.4628 | 3.1900 | 0.7706 | 0.1277 | -0.9151 | 0.3916 |
| **MOM_18m** | | | | | | | | | |
| Mean Slope | -0.0041 | -0.0049 | -0.0048 | -0.0001 | 0.0078 | -0.0006 | 0.0134 | -0.0126 | -0.0009 |
| T-Statistic | -1.5618 | -1.8598 | -2.1749 | 0.0217 | 0.8012 | -0.1345 | 2.4151 | -2.0258 | -0.3644 |
| **Intan_MV_2yr** | | | | | | | | | |
| Mean Slope | 0.0005 | 0.0022 | 0.0004 | -0.0015 | -0.0012 | 0.0013 | -0.0016 | 0.0028 | 0.0004 |
| T-Statistic | 0.5278 | 1.8516 | 0.3471 | -1.1399 | -0.2129 | 0.5090 | -0.8101 | 0.8019 | 0.3774 |
| **NS** | | | | | | | | | |
| Mean Slope | -0.0014 | 0.0005 | 0.0001 | 0.0016 | 0.0017 | -0.0046 | -0.0042 | 0.0060 | -0.0004 |
| T-Statistic | -0.4339 | 0.1999 | 0.0008 | 0.9021 | 0.4116 | -3.7065 | -3.7614 | 1.4516 | -0.9705 |
| **P** | | | | | | | | | |
| Mean Slope | 0.0006 | -0.0051 | -0.0016 | 0.0018 | 0.0077 | 0.0014 | 0.0102 | -0.0111 | 0.0005 |
| T-Statistic | 0.1400 | -2.4935 | -0.6217 | 0.9062 | 1.5548 | 0.5422 | 2.4261 | -1.9290 | 0.3432 |
| **P_1yr** | | | | | | | | | |
| Mean Slope | -0.0055 | -0.0030 | -0.0096 | -0.0028 | 0.0061 | -0.0023 | 0.0184 | -0.0116 | -0.0009 |
| T-Statistic | -1.5806 | -0.9263 | -2.8237 | -1.2467 | 0.9559 | -0.9248 | 2.6008 | -1.2536 | -0.3420 |
| **DepAmort_TA_2yr** | | | | | | | | | |
| Mean Slope | 0.0000 | -0.0011 | -0.0032 | -0.0001 | -0.0019 | -0.0004 | 0.0187 | -0.0074 | 0.0006 |
| T-Statistic | 0.0338 | -0.5013 | -1.1715 | -0.0317 | -0.5970 | -0.1235 | 2.7460 | -0.8131 | 0.3391 |
| **INV** | | | | | | | | | |
| Mean Slope | 0.0000 | 0.0005 | -0.0005 | 0.0020 | 0.0008 | -0.0031 | -0.0031 | 0.0035 | -0.0002 |
| T-Statistic | 0.0040 | 0.2320 | -0.6086 | 1.4143 | 0.3477 | -3.2807 | -3.2807 | 0.9959 | -0.3146 |
| **EY_6m** | | | | | | | | | |
| Mean Slope | 0.0004 | -0.0030 | 0.0046 | -0.0002 | 0.0033 | 0.0051 | -0.0077 | 0.0010 | 0.0004 |
| T-Statistic | 0.1470 | -2.6111 | 2.6114 | -0.1603 | 0.6695 | 2.4790 | -1.8294 | 0.2104 | 0.3136 |
| **NPMtP_2yr** | | | | | | | | | |
| Mean Slope | -0.0003 | -0.0024 | 0.0007 | 0.0018 | 0.0010 | 0.0007 | -0.0006 | 0.0008 | 0.0002 |
| T-Statistic | -0.1194 | -1.6886 | 0.7366 | 1.5225 | 0.4873 | 0.7859 | -0.4444 | 0.4139 | 0.3127 |
| **MOM_12m** | | | | | | | | | |
| Mean Slope | -0.0038 | -0.0038 | -0.0064 | -0.0016 | 0.0069 | -0.0023 | 0.0144 | -0.0083 | -0.0006 |
| T-Statistic | -1.8899 | -1.4748 | -2.7309 | -0.7513 | 0.6973 | -0.4533 | 2.3440 | -1.1660 | -0.3087 |
| **INV_2yr** | | | | | | | | | |
| Mean Slope | -0.0004 | -0.0023 | -0.0004 | 0.0004 | 0.0013 | 0.0013 | 0.0013 | -0.0041 | -0.0002 |
| T-Statistic | -0.1990 | -1.5735 | -0.2592 | 0.2147 | 0.5910 | 0.7080 | 0.7080 | -2.3089 | -0.2979 |
| **Sales_P_6m** | | | | | | | | | |
| Mean Slope | 0.0078 | 0.0008 | 0.0099 | -0.0017 | -0.0014 | 0.0079 | -0.0190 | 0.0015 | 0.0007 |
| T-Statistic | 1.6616 | 0.2701 | 2.5494 | -0.6801 | -0.0974 | 1.1999 | -2.4737 | 0.1680 | 0.2589 |
| **ROEpub_2yr** | | | | | | | | | |
| Mean Slope | -0.0020 | -0.0025 | 0.0009 | 0.0023 | 0.0014 | 0.0010 | 0.0016 | -0.0014 | 0.0001 |
| T-Statistic | -0.6308 | -1.8113 | 0.9348 | 1.9888 | 1.1769 | 0.5284 | 1.2631 | -0.9219 | 0.2460 |
| **EY_1yr** | | | | | | | | | |
| Mean Slope | 0.0014 | -0.0035 | 0.0034 | 0.0007 | 0.0000 | 0.0027 | -0.0048 | 0.0021 | 0.0002 |
| T-Statistic | 0.4786 | -2.9957 | 1.7312 | 0.4588 | 0.0125 | 1.3998 | -1.4424 | 0.4874 | 0.2447 |
| **Intan_MV_6m** | | | | | | | | | |
| Mean Slope | 0.0052 | 0.0007 | 0.0048 | -0.0023 | 0.0037 | 0.0063 | -0.0137 | -0.0023 | 0.0005 |
| T-Statistic | 1.2734 | 0.3336 | 2.9906 | -1.1408 | 0.2681 | 1.4163 | -2.2999 | -0.2684 | 0.2371 |
| **NCF_6P1yrDiv_6m** | | | | | | | | | |
| Mean Slope | -0.0024 | -0.0015 | -0.0017 | 0.0033 | 0.0055 | -0.0017 | -0.0013 | -0.0010 | -0.0002 |
| T-Statistic | -0.7468 | -0.7434 | -0.7498 | 3.5591 | 4.2157 | -0.7077 | -0.5154 | -0.5187 | -0.1870 |
| **LnMV_3m** | | | | | | | | | |
| Mean Slope | -0.0016 | -0.0014 | -0.0067 | -0.0005 | -0.0014 | -0.0119 | 0.0208 | -0.0009 | -0.0004 |
| T-Statistic | -0.3070 | -0.4479 | -2.2496 | -0.1995 | -0.1104 | -1.7603 | 2.9202 | -0.1285 | -0.1790 |
| **TLC_TA_1yr** | | | | | | | | | |
| Mean Slope | -0.0002 | 0.0000 | 0.0017 | 0.0008 | -0.0005 | -0.0026 | -0.0036 | 0.0010 | -0.0001 |
| T-Statistic | -0.1788 | 0.8751 | 1.5600 | 0.8312 | -0.6569 | -4.5759 | -5.7232 | 0.7745 | -0.1603 |
| **AccRec** | | | | | | | | | |
| Mean Slope | -0.0005 | 0.0007 | 0.0000 | 0.0024 | 0.0006 | -0.0023 | -0.0056 | 0.0036 | -0.0001 |
| T-Statistic | -0.1421 | 0.3796 | -0.0284 | 1.4896 | 0.1856 | -1.8393 | -1.6115 | 1.1292 | -0.1631 |

University of Cape Town

## Appendix C.2.: Cross-sectional univariate regression results by year
-continued

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Sales_Emp_2yr** | | | | | | | | | |
| Mean Slope | 0.0013 | -0.0034 | 0.0015 | -0.0001 | 0.0014 | 0.0016 | 0.0039 | -0.0037 | -0.0001 |
| T-Statistic | 0.4536 | -2.7178 | 0.9378 | -0.0907 | 0.6463 | 0.7797 | 1.3206 | -1.2043 | -0.1599 |
| **MOM_6m** | | | | | | | | | |
| Mean Slope | -0.0073 | 0.0021 | -0.0056 | 0.0002 | 0.0048 | -0.0045 | 0.0147 | -0.0079 | -0.0003 |
| T-Statistic | 2.4316 | 1.1511 | -2.1305 | 0.0800 | 0.5486 | -1.1556 | 2.1224 | -0.3859 | -0.1545 |
| **OPMtP_2yr** | | | | | | | | | |
| Mean Slope | 0.0013 | 0.0031 | -0.0001 | -0.0014 | -0.0005 | 0.0003 | -0.0037 | 0.0063 | -0.0001 |
| T-Statistic | 0.4397 | -1.3731 | -0.1173 | -2.5452 | -0.3917 | 0.3257 | -2.9314 | 1.5029 | -0.1440 |
| **P_3m** | | | | | | | | | |
| Mean Slope | -0.0020 | -0.0017 | -0.0070 | -0.0003 | -0.0009 | -0.0117 | 0.0229 | -0.0011 | -0.0003 |
| T-Statistic | -0.3984 | -0.5731 | -2.3189 | -0.1203 | -0.0775 | -1.7839 | 2.9039 | -0.1499 | -0.1307 |
| **BP1yrDiv** | | | | | | | | | |
| Mean Slope | 0.0016 | -0.0010 | 0.0005 | 0.0010 | 0.0010 | 0.0029 | -0.0032 | 0.0017 | -0.0001 |
| T-Statistic | 0.6686 | -0.6423 | 0.3966 | 0.7836 | 0.3940 | 1.2619 | -1.2211 | 0.7506 | -0.1256 |
| **Sales** | | | | | | | | | |
| Mean Slope | 0.0000 | -0.0006 | 0.0006 | 0.0025 | 0.0028 | -0.0007 | -0.0060 | 0.0024 | 0.0001 |
| T-Statistic | 0.0076 | -0.3340 | 0.3449 | 1.7152 | 0.6087 | 0.4161 | -1.6161 | 0.8283 | 0.1233 |
| **CFMtP** | | | | | | | | | |
| Mean Slope | 0.0003 | 0.0017 | 0.0018 | -0.0002 | 0.0015 | -0.0007 | -0.0077 | 0.0043 | 0.0001 |
| T-Statistic | 0.1608 | 0.9482 | 1.1669 | -0.1831 | 0.2619 | -0.2544 | -2.5849 | 1.0961 | 0.1126 |
| **OPMtP_1yr** | | | | | | | | | |
| Mean Slope | 0.0016 | -0.0027 | -0.0001 | 0.0017 | 0.0021 | 0.0039 | -0.0070 | 0.0023 | 0.0001 |
| T-Statistic | 0.6211 | -2.5053 | -0.0791 | 1.6791 | 1.3315 | 1.2329 | -2.7676 | 0.5836 | 0.1117 |
| **ROEpub_1yr** | | | | | | | | | |
| Mean Slope | -0.0005 | -0.0022 | 0.0007 | 0.0012 | 0.0015 | 0.0011 | -0.0007 | -0.0006 | 0.0001 |
| T-Statistic | -0.2576 | -2.0699 | 0.4317 | 1.0689 | 0.6249 | 0.5936 | -0.5490 | 0.3410 | 0.1070 |
| **P_6m** | | | | | | | | | |
| Mean Slope | -0.0075 | -0.0018 | -0.0081 | 0.0008 | 0.0041 | 0.0060 | 0.0236 | -0.0028 | 0.0003 |
| T-Statistic | -1.8197 | -0.5339 | -2.0254 | 0.2846 | 0.7805 | 0.9913 | 2.6976 | -0.3124 | 0.1030 |
| **RD_TA_2yr** | | | | | | | | | |
| Mean Slope | 0.0004 | -0.0016 | 0.0003 | -0.0001 | -0.0004 | 0.0000 | -0.0003 | 0.0012 | -0.0001 |
| T-Statistic | 0.5122 | -1.4578 | 0.2578 | -0.0919 | -0.1697 | -0.0078 | -0.1331 | 0.5040 | -0.1017 |
| **NCF_BP1yr_6m** | | | | | | | | | |
| Mean Slope | -0.0020 | -0.0015 | -0.0010 | 0.0039 | 0.0024 | 0.0045 | -0.0046 | -0.0018 | -0.0001 |
| T-Statistic | -0.5647 | -0.6745 | -0.4018 | 3.5360 | 1.5292 | 1.9241 | -1.4136 | -0.6735 | -0.1010 |
| **Sales_Emp_6m** | | | | | | | | | |
| Mean Slope | 0.0013 | -0.0015 | 0.0035 | -0.0016 | 0.0001 | 0.0017 | 0.0003 | -0.0034 | 0.0001 |
| T-Statistic | 0.5816 | -1.8009 | 3.4397 | -1.6634 | 0.0569 | 0.9160 | 0.1648 | -1.3080 | 0.0788 |
| **RD_TA_6m** | | | | | | | | | |
| Mean Slope | 0.0010 | 0.0006 | 0.0003 | -0.0009 | 0.0016 | 0.0004 | -0.0045 | 0.0013 | 0.0000 |
| T-Statistic | 0.9578 | 0.5686 | 0.2798 | -1.2267 | 1.2844 | 0.3059 | -2.4631 | 0.5365 | -0.0589 |
| **ChEPS_P_2yr** | | | | | | | | | |
| Mean Slope | -0.0016 | -0.0044 | 0.0021 | 0.0013 | 0.0049 | 0.0004 | 0.0043 | -0.0064 | 0.0000 |
| T-Statistic | -0.5153 | -3.0352 | 1.1134 | 0.7244 | 1.4333 | 0.1781 | 1.5901 | -2.2875 | 0.0509 |
| **Sales_P** | | | | | | | | | |
| Mean Slope | 0.0020 | 0.0043 | 0.0026 | -0.0010 | 0.0014 | -0.0006 | -0.0112 | 0.0086 | -0.0001 |
| T-Statistic | 1.0512 | 4.4369 | 1.0978 | -0.8044 | 0.5952 | -0.1077 | -2.2145 | 1.2436 | -0.0435 |
| **RD_EQ_6m** | | | | | | | | | |
| Mean Slope | 0.0004 | 0.0005 | 0.0006 | 0.0006 | 0.0001 | -0.0005 | 0.0046 | 0.0026 | 0.0000 |
| T-Statistic | 0.3671 | 0.4061 | 0.8067 | 0.7652 | 0.0468 | -0.3635 | -2.6312 | 1.1626 | -0.0296 |
| **DepAmort_TA** | | | | | | | | | |
| Mean Slope | -0.0009 | 0.0008 | 0.0018 | 0.0020 | 0.0039 | -0.0040 | 0.0027 | -0.0067 | 0.0000 |
| T-Statistic | -0.2023 | 0.3741 | 1.0023 | 0.5589 | 0.7582 | -1.4841 | 0.4879 | -1.2997 | -0.0219 |
| **AOCE_2yr** | | | | | | | | | |
| Mean Slope | -0.0024 | -0.0037 | 0.0010 | 0.0025 | 0.0042 | 0.0002 | 0.0002 | -0.0016 | 0.0000 |
| T-Statistic | -0.6142 | -1.5218 | 0.7915 | 1.7933 | 1.2059 | 0.1061 | 0.1061 | -1.1590 | 0.0165 |
| **LnMV_6m** | | | | | | | | | |
| Mean Slope | -0.0075 | -0.0017 | -0.0073 | 0.0006 | 0.0032 | -0.0061 | 0.0218 | -0.0029 | 0.0000 |
| T-Statistic | -1.7631 | -0.5155 | -1.8643 | 0.1877 | 0.9133 | -0.9987 | 2.6472 | -0.3198 | 0.0038 |
| **EPS_2yr** | | | | | | | | | |
| Mean Slope | -0.0018 | -0.0035 | 0.0017 | 0.0016 | 0.0022 | 0.0011 | 0.0055 | 0.0049 | 0.0000 |
| T-Statistic | 0.4149 | -3.0285 | 0.9559 | 1.0919 | 0.5471 | 0.3025 | 2.0914 | -2.1542 | -0.0001 |

University of Cape Town

## Appendix C.3.: Correlation matrix of monthly payoffs to significant firm-specific attributes

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the cross-sectional regression analysis. Attributes are significant at the 5% level using Student's (1908) t-statistic. The firm-specific attribute data are standardised and adjusted for thin-trading and outliers. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and a white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| | P_1m | LnMV_1m | VO_1m | VO_3m | VO_6m | VO_1yr | TV_1m | TV_3m | TV_6m | TV_1yr | MVT_3m | MVT_MV_1m | MVT_MV_3m | MVT_MV_6m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P_1m | 1.000 | | | | | | | | | | | | | |
| LnMV_1m | 0.997 | 1.000 | | | | | | | | | | | | |
| VO_1m | 0.036 | 0.024 | 1.000 | | | | | | | | | | | |
| VO_3m | 0.138 | 0.126 | 0.662 | 1.000 | | | | | | | | | | |
| VO_6m | 0.193 | 0.184 | 0.508 | 0.729 | 1.000 | | | | | | | | | |
| VO_1yr | 0.414 | 0.402 | 0.439 | 0.632 | 0.720 | 1.000 | | | | | | | | |
| TV_1m | 0.035 | 0.022 | 0.988 | 0.670 | 0.506 | 0.446 | 1.000 | | | | | | | |
| TV_3m | 0.128 | 0.115 | 0.637 | 0.991 | 0.719 | 0.627 | 0.656 | 1.000 | | | | | | |
| TV_6m | 0.205 | 0.194 | 0.514 | 0.755 | 0.987 | 0.726 | 0.527 | 0.756 | 1.000 | | | | | |
| TV_1yr | 0.403 | 0.392 | 0.415 | 0.619 | 0.711 | 0.988 | 0.429 | 0.620 | 0.728 | 1.000 | | | | |
| MVT_3m | 0.664 | 0.661 | 0.336 | 0.715 | 0.600 | 0.739 | 0.337 | 0.692 | 0.625 | 0.735 | 1.000 | | | |
| MVT_MV_1m | 0.031 | 0.018 | 1.000 | 0.662 | 0.506 | 0.438 | 0.988 | 0.637 | 0.512 | 0.413 | 0.330 | 1.000 | | |
| MVT_MV_3m | 0.135 | 0.123 | 0.660 | 1.000 | 0.731 | 0.634 | 0.669 | 0.991 | 0.757 | 0.620 | 0.711 | 0.660 | 1.000 | |
| MVT_MV_6m | 0.187 | 0.178 | 0.506 | 0.733 | 0.999 | 0.717 | 0.507 | 0.723 | 0.986 | 0.709 | 0.597 | 0.505 | 0.736 | 1.000 |
| MVT_MV_1yr | 0.407 | 0.395 | 0.439 | 0.637 | 0.726 | 0.999 | 0.446 | 0.634 | 0.732 | 0.989 | 0.735 | 0.438 | 0.639 | 0.724 |
| Reten | 0.219 | 0.219 | 0.170 | 0.332 | 0.430 | 0.548 | 0.150 | 0.314 | 0.408 | 0.528 | 0.477 | 0.163 | 0.329 | 0.414 |
| Reten_6m | 0.141 | 0.145 | 0.032 | 0.138 | 0.061 | 0.291 | 0.047 | 0.143 | 0.077 | 0.303 | 0.242 | 0.036 | 0.144 | 0.070 |
| Reten_1yr | 0.155 | 0.173 | 0.055 | 0.088 | -0.081 | 0.217 | 0.072 | 0.078 | -0.104 | 0.209 | 0.192 | 0.062 | 0.093 | -0.071 |
| CPS_6m | 0.061 | 0.062 | -0.073 | 0.101 | 0.077 | 0.153 | -0.091 | 0.093 | 0.100 | 0.183 | 0.164 | -0.083 | 0.093 | 0.068 |
| INV_1yr | 0.210 | 0.219 | -0.023 | -0.030 | 0.029 | 0.094 | -0.063 | -0.074 | -0.024 | 0.083 | 0.207 | -0.025 | -0.036 | 0.018 |
| NCA_MV_1yr | -0.550 | -0.571 | 0.190 | 0.200 | 0.168 | -0.179 | 0.201 | 0.232 | 0.177 | -0.179 | -0.352 | 0.196 | 0.211 | 0.180 |
| NCA_MV_2yr | -0.390 | -0.414 | 0.128 | 0.101 | 0.080 | -0.097 | 0.162 | 0.140 | 0.122 | -0.098 | -0.272 | 0.133 | 0.107 | 0.090 |
| AssTurn_6m | 0.050 | 0.039 | 0.182 | 0.317 | 0.224 | 0.191 | 0.164 | 0.320 | 0.222 | 0.174 | 0.168 | 0.181 | 0.317 | 0.221 |
| AssTurn_1yr | 0.063 | 0.051 | 0.214 | 0.345 | 0.368 | 0.232 | 0.191 | 0.335 | 0.357 | 0.210 | 0.186 | 0.214 | 0.348 | 0.370 |
| AssTurn_2yr | 0.149 | 0.139 | 0.218 | 0.311 | 0.289 | 0.275 | 0.200 | 0.319 | 0.323 | 0.267 | 0.257 | 0.207 | 0.310 | 0.294 |
| PEGI | -0.254 | -0.252 | -0.085 | -0.109 | -0.106 | -0.263 | -0.068 | -0.078 | -0.117 | -0.260 | -0.329 | -0.078 | -0.102 | -0.097 |
| PEGI_6m | 0.500 | 0.503 | -0.077 | -0.264 | -0.231 | 0.048 | -0.076 | -0.286 | -0.220 | 0.054 | 0.269 | -0.087 | -0.275 | -0.246 |
| PEGI_1yr | 0.207 | 0.213 | -0.021 | -0.179 | -0.209 | 0.001 | -0.004 | -0.163 | -0.183 | 0.019 | 0.066 | -0.029 | -0.190 | -0.223 |
| PEGI_2yr | -0.081 | -0.075 | 0.060 | -0.078 | -0.140 | -0.169 | 0.077 | -0.063 | -0.140 | -0.151 | -0.129 | 0.057 | -0.082 | -0.144 |
| NS_6m | 0.195 | 0.196 | 0.064 | 0.058 | 0.105 | 0.338 | 0.047 | 0.029 | 0.093 | 0.313 | 0.272 | 0.062 | 0.056 | 0.094 |
| DIV_6m | 0.057 | 0.055 | 0.063 | 0.071 | 0.103 | 0.260 | 0.045 | 0.073 | 0.110 | 0.233 | 0.136 | 0.058 | 0.072 | 0.094 |
| TD_TA_6m | -0.084 | -0.092 | 0.062 | 0.149 | 0.183 | -0.031 | 0.070 | 0.159 | 0.193 | -0.029 | -0.025 | 0.069 | 0.152 | 0.197 |
| Sales_Emp | -0.258 | -0.276 | 0.109 | 0.012 | 0.043 | -0.128 | 0.124 | 0.045 | 0.058 | -0.135 | -0.309 | 0.114 | 0.016 | 0.053 |
| RD_TA | 0.337 | 0.345 | 0.011 | 0.059 | -0.011 | 0.222 | 0.020 | 0.043 | 0.017 | 0.235 | 0.358 | -0.001 | 0.047 | -0.028 |
| RD_EQ | 0.064 | 0.067 | 0.226 | 0.153 | 0.068 | 0.150 | 0.258 | 0.148 | 0.107 | 0.169 | 0.146 | 0.220 | 0.144 | 0.057 |
| ICBT_6m | 0.098 | 0.109 | -0.233 | -0.081 | 0.036 | 0.069 | -0.253 | -0.106 | 0.010 | 0.076 | 0.090 | -0.233 | -0.084 | 0.030 |
| ICBT_1yr | 0.378 | 0.389 | -0.199 | -0.093 | 0.008 | 0.181 | -0.243 | -0.137 | -0.019 | 0.167 | 0.346 | -0.205 | -0.099 | 0.000 |
| ICBT_2yr | 0.340 | 0.343 | -0.145 | 0.014 | 0.024 | 0.166 | -0.193 | -0.022 | 0.016 | 0.153 | 0.383 | -0.152 | 0.009 | 0.015 |
| AccRec_6m | 0.128 | 0.116 | 0.053 | 0.154 | 0.232 | 0.371 | 0.021 | 0.134 | 0.233 | 0.384 | 0.295 | 0.046 | 0.152 | 0.220 |
| NCF_BP1yr | 0.099 | 0.099 | -0.107 | 0.051 | 0.121 | 0.293 | -0.110 | 0.065 | 0.118 | 0.302 | 0.192 | -0.110 | 0.055 | 0.113 |
| ChSalelsChInv | 0.174 | 0.160 | 0.095 | 0.257 | 0.100 | 0.157 | 0.072 | 0.241 | 0.124 | 0.183 | 0.306 | 0.086 | 0.249 | 0.095 |
| MOM_1m | 0.849 | 0.818 | 0.141 | 0.232 | 0.236 | 0.455 | 0.138 | 0.221 | 0.265 | 0.458 | 0.615 | 0.135 | 0.226 | 0.233 |
| Crossover3_12 | -0.161 | -0.174 | 0.130 | 0.155 | 0.210 | 0.042 | 0.116 | 0.156 | 0.199 | 0.045 | -0.069 | 0.130 | 0.155 | 0.215 |
| Crossover6_12 | -0.168 | -0.175 | 0.166 | 0.165 | 0.298 | 0.196 | 0.186 | 0.183 | 0.320 | 0.232 | 0.002 | 0.165 | 0.166 | 0.299 |
| Crossover3_18 | -0.038 | -0.052 | 0.236 | 0.228 | 0.239 | 0.091 | 0.205 | 0.210 | 0.233 | 0.081 | 0.053 | 0.237 | 0.228 | 0.243 |
| Crossover6_18 | -0.058 | -0.069 | 0.099 | 0.163 | 0.296 | 0.173 | 0.086 | 0.167 | 0.300 | 0.175 | 0.050 | 0.101 | 0.166 | 0.298 |

University of Cape Town

**Appendix C.3.: Correlation matrix of monthly payoffs to significant firm-specific attributes**
-continued

| | MVT_MV_1yr | Reten | Reten_6m | Reten_1yr | CPS_6m | INV_1yr | NCA_MV_1yr | NCA_MV_2yr | AssTurn_6m | AssTurn_1yr | AssTurn_2yr | PEGI | PEGI_6m | PEGI_1yr | PEGI_2yr | NS_6m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P_1m | | | | | | | | | | | | | | | | |
| LnMV_1m | | | | | | | | | | | | | | | | |
| VO_1m | | | | | | | | | | | | | | | | |
| VO_3m | | | | | | | | | | | | | | | | |
| VO_6m | | | | | | | | | | | | | | | | |
| VO_1yr | | | | | | | | | | | | | | | | |
| TV_1m | | | | | | | | | | | | | | | | |
| TV_3m | | | | | | | | | | | | | | | | |
| TV_6m | | | | | | | | | | | | | | | | |
| TV_1yr | | | | | | | | | | | | | | | | |
| MVT_3m | | | | | | | | | | | | | | | | |
| MVT_MV_1m | | | | | | | | | | | | | | | | |
| MVT_MV_3m | | | | | | | | | | | | | | | | |
| MVT_MV_6m | | | | | | | | | | | | | | | | |
| MVT_MV_1yr | 1.000 | | | | | | | | | | | | | | | |
| Reten | 0.532 | 1.000 | | | | | | | | | | | | | | |
| Reten_6m | 0.301 | 0.060 | 1.000 | | | | | | | | | | | | | |
| Reten_1yr | 0.228 | 0.113 | 0.589 | 1.000 | | | | | | | | | | | | |
| CPS_6m | 0.145 | 0.225 | 0.010 | -0.090 | 1.000 | | | | | | | | | | | |
| INV_1yr | 0.078 | 0.331 | -0.145 | -0.055 | 0.170 | 1.000 | | | | | | | | | | |
| NCA_MV_1yr | -0.167 | -0.208 | -0.189 | -0.402 | -0.227 | -0.381 | 1.000 | | | | | | | | | |
| NCA_MV_2yr | -0.088 | -0.224 | -0.137 | -0.300 | -0.175 | -0.462 | 0.684 | 1.000 | | | | | | | | |
| AssTurn_6m | 0.168 | 0.158 | 0.012 | -0.031 | 0.256 | -0.058 | 0.128 | 0.113 | 1.000 | | | | | | | |
| AssTurn_1yr | 0.232 | 0.125 | -0.021 | -0.126 | 0.231 | 0.045 | 0.170 | 0.068 | 0.802 | 1.000 | | | | | | |
| AssTurn_2yr | 0.266 | 0.233 | -0.046 | -0.103 | 0.288 | 0.023 | 0.040 | 0.201 | 0.674 | 0.796 | 1.000 | | | | | |
| PEGI | -0.242 | -0.421 | 0.095 | 0.035 | -0.401 | -0.487 | 0.313 | 0.197 | -0.017 | -0.131 | -0.360 | 1.000 | | | | |
| PEGI_6m | 0.030 | 0.123 | 0.062 | 0.185 | -0.127 | 0.255 | -0.722 | -0.431 | -0.299 | -0.338 | -0.131 | -0.198 | 1.000 | | | |
| PEGI_1yr | -0.012 | 0.033 | -0.085 | 0.032 | -0.227 | 0.015 | -0.401 | -0.178 | -0.399 | -0.575 | -0.369 | 0.142 | 0.697 | 1.000 | | |
| PEGI_2yr | -0.164 | -0.183 | 0.014 | 0.030 | -0.311 | -0.234 | 0.042 | -0.116 | -0.173 | -0.305 | -0.434 | 0.673 | 0.232 | 0.543 | 1.000 | |
| NS_6m | 0.316 | 0.482 | 0.059 | 0.129 | 0.065 | 0.438 | -0.349 | -0.316 | 0.123 | 0.090 | 0.103 | -0.439 | 0.250 | 0.100 | -0.243 | 1.000 |
| DIV_6m | 0.239 | 0.380 | -0.271 | -0.220 | 0.220 | 0.400 | -0.084 | 0.001 | 0.159 | 0.183 | 0.352 | -0.637 | -0.037 | -0.080 | -0.553 | 0.594 |
| TD_TA_6m | -0.008 | -0.302 | 0.159 | 0.025 | -0.042 | -0.254 | 0.309 | 0.192 | -0.083 | 0.138 | 0.038 | 0.235 | -0.253 | -0.317 | 0.087 | -0.452 |
| Sales_Emp | -0.117 | -0.315 | -0.231 | -0.285 | -0.178 | -0.300 | 0.535 | 0.473 | 0.127 | 0.230 | 0.210 | 0.053 | -0.384 | -0.271 | -0.146 | -0.285 |
| RD_TA | 0.206 | 0.353 | 0.106 | 0.148 | 0.358 | 0.420 | -0.564 | -0.520 | -0.002 | -0.047 | 0.136 | -0.418 | 0.448 | 0.170 | -0.128 | 0.394 |
| RD_EQ | 0.147 | 0.214 | 0.159 | 0.188 | 0.220 | 0.036 | -0.233 | -0.276 | -0.020 | -0.043 | 0.046 | -0.102 | 0.232 | 0.082 | 0.114 | 0.061 |
| ICBT_6m | 0.062 | 0.253 | -0.056 | 0.006 | 0.356 | 0.318 | -0.328 | -0.414 | -0.056 | -0.057 | -0.143 | -0.243 | -0.017 | 0.019 | -0.223 | 0.278 |
| ICBT_1yr | 0.167 | 0.374 | 0.045 | 0.073 | 0.358 | 0.597 | -0.598 | -0.657 | -0.007 | 0.052 | 0.053 | -0.513 | 0.290 | -0.079 | -0.323 | 0.495 |
| ICBT_2yr | 0.150 | 0.433 | -0.082 | -0.059 | 0.452 | 0.517 | -0.437 | -0.477 | 0.163 | 0.227 | 0.291 | -0.611 | 0.193 | -0.205 | -0.429 | 0.411 |
| AccRec_6m | 0.357 | 0.556 | -0.178 | -0.222 | 0.490 | 0.367 | -0.156 | -0.098 | 0.302 | 0.261 | 0.309 | -0.401 | -0.022 | -0.072 | -0.268 | 0.437 |
| NCF_BP1yr | 0.288 | 0.304 | 0.150 | 0.086 | 0.301 | 0.022 | -0.164 | -0.098 | -0.007 | -0.201 | -0.124 | -0.225 | -0.001 | 0.035 | -0.192 | 0.184 |
| ChSalelsChInv | 0.155 | 0.296 | 0.108 | -0.061 | 0.363 | 0.118 | -0.115 | -0.335 | 0.214 | 0.307 | 0.196 | -0.273 | 0.068 | -0.083 | -0.047 | 0.187 |
| MOM_1m | 0.452 | 0.187 | 0.166 | 0.060 | 0.102 | 0.145 | -0.349 | -0.224 | 0.078 | 0.090 | 0.176 | -0.274 | 0.401 | 0.151 | -0.121 | 0.149 |
| Crossover3_12 | 0.046 | 0.067 | -0.066 | -0.135 | 0.303 | -0.124 | 0.251 | 0.050 | 0.304 | 0.440 | 0.268 | -0.098 | -0.357 | -0.457 | -0.153 | -0.043 |
| Crossover6_12 | 0.199 | 0.205 | 0.077 | -0.112 | 0.216 | -0.092 | 0.161 | 0.179 | 0.113 | 0.195 | 0.166 | -0.097 | -0.286 | -0.240 | -0.170 | 0.142 |
| Crossover3_18 | 0.096 | 0.049 | -0.047 | -0.005 | 0.149 | -0.131 | 0.143 | -0.075 | 0.227 | 0.234 | 0.040 | 0.124 | -0.203 | -0.225 | 0.201 | -0.068 |
| Crossover6_18 | 0.176 | 0.227 | 0.033 | 0.032 | 0.137 | -0.161 | 0.171 | 0.027 | 0.221 | 0.167 | 0.099 | 0.034 | -0.318 | -0.266 | 0.009 | 0.080 |

University of Cape Town

**Appendix C.3.: Correlation matrix of monthly payoffs to significant firm-specific attributes**
-continued

| | DIV_6m | TD_TA_6m | Sales_Emp | RD_TA | RD_EQ | ICBT_6m | ICBT_1yr | ICBT_2yr | AccRec_6m | NCF_BP1yr | ChSalesChInv | MOM_1m | Crossover3_12 | Crossover6_12 | Crossover3_18 | Crossover6_18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P_1m | | | | | | | | | | | | | | | | |
| LnMV_1m | | | | | | | | | | | | | | | | |
| VO_1m | | | | | | | | | | | | | | | | |
| VO_3m | | | | | | | | | | | | | | | | |
| VO_6m | | | | | | | | | | | | | | | | |
| VO_1yr | | | | | | | | | | | | | | | | |
| TV_1m | | | | | | | | | | | | | | | | |
| TV_3m | | | | | | | | | | | | | | | | |
| TV_6m | | | | | | | | | | | | | | | | |
| TV_1yr | | | | | | | | | | | | | | | | |
| MVT_3m | | | | | | | | | | | | | | | | |
| MVT_MV_1m | | | | | | | | | | | | | | | | |
| MVT_MV_3m | | | | | | | | | | | | | | | | |
| MVT_MV_6m | | | | | | | | | | | | | | | | |
| MVT_MV_1yr | | | | | | | | | | | | | | | | |
| Roten | | | | | | | | | | | | | | | | |
| Roten_6m | | | | | | | | | | | | | | | | |
| Roten_1yr | | | | | | | | | | | | | | | | |
| CPS_6m | | | | | | | | | | | | | | | | |
| INV_1yr | | | | | | | | | | | | | | | | |
| NCA_MV_1yr | | | | | | | | | | | | | | | | |
| NCA_MV_2yr | | | | | | | | | | | | | | | | |
| AssTurn_6m | | | | | | | | | | | | | | | | |
| AssTurn_1yr | | | | | | | | | | | | | | | | |
| AssTurn_2yr | | | | | | | | | | | | | | | | |
| PEGI | | | | | | | | | | | | | | | | |
| PEGI_6m | | | | | | | | | | | | | | | | |
| PEGI_1yr | | | | | | | | | | | | | | | | |
| PEGI_2yr | | | | | | | | | | | | | | | | |
| NS_6m | | | | | | | | | | | | | | | | |
| DIV_6m | 1.000 | | | | | | | | | | | | | | | |
| TD_TA_6m | -0.477 | 1.000 | | | | | | | | | | | | | | |
| Sales_Emp | 0.125 | 0.166 | 1.000 | | | | | | | | | | | | | |
| RD_TA | 0.222 | -0.228 | -0.468 | 1.000 | | | | | | | | | | | | |
| RD_EQ | -0.156 | 0.085 | -0.298 | 0.740 | 1.000 | | | | | | | | | | | |
| ICBT_6m | 0.205 | -0.253 | -0.402 | 0.276 | -0.020 | 1.000 | | | | | | | | | | |
| ICBT_1yr | 0.346 | -0.286 | -0.451 | 0.540 | 0.070 | 0.597 | 1.000 | | | | | | | | | |
| ICBT_2yr | 0.444 | -0.264 | -0.298 | 0.413 | -0.041 | 0.421 | 0.852 | 1.000 | | | | | | | | |
| AccRec_6m | 0.557 | -0.376 | -0.124 | 0.368 | 0.061 | 0.333 | 0.396 | 0.495 | 1.000 | | | | | | | |
| NCF_BP1yr | 0.164 | -0.186 | -0.219 | 0.067 | -0.067 | 0.188 | 0.191 | 0.191 | 0.167 | 1.000 | | | | | | |
| ChSalesChInv | 0.151 | -0.085 | -0.039 | 0.282 | 0.199 | 0.154 | 0.326 | 0.404 | 0.338 | 0.009 | 1.000 | | | | | |
| MOM_1m | 0.029 | -0.009 | -0.136 | 0.321 | 0.098 | 0.010 | 0.279 | 0.297 | 0.197 | 0.103 | 0.292 | 1.000 | | | | |
| Crossover3_12 | -0.027 | 0.144 | 0.130 | -0.030 | 0.067 | 0.037 | 0.055 | 0.178 | 0.181 | -0.147 | 0.224 | -0.003 | 1.000 | | | |
| Crossover6_12 | 0.118 | -0.053 | 0.034 | -0.051 | -0.019 | 0.177 | 0.023 | 0.051 | 0.198 | 0.078 | 0.141 | -0.064 | 0.536 | 1.000 | | |
| Crossover3_18 | -0.195 | 0.187 | -0.028 | -0.050 | 0.150 | -0.061 | -0.061 | 0.060 | 0.059 | -0.073 | 0.278 | 0.106 | 0.478 | 0.206 | 1.000 | |
| Crossover6_18 | 0.001 | 0.025 | 0.059 | -0.067 | 0.054 | 0.012 | -0.001 | 0.110 | 0.130 | 0.191 | 0.161 | 0.028 | 0.308 | 0.386 | 0.739 | 1.000 |

University of Cape Town

## Appendix C.4.: Univariate cross-sectional regression results for un-adjusted returns

The table shows the t-statistic, mean coefficient, information coefficient and the number of observations in the final month of analysis for all firm-specific attributes using un-adjusted returns. Results are obtained from monthly univariate cross-sectional regressions and the data are standardised and adjusted for thin-trading and outliers. The mean information coefficient measures the average monthly correlation between expected and realised returns. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. The variables are arranged in descending order if the absolute value of the t-statistic. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| Charactoristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| BTMV | 6.0038 | 0.0088 | 0.1286 | 651 |
| MTBV | -5.8912 | -0.0080 | 0.1222 | 632 |
| CEY | 4.3159 | 0.0045 | 0.0814 | 651 |
| OPMtP | 3.7236 | 0.0048 | 0.0900 | 606 |
| P | -3.5592 | -0.0036 | 0.0671 | 562 |
| ICBT_6m | 3.4801 | 0.0025 | 0.0485 | 649 |
| CFMtP | 3.4010 | 0.0038 | 0.0811 | 649 |
| LnMV | -3.3328 | -0.0066 | 0.1363 | 649 |
| TV_3m | 3.1681 | 0.0031 | 0.0739 | 651 |
| MVT_MV_3m | 3.1473 | 0.0031 | 0.0783 | 651 |
| VO_3m | 3.0497 | 0.0030 | 0.0733 | 646 |
| Sales_P | 2.9318 | 0.0063 | 0.1419 | 649 |
| MVT | -2.9077 | -0.0037 | 0.0908 | 645 |
| DY | 2.8517 | 0.0049 | 0.1244 | 641 |
| Sales_Emp_1yr | 2.8369 | 0.0024 | 0.0578 | 590 |
| EY | 2.7147 | 0.0030 | 0.0792 | 649 |
| MVT_MV_6m | 2.5990 | 0.0030 | 0.0729 | 602 |
| NCF_BP1yrDiv_6m | -2.5877 | -0.0013 | 0.0335 | 557 |
| NCF_6m | -2.5746 | -0.0013 | 0.0348 | 594 |
| Reten_2yr | 2.5412 | 0.0015 | 0.0428 | 640 |
| NCF_TD_6m | -2.5037 | -0.0015 | 0.0395 | 649 |
| VO_6m | 2.4967 | 0.0029 | 0.0723 | 651 |
| TV_6m | 2.4776 | 0.0029 | 0.0744 | 651 |
| DPS | -2.4602 | -0.0025 | 0.0639 | 641 |
| NCF_BP1yr_6m | -2.4478 | -0.0014 | 0.0398 | 649 |
| NAVpS | -2.4368 | -0.0022 | 0.0597 | 572 |
| EPS_2yrAV | -2.4240 | -0.0024 | 0.0657 | 646 |
| MVT_3m | 2.3235 | 0.0024 | 0.0713 | 614 |
| EPS | -2.3212 | -0.0024 | 0.0670 | 444 |
| Intan_MV | 2.3055 | 0.0029 | 0.0730 | 649 |
| ICBT_2yr | 2.2304 | 0.0018 | 0.0533 | 588 |
| AssTurn_1yr | 2.2185 | 0.0020 | 0.0629 | 651 |
| DepAmort_TA_6m | 2.2132 | 0.0042 | 0.1308 | 572 |
| Borrow_1yr | -2.1754 | -0.0017 | 0.0540 | 651 |
| MTBV_2yr | -2.1695 | -0.0038 | 0.1149 | 649 |
| AssTurn_6m | 2.0980 | 0.0014 | 0.0442 | 651 |
| RD_EQ_2yr | -2.0694 | -0.0016 | 0.0573 | 476 |
| MTBV_1yr | -2.0694 | -0.0036 | 0.1154 | 630 |
| Quick_6m | 2.0558 | 0.0011 | 0.0374 | 488 |
| ICBT_1yr | 2.0205 | 0.0017 | 0.0548 | 591 |
| TD_TA_1yr | -1.9710 | -0.0013 | 0.0446 | 578 |
| AccRec | -1.9639 | -0.0019 | 0.0673 | 651 |
| RD_TA_6m | -1.9600 | -0.0013 | 0.0430 | 649 |
| RD_TA_2yr | -1.9347 | -0.0015 | 0.0548 | 584 |
| DIV | -1.9215 | -0.0027 | 0.1011 | 560 |
| EqCapRes | -1.9068 | -0.0027 | 0.0989 | 638 |
| Reten_1yr | 1.9019 | 0.0009 | 0.0315 | 645 |
| CFMtP_2yr | 1.8923 | 0.0017 | 0.0600 | 649 |
| Borrow_2yr | -1.8566 | -0.0012 | 0.0447 | 651 |
| RD_TA_1yr | -1.8326 | -0.0014 | 0.0528 | 590 |
| Gear_2yr | -1.8044 | -0.0010 | 0.0379 | 605 |
| BVpS | -1.8012 | -0.0018 | 0.0633 | 651 |
| RD_EQ_1yr | -1.7999 | -0.0014 | 0.0529 | 479 |
| BTMV_6m | 1.7723 | 0.0035 | 0.1231 | 651 |
| NCF | -1.7621 | -0.0010 | 0.0392 | 605 |
| CPS | -1.7546 | -0.0015 | 0.0557 | 651 |
| Sales_Emp_6m | 1.7313 | 0.0013 | 0.0491 | 584 |

University of Cape Town

**Appendix C.4.: Univariate cross-sectional regression results for un-adjusted returns** -continued

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| WC | -1.7125 | -0.0025 | 0.0958 | 651 |
| Sales_Emp | 1.6817 | 0.0015 | 0.0682 | 590 |
| TD_TA_2yr | -1.6745 | -0.0010 | 0.0393 | 571 |
| Crossover1_18 | -1.6564 | -0.0008 | 0.0339 | 651 |
| MTBV_6m | -1.6549 | -0.0030 | 0.1182 | 649 |
| INV_2yr | -1.6319 | -0.0015 | 0.0648 | 640 |
| BVpS_2yr | 1.6259 | 0.0024 | 0.0910 | 651 |
| BTMV_1yr | 1.6196 | 0.0031 | 0.1198 | 651 |
| OPMtP_2yr | 1.5889 | 0.0013 | 0.0523 | 649 |
| Quick | -1.5839 | -0.0023 | 0.0978 | 484 |
| EqCapRes_2yr | -1.5837 | -0.0022 | 0.0843 | 632 |
| CEY_2yr | 1.5732 | 0.0015 | 0.0627 | 651 |
| ChSalesChInv | 1.5696 | 0.0009 | 0.0306 | 651 |
| OPMtP_1yr | 1.5641 | 0.0014 | 0.0558 | 649 |
| Crossover6_18 | 1.5639 | 0.0007 | 0.0315 | 510 |
| TV_1yr | 1.5596 | 0.0017 | 0.0764 | 651 |
| LnMV_2yr | -1.5547 | -0.0034 | 0.1401 | 649 |
| DPS_2yr | -1.5521 | -0.0022 | 0.0935 | 649 |
| NS_6m | -1.5341 | -0.0013 | 0.0599 | 599 |
| PEGI_2yr | -1.5252 | -0.0011 | 0.0482 | 637 |
| EqCapRes_6m | -1.5151 | -0.0017 | 0.0609 | 630 |
| Gear_1yr | -1.5098 | -0.0010 | 0.0443 | 606 |
| AssTurn_2yr | 1.4896 | 0.0013 | 0.0601 | 651 |
| CPS_1yr | 1.4580 | 0.0013 | 0.0554 | 651 |
| P_2yr | -1.4513 | -0.0028 | 0.1240 | 651 |
| NCA_MV | 1.4482 | 0.0015 | 0.0690 | 637 |
| Borrow_6m | -1.4421 | -0.0010 | 0.0467 | 651 |
| MVT_6m | 1.4416 | 0.0019 | 0.0826 | 607 |
| MOM_18m | -1.4200 | -0.0025 | 0.1154 | 645 |
| Sales_Emp_2yr | 1.4049 | 0.0011 | 0.0483 | 587 |
| EqCapRes_1yr | -1.3954 | -0.0019 | 0.0819 | 638 |
| ROCE | -1.3935 | -0.0024 | 0.1042 | 621 |
| MV1_MV_1yr | 1.3858 | 0.0015 | 0.0740 | 591 |
| NCF_BP1yrDiv_1yr | -1.3737 | -0.0008 | 0.0406 | 640 |
| OPMtP_6m | 1.3622 | 0.0024 | 0.1071 | 644 |
| MOM_1m | -1.3606 | -0.0021 | 0.1051 | 640 |
| TLC_TA_2yr | -1.3557 | -0.0008 | 0.0389 | 644 |
| ChEPS_P_1yr | 1.3551 | 0.0012 | 0.0605 | 640 |
| MVT_MV_1m | 1.3360 | 0.0014 | 0.0702 | 594 |
| ROEpob | 1.3223 | 0.0021 | 0.0942 | 640 |
| VO_1m | 1.3200 | 0.0014 | 0.0703 | 651 |
| PEGI_1yr | -1.3074 | -0.0007 | 0.0370 | 643 |
| BVpS_1yr | -1.3022 | -0.0018 | 0.0861 | 651 |
| NAVpS_6m | -1.3010 | -0.0015 | 0.0665 | 642 |
| CEY_1yr | 1.2854 | 0.0013 | 0.0581 | 651 |
| CPS_6m | 1.2778 | 0.0009 | 0.0459 | 651 |
| INV | -1.2778 | -0.0012 | 0.0601 | 649 |
| BVpS_6m | -1.2658 | -0.0016 | 0.0843 | 651 |
| Crossover1_3 | -1.2646 | -0.0008 | 0.0397 | 651 |
| CEY_6m | 1.2462 | 0.0022 | 0.1065 | 649 |
| TLC_TA_1yr | -1.2368 | -0.0007 | 0.0394 | 644 |
| NCF_BP1yr | -1.2270 | -0.0007 | 0.0365 | 591 |
| TV_1m | 1.2225 | 0.0013 | 0.0706 | 651 |
| NCF_BP1yr_1yr | 1.2219 | 0.0008 | 0.0432 | 589 |
| NCF_1yr | -1.2198 | -0.0007 | 0.0384 | 601 |
| NS_1yr | -1.2142 | -0.0011 | 0.0611 | 588 |
| BTMV_2yr | 1.2122 | 0.0023 | 0.1079 | 651 |

University of Cape Town

**Appendix C.4.: Univariate cross-sectional regression results for un-adjusted returns** -continued

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| NAVpS_1yr | -1.2030 | -0.0016 | 0.0804 | 560 |
| ID_TA_6m | -1.1915 | -0.0007 | 0.0444 | 605 |
| DepAmort_TA | -1.1898 | -0.0034 | 0.1960 | 444 |
| NS_2yr | -1.1860 | 0.0013 | 0.0724 | 649 |
| OPMtP_6m | 1.1792 | 0.0022 | 0.1110 | 564 |
| NCF_ID_1yr | -1.1572 | -0.0007 | 0.0446 | 404 |
| WC_6m | 1.1493 | 0.0006 | 0.0369 | 651 |
| NAVpS_2yr | -1.1489 | -0.0016 | 0.0831 | 642 |
| Reten_6m | 1.1396 | 0.0006 | 0.0359 | 649 |
| NCA_MV_6m | 1.1300 | 0.0020 | 0.0957 | 609 |
| AccRec_2yr | -1.1193 | -0.0015 | 0.0799 | 651 |
| EPS_1yr | -1.1125 | -0.0011 | 0.0694 | 649 |
| MVT_2yr | 1.1124 | 0.0013 | 0.0808 | 620 |
| NCA_MV_2yr | 1.0974 | 0.0007 | 0.0433 | 611 |
| ROCE_2yr | -1.0651 | -0.0009 | 0.0552 | 649 |
| MOM_3m | 1.0637 | 0.0018 | 0.1087 | 638 |
| ID_TA | -1.0609 | -0.0016 | 0.0996 | 596 |
| DPS_1yr | -1.0539 | -0.0012 | 0.0723 | 649 |
| EPS_2yr | 1.0457 | -0.0011 | 0.0615 | 649 |
| Growth | -1.0445 | -0.0016 | 0.0939 | 594 |
| VO_1yr | 1.0433 | 0.0012 | 0.0733 | 651 |
| MVT_1m | 1.0160 | 0.0011 | 0.0682 | 640 |
| DIV_1yr | -1.0019 | -0.0009 | 0.0543 | 649 |
| Crossover3_18 | 0.9906 | 0.0005 | 0.0361 | 651 |
| ChEPS_P_6m | 0.9702 | 0.0008 | 0.0576 | 651 |
| Growth_6m | 0.9359 | 0.0006 | 0.0400 | 594 |
| LnMV_1m | 0.9308 | 0.0015 | 0.1000 | 645 |
| Crossover6_12 | 0.9302 | 0.0005 | 0.0349 | 596 |
| Gear_6m | -0.9300 | 0.0006 | 0.0437 | 594 |
| Gear | 0.9268 | 0.0018 | 0.1303 | 599 |
| PEGI | -0.9109 | -0.0005 | 0.0405 | 648 |
| PEGI_6m | -0.9099 | 0.0005 | 0.0429 | 643 |
| P_1m | -0.8939 | -0.0014 | 0.1018 | 564 |
| Sales_P_2yr | 0.8864 | 0.0019 | 0.1191 | 587 |
| OPMtP_1yr | 0.8835 | 0.0009 | 0.0628 | 607 |
| ROCE_1yr | -0.8753 | -0.0007 | 0.0529 | 649 |
| PPMtP_6m | 0.8648 | 0.0015 | 0.1046 | 488 |
| ROCF_6m | 0.8475 | 0.0006 | 0.0432 | 645 |
| NCF_BP1yrDiv | -0.8420 | -0.0005 | 0.0332 | 645 |
| LnMV_1yr | -0.8312 | 0.0017 | 0.1337 | 640 |
| NCF_ID_2yr | -0.8117 | -0.0007 | 0.0565 | 649 |
| INV_1yr | -0.7961 | 0.0005 | 0.0423 | 645 |
| TL_TA | 0.7929 | 0.0014 | 0.1186 | 586 |
| NCF_BP1yrDiv_2yr | -0.7924 | 0.0007 | 0.0538 | 574 |
| NPMtP_6m | 0.7695 | 0.0013 | 0.1004 | 581 |
| RD_FQ_6m | -0.7686 | 0.0005 | 0.0470 | 596 |
| NCF_BP1yr_2yr | -0.7485 | -0.0006 | 0.0528 | 649 |
| NS | -0.7351 | -0.0007 | 0.0605 | 564 |
| EY_1yr | -0.6933 | -0.0007 | 0.0583 | 599 |
| MOM_12m | -0.6902 | -0.0012 | 0.1157 | 649 |
| Sales_P_1yr | 0.6831 | 0.0014 | 0.1279 | 645 |
| FY_6m | 0.6812 | 0.0007 | 0.0636 | 606 |
| AssTurn | 0.6629 | 0.0005 | 0.0528 | 651 |
| INV_6m | -0.6542 | -0.0004 | 0.0416 | 649 |
| DIV_6m | -0.6238 | 0.0005 | 0.0489 | 646 |
| WC_2yr | -0.6231 | -0.0005 | 0.0470 | 651 |

University of Cape Town

**Appendix C.4.: Univariate cross-sectional regression results for un-adjusted returns**
-continued

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| NPMtP 1yr | -0.6099 | -0.0005 | 0.0532 | 640 |
| P 1yr | -0.6018 | -0.0011 | 0.1206 | 651 |
| ICBT | -0.5966 | -0.0005 | 0.0530 | 594 |
| Crossover3_1 | -0.5875 | -0.0004 | 0.0465 | 651 |
| IV | -0.5735 | -0.0008 | 0.0935 | 631 |
| NOEpub_2yr | -0.5648 | -0.0005 | 0.0517 | 649 |
| Quick 1yr | 0.5102 | 0.0003 | 0.0441 | 479 |
| VO | -0.5098 | -0.0007 | 0.0903 | 651 |
| PPMtP | 0.5076 | 0.0006 | 0.0668 | 18 |
| DIV 2yr | -0.5058 | -0.0005 | 0.0524 | 649 |
| CPS_6m | 0.5052 | 0.0005 | 0.0639 | 641 |
| MOM 6m | -0.4999 | -0.0009 | 0.1061 | 638 |
| LnMV_6m | -0.4952 | 0.0010 | 0.1297 | 645 |
| NID_EQ | -0.4895 | -0.0007 | 0.0888 | 484 |
| TV 2yr | 0.4712 | 0.0005 | 0.0752 | 651 |
| TLC_TA | 0.4566 | 0.0005 | 0.0683 | 644 |
| DPS 6m | -0.4204 | -0.0005 | 0.0720 | 646 |
| MVT_MV | -0.4019 | 0.0006 | 0.0922 | 594 |
| MVT_MV 2yr | 0.3972 | 0.0005 | 0.0769 | 589 |
| DY 6m | 0.3784 | 0.0006 | 0.0945 | 510 |
| Sales_P_6m | 0.3614 | 0.0008 | 0.1310 | 587 |
| NPMtP_2yr | 0.3594 | 0.0003 | 0.0542 | 647 |
| AccRec_6m | 0.3530 | 0.0003 | 0.0469 | 651 |
| Growth 1yr | 0.3483 | 0.0002 | 0.0397 | 591 |
| TLC_TA_6m | -0.3474 | -0.0002 | 0.0395 | 639 |
| NCF 2yr | -0.3175 | -0.0003 | 0.0484 | 594 |
| CPS_2yr | 0.3174 | 0.0003 | 0.0590 | 651 |
| Borrow | 0.2849 | 0.0004 | 0.0933 | 651 |
| DY 1yr | 0.2728 | 0.0004 | 0.0980 | 651 |
| WC_1yr | -0.2650 | -0.0002 | 0.0409 | 651 |
| Intan MV 6m | 0.2600 | 0.0005 | 0.1101 | 649 |
| ROEpub_6m | 0.2592 | 0.0002 | 0.0396 | 645 |
| NCA MV 1yr | 0.2521 | 0.0002 | 0.0490 | 633 |
| Intan_MV_2yr | 0.2374 | -0.0003 | 0.0771 | 641 |
| Quick 2yr | -0.2322 | -0.0002 | 0.0462 | 476 |
| ROEpub_1yr | -0.2276 | 0.0002 | 0.0430 | 649 |
| VO 2yr | 0.2274 | 0.0003 | 0.0777 | 648 |
| NPMtP | 0.2081 | 0.0002 | 0.0690 | 645 |
| Intan_MV_1yr | -0.2046 | -0.0003 | 0.0808 | 645 |
| LnMV 3m | 0.1943 | 0.0004 | 0.1352 | 649 |
| P_6m | 0.1828 | 0.0003 | 0.1167 | 648 |
| ChSalesChAR | -0.1799 | -0.0001 | 0.0391 | 651 |
| P_3m | 0.1790 | 0.0003 | 0.1186 | 651 |
| DY_2yr | -0.1760 | -0.0003 | 0.0968 | 596 |
| EY 2yr | -0.1696 | -0.0002 | 0.0652 | 606 |
| NCF_TD | -0.1637 | -0.0001 | 0.0361 | 469 |
| Crossover3_12 | -0.1572 | -0.0001 | 0.0335 | 651 |
| Reten | 0.1473 | 0.0002 | 0.0924 | 649 |
| AccRec 1yr | 0.1447 | 0.0001 | 0.0612 | 651 |
| MVT_1yr | 0.1436 | 0.0002 | 0.0851 | 621 |
| PPMtP 1yr | -0.1271 | -0.0001 | 0.0510 | 16 |
| Growth_2yr | 0.0964 | 0.0001 | 0.0427 | 589 |
| PPMtP 2yr | -0.0560 | 0.0000 | 0.0477 | 12 |
| DepAmort_TA_2yr | 0.0495 | 0.0002 | 0.3161 | 602 |
| DepAmort TA 1yr | -0.0311 | -0.0001 | 0.1930 | 651 |
| ChCPS_P_2yr | 0.0174 | 0.0000 | 0.0543 | 651 |

University of Cape Town

## Appendix C.5.: Univariate cross-sectional regression results for single-index adjusted returns

The table shows the t statistic, mean coefficient, information coefficient and the number of observations in the final month of analysis for all firm-specific attributes using single-index adjusted returns. Results are obtained from monthly univariate cross-sectional regressions and the data are standardised and adjusted for thin-trading and outliers. The mean information coefficient measures the average monthly correlation between expected and realised returns. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. The variables are arranged in descending order if the absolute value of the t-statistic. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| BTMV | 5.7574 | 0.0075 | 0.1139 | 651 |
| MTBV | -5.5367 | -0.0069 | 0.1092 | 632 |
| CEY | 4.9268 | 0.0040 | 0.0705 | 651 |
| CFMtP | 3.5767 | 0.0035 | 0.0768 | 649 |
| OPMtP | 3.3823 | 0.0041 | 0.0845 | 606 |
| DY | 3.3365 | 0.0039 | 0.0851 | 641 |
| DepAmort_TA_6m | 3.3094 | 0.0056 | 0.1320 | 572 |
| P | -3.2765 | -0.0036 | 0.0727 | 562 |
| LnMV | -3.2188 | -0.0058 | 0.1276 | 649 |
| Sales_P | 3.0653 | 0.0060 | 0.1367 | 649 |
| NS | -2.9867 | -0.0067 | 0.1525 | 640 |
| MTBV_1yr | -2.8840 | -0.0034 | 0.0819 | 630 |
| MVT | -2.7981 | -0.0038 | 0.0940 | 645 |
| MVT_MV_6m | 2.7629 | 0.0030 | 0.0750 | 602 |
| Reten_2yr | 2.7495 | 0.0016 | 0.0410 | 640 |
| DPS | -2.7365 | -0.0024 | 0.0596 | 641 |
| MTBV_2yr | -2.7347 | -0.0035 | 0.0862 | 649 |
| EY | 2.6057 | 0.0021 | 0.0542 | 649 |
| VO_6m | 2.5631 | 0.0028 | 0.0738 | 651 |
| Sales_Emp_1yr | 2.5596 | 0.0017 | 0.0447 | 590 |
| TV_6m | 2.5458 | 0.0029 | 0.0756 | 651 |
| Intan_MV | 2.5035 | 0.0026 | 0.0655 | 649 |
| EPS_1yr | -2.4936 | -0.0018 | 0.0487 | 649 |
| EPS_2yrAV | -2.4788 | -0.0022 | 0.0617 | 646 |
| EPS | -2.4575 | -0.0023 | 0.0645 | 444 |
| TV_3m | 2.4395 | 0.0026 | 0.0799 | 651 |
| MTBV_6m | -2.4367 | -0.0035 | 0.0947 | 649 |
| NAVpS | -2.4084 | -0.0018 | 0.0539 | 572 |
| NS_1yr | -2.3760 | -0.0037 | 0.1098 | 645 |
| NCA_MV_6m | 2.3462 | 0.0028 | 0.0688 | 609 |
| MOM_18m | -2.3163 | -0.0032 | 0.0887 | 645 |
| MVT_MV_3m | 2.3127 | 0.0025 | 0.0805 | 651 |
| RD_EQ_2yr | -2.2880 | -0.0017 | 0.0549 | 476 |
| RD_EQ_1yr | -2.2879 | -0.0016 | 0.0512 | 479 |
| Borrow_1yr | -2.2510 | -0.0014 | 0.0423 | 651 |
| OPMtP_6m | 2.2507 | 0.0029 | 0.0778 | 564 |
| LnMV_2yr | -2.2506 | -0.0035 | 0.1083 | 649 |
| VO_3m | 2.2330 | 0.0024 | 0.0796 | 646 |
| OPMtP_2yr | 2.2034 | 0.0014 | 0.0437 | 649 |
| CFMtP_6m | 2.1805 | 0.0027 | 0.0761 | 644 |
| BTMV_6m | 2.1306 | 0.0035 | 0.1022 | 651 |
| P_2yr | -2.0755 | -0.0031 | 0.1026 | 651 |
| ICBT_6m | 2.0687 | 0.0012 | 0.0425 | 649 |
| MOM_3m | -2.0672 | -0.0028 | 0.0871 | 638 |
| Sales_Emp_6m | 2.0542 | 0.0014 | 0.0471 | 584 |
| DIV | -2.0465 | -0.0025 | 0.0880 | 560 |
| CEY_6m | 2.0289 | 0.0025 | 0.0775 | 649 |
| Borrow_6m | -2.0159 | -0.0012 | 0.0422 | 651 |
| CPS | -2.0040 | -0.0015 | 0.0530 | 651 |
| BVpS | -1.9990 | -0.0018 | 0.0617 | 651 |
| AssTurn_6m | 1.9983 | 0.0012 | 0.0342 | 651 |
| BTMV_1yr | 1.9857 | 0.0029 | 0.0904 | 651 |
| WC | -1.9734 | -0.0026 | 0.0929 | 651 |
| LnMV_1yr | -1.9427 | -0.0026 | 0.0857 | 640 |
| EqCapRes | -1.9365 | -0.0024 | 0.0884 | 638 |
| MOM_1m | -1.8718 | -0.0023 | 0.0925 | 640 |
| P_1m | -1.8520 | -0.0024 | 0.0931 | 564 |

University of Cape Town

**Appendix C.5.: Univariate cross-sectional regression results for single-index adjusted returns**
-continued

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| RD_TA_2yr | -1.8438 | -0.0012 | 0.0481 | 584 |
| Quick | -1.8266 | -0.0024 | 0.0940 | 484 |
| Heton_1yr | 1.8209 | 0.0008 | 0.0314 | 645 |
| Crossover1_18 | -1.8114 | -0.0007 | 0.0266 | 651 |
| ROCE_1yr | -1.8049 | -0.0012 | 0.0437 | 649 |
| NCF_TD_6m | -1.8032 | -0.0010 | 0.0360 | 649 |
| NCF_BP1yrDiv | -1.7705 | -0.0010 | 0.0354 | 645 |
| NCF_6m | -1.7553 | -0.0008 | 0.0343 | 594 |
| NCF | -1.7533 | -0.0010 | 0.0389 | 605 |
| Quick_6m | 1.7452 | 0.0010 | 0.0385 | 488 |
| Sales_Emp | 1.7154 | 0.0014 | 0.0516 | 590 |
| NCF_BP1yrDiv_6m | -1.6956 | -0.0008 | 0.0299 | 557 |
| AccHec | -1.6871 | -0.0015 | 0.0654 | 651 |
| Sales_P_2yr | 1.6615 | 0.0025 | 0.0919 | 587 |
| CFMtP_2yr | 1.6534 | 0.0013 | 0.0565 | 649 |
| LnMV_1m | -1.6496 | -0.0022 | 0.0936 | 645 |
| DPS_1yr | -1.6329 | -0.0014 | 0.0642 | 649 |
| NCF_BP1yr_6m | -1.6304 | -0.0009 | 0.0353 | 649 |
| DepAmort_TA | -1.6236 | -0.0033 | 0.1578 | 444 |
| CFMtP_1yr | 1.6043 | 0.0012 | 0.0467 | 649 |
| AssTurn_2yr | 1.5735 | 0.0012 | 0.0526 | 651 |
| LnMV_6m | -1.5596 | -0.0024 | 0.0991 | 645 |
| NPMtP_6m | 1.5532 | 0.0018 | 0.0719 | 581 |
| BTMV_2yr | 1.5514 | 0.0021 | 0.0821 | 651 |
| P_1yr | -1.5488 | -0.0021 | 0.0856 | 651 |
| Heton_6m | 1.4988 | 0.0007 | 0.0345 | 649 |
| PPMtP_6m | 1.4891 | 0.0017 | 0.0731 | 488 |
| PEGI_2yr | -1.4849 | -0.0009 | 0.0431 | 637 |
| MVT_3m | 1.4540 | 0.0016 | 0.0786 | 614 |
| MVT_2yr | -1.4421 | -0.0017 | 0.0809 | 620 |
| ROEpub | -1.4323 | -0.0020 | 0.0860 | 640 |
| Crossover6_18 | 1.4239 | 0.0006 | 0.0288 | 510 |
| AssTurn_1yr | 1.4142 | 0.0011 | 0.0457 | 651 |
| Sales_Emp_2yr | 1.3997 | 0.0010 | 0.0497 | 587 |
| DPS_2yr | -1.3964 | -0.0016 | 0.0849 | 649 |
| CEY_2yr | 1.3905 | 0.0012 | 0.0596 | 651 |
| ROCE | -1.3801 | -0.0020 | 0.0913 | 621 |
| EY_1yr | -1.3710 | -0.0011 | 0.0478 | 599 |
| RD_TA_6m | -1.3480 | -0.0007 | 0.0350 | 649 |
| EqCapHes_6m | -1.3344 | -0.0012 | 0.0576 | 630 |
| CEY_1yr | 1.3241 | 0.0011 | 0.0510 | 651 |
| RD_TA_1yr | -1.3099 | -0.0007 | 0.0380 | 590 |
| Intan_MV_6m | 1.3066 | 0.0017 | 0.0759 | 649 |
| Sales_P_1yr | 1.3007 | 0.0019 | 0.0807 | 645 |
| P_6m | -1.2788 | -0.0019 | 0.0972 | 648 |
| WC_2yr | -1.2683 | -0.0008 | 0.0439 | 651 |
| BVpS_6m | -1.2637 | -0.0012 | 0.0577 | 651 |
| TLC_TA_2yr | -1.2594 | -0.0008 | 0.0402 | 644 |
| MOM_12m | -1.2426 | -0.0019 | 0.0920 | 649 |
| TV | -1.2000 | -0.0016 | 0.0927 | 631 |
| NPMtP_1yr | -1.1958 | -0.0008 | 0.0456 | 640 |
| Sales_P_6m | 1.1933 | 0.0020 | 0.1009 | 587 |
| ROEpub_1yr | -1.1707 | -0.0007 | 0.0395 | 649 |
| Growth | -1.1651 | -0.0016 | 0.0850 | 594 |
| NCF_BP1yr | -1.1633 | -0.0006 | 0.0324 | 591 |
| ICBT | -1.1622 | -0.0009 | 0.0538 | 594 |

University of Cape Town

**Appendix C.5.: Univariate cross-sectional regression results for single-index adjusted returns**
-continued

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| BVpS_1yr | -1.1619 | -0.0014 | 0.0765 | 651 |
| EqMV_3m | -1.1611 | -0.0017 | 0.1012 | 649 |
| MVT_MV | 1.1593 | -0.0015 | 0.0923 | 594 |
| Gear | 1.1574 | 0.0019 | 0.1068 | 599 |
| MVT_6m | 1.1478 | 0.0014 | 0.0646 | 607 |
| MOM_6m | -1.1203 | -0.0017 | 0.0663 | 636 |
| DPS_6m | -1.1116 | 0.0010 | 0.0614 | 646 |
| Crossover1_3 | -1.1071 | -0.0005 | 0.0336 | 651 |
| Crossover6_12 | 1.0975 | 0.0005 | 0.0290 | 596 |
| RD_EQ_6m | -1.0810 | -0.0007 | 0.0451 | 596 |
| P_3m | -1.0796 | -0.0015 | 0.0940 | 651 |
| ICRT_1yr | 1.0733 | 0.0007 | 0.0458 | 591 |
| EqCapRes_1yr | -1.0716 | -0.0012 | 0.0758 | 636 |
| Growth_1yr | -1.0610 | -0.0005 | 0.0360 | 591 |
| WC_6m | 1.0544 | 0.0006 | 0.0379 | 651 |
| INV_2yr | -1.0114 | 0.0008 | 0.0521 | 640 |
| TD_TA | 1.0006 | 0.0014 | 0.0963 | 586 |
| INV_1yr | -0.9982 | -0.0006 | 0.0364 | 645 |
| NAVpS_6m | -0.9969 | -0.0009 | 0.0585 | 642 |
| Gear_1yr | -0.9961 | -0.0005 | 0.0339 | 606 |
| Borrow_2yr | 0.9825 | 0.0006 | 0.0398 | 651 |
| Quick_2yr | -0.9806 | -0.0006 | 0.0380 | 476 |
| CPS_1yr | 0.9733 | 0.0007 | 0.0459 | 651 |
| NS_2yr | -0.9658 | -0.0008 | 0.0526 | 649 |
| TD_TA | -0.9520 | -0.0012 | 0.0676 | 596 |
| BVpS_2yr | -0.9442 | -0.0012 | 0.0843 | 651 |
| VO | -0.9341 | -0.0012 | 0.0685 | 651 |
| Gear_6m | 0.9236 | 0.0005 | 0.0426 | 594 |
| INV | -0.9195 | -0.0008 | 0.0594 | 649 |
| CPS_6m | 0.9145 | 0.0006 | 0.0419 | 651 |
| PPMIP_1yr | -0.9009 | -0.0006 | 0.0416 | 16 |
| TV_1yr | 0.8991 | 0.0010 | 0.0601 | 651 |
| AssTurn | 0.8958 | 0.0007 | 0.0526 | 651 |
| NCA_MV_1yr | 0.8748 | 0.0005 | 0.0370 | 633 |
| NAVpS_1yr | -0.8715 | -0.0009 | 0.0725 | 560 |
| VO_1m | 0.8515 | 0.0008 | 0.0694 | 651 |
| Crossover3_12 | 0.8494 | 0.0004 | 0.0277 | 651 |
| MVT_MV_1m | 0.8469 | 0.0008 | 0.0696 | 594 |
| NS_6m | -0.8425 | -0.0007 | 0.0536 | 599 |
| TD_TA_1yr | -0.8312 | -0.0005 | 0.0419 | 576 |
| MVT_MV_1yr | 0.8270 | 0.0009 | 0.0766 | 591 |
| NCA_MV | 0.8233 | 0.0008 | 0.0625 | 637 |
| OPMIP_1yr | 0.8210 | 0.0007 | 0.0496 | 607 |
| EPS_2yr | -0.8016 | -0.0007 | 0.0540 | 649 |
| ChEPS_P_1yr | 0.8011 | 0.0005 | 0.0464 | 640 |
| ROCE_6m | -0.7895 | -0.0005 | 0.0413 | 645 |
| TV_1m | 0.7842 | 0.0008 | 0.0711 | 651 |
| NCA_MV_2yr | 0.7797 | 0.0005 | 0.0411 | 611 |
| DepAmort_TA_1yr | 0.7776 | 0.0021 | 0.1790 | 651 |
| ChSalesChInv | 0.7554 | 0.0004 | 0.0312 | 651 |
| ICRT_2yr | 0.7414 | 0.0006 | 0.0507 | 586 |
| PEGI_1yr | -0.7401 | -0.0004 | 0.0441 | 643 |
| EPS_6m | -0.7261 | -0.0005 | 0.0441 | 641 |
| AccRec_2yr | -0.7161 | -0.0009 | 0.0796 | 651 |
| EqCapRes_2yr | -0.7020 | -0.0009 | 0.0806 | 632 |
| NCF_OP1yr_1yr | 0.6989 | -0.0004 | 0.0377 | 589 |
| PEGI | -0.6916 | -0.0004 | 0.0374 | 648 |

University of Cape Town

**Appendix C.5.: Univariate cross-sectional regression results for single-index adjusted returns**
-continued

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| DY_6m | 0.6892 | 0.0009 | 0.0828 | 510 |
| TD_TA_6m | -0.6680 | -0.0004 | 0.0447 | 605 |
| Reten | 0.6649 | 0.0006 | 0.0632 | 649 |
| ROCE_2yr | -0.6529 | -0.0005 | 0.0477 | 649 |
| Crossover3_18 | 0.6240 | 0.0003 | 0.0295 | 651 |
| NCF_BP1yrDiv_1yr | -0.5844 | -0.0003 | 0.0353 | 640 |
| INV_6m | -0.5688 | -0.0003 | 0.0383 | 649 |
| NPMtP_2yr | 0.5608 | 0.0004 | 0.0450 | 647 |
| NCF_BP1yrDiv_2yr | -0.5573 | -0.0005 | 0.0547 | 574 |
| ChEPS_P_6m | 0.5438 | 0.0003 | 0.0403 | 651 |
| DepAmort_TA_2yr | -0.5434 | -0.0018 | 0.2611 | 602 |
| Borrow | 0.5348 | 0.0008 | 0.0897 | 651 |
| MVT_1yr | -0.5213 | -0.0006 | 0.0828 | 621 |
| PEGI_6m | -0.4901 | -0.0003 | 0.0396 | 643 |
| VO_1yr | 0.4862 | 0.0005 | 0.0768 | 651 |
| TLC_TA | 0.4848 | 0.0004 | 0.0598 | 644 |
| Growth_6m | 0.4715 | 0.0002 | 0.0366 | 594 |
| AccRec_1yr | -0.4564 | -0.0004 | 0.0605 | 651 |
| MVT_1m | 0.4260 | 0.0004 | 0.0701 | 640 |
| NAVpS_2yr | -0.4023 | -0.0005 | 0.0860 | 642 |
| RID_EQ | -0.3806 | -0.0004 | 0.0721 | 484 |
| NCF_TD_1yr | -0.3709 | -0.0002 | 0.0389 | 404 |
| NCF_BP1yr_2yr | -0.3487 | -0.0003 | 0.0534 | 649 |
| DIV_6m | 0.3396 | 0.0003 | 0.0487 | 646 |
| NCF_2yr | -0.2959 | -0.0002 | 0.0517 | 594 |
| ChSaletsChAR | 0.2878 | 0.0002 | 0.0348 | 651 |
| NCF_TD_2yr | -0.2865 | -0.0002 | 0.0510 | 649 |
| Intan_MV_1yr | 0.2826 | 0.0003 | 0.0601 | 645 |
| DY_1yr | 0.2764 | 0.0003 | 0.0793 | 651 |
| TLC_TA_1yr | -0.2721 | -0.0001 | 0.0388 | 644 |
| PPMtP_2yr | -0.2674 | -0.0002 | 0.0414 | 12 |
| WC_1yr | -0.2623 | -0.0002 | 0.0399 | 651 |
| EY_2yr | 0.2444 | 0.0002 | 0.0587 | 606 |
| CPS_2yr | 0.2260 | 0.0002 | 0.0604 | 651 |
| NCF_1yr | -0.2157 | -0.0001 | 0.0358 | 601 |
| TD_TA_2yr | -0.2007 | -0.0001 | 0.0408 | 571 |
| AccRec_6m | -0.1906 | -0.0001 | 0.0514 | 651 |
| NPMtP | -0.1814 | -0.0002 | 0.0627 | 645 |
| PPMtP | 0.1727 | 0.0002 | 0.0613 | 18 |
| DY_2yr | 0.1682 | 0.0002 | 0.0797 | 596 |
| ROEpub_2yr | -0.1620 | -0.0001 | 0.0453 | 649 |
| Gear_2yr | -0.1459 | -0.0001 | 0.0394 | 605 |
| DIV_2yr | -0.1457 | -0.0001 | 0.0596 | 649 |
| Growth_2yr | 0.1454 | 0.0001 | 0.0401 | 589 |
| ROEpub_6m | 0.1277 | 0.0001 | 0.0417 | 645 |
| VO_2yr | -0.1239 | -0.0001 | 0.0822 | 648 |
| Quick_1yr | -0.1225 | -0.0001 | 0.0384 | 479 |
| ChEPS_P_2yr | 0.1221 | 0.0001 | 0.0464 | 651 |
| TV_2yr | 0.0961 | 0.0001 | 0.0787 | 651 |
| MVT_MV_2yr | 0.0823 | 0.0001 | 0.0813 | 589 |
| Crossover3_1 | -0.0621 | 0.0000 | 0.0415 | 651 |
| DIV_1yr | 0.0400 | 0.0000 | 0.0545 | 649 |
| TLC_TA_6m | 0.0268 | 0.0000 | 0.0371 | 639 |
| EY_6m | -0.0188 | 0.0000 | 0.0483 | 606 |
| Intan_MV_2yr | -0.0111 | 0.0000 | 0.0644 | 641 |
| NCF_TD | 0.0056 | 0.0000 | 0.0310 | 469 |

University of Cape Town

## Appendix C.6.: Univariate cross-sectional regression results for multi-index adjusted returns

The table shows the t-statistic, mean coefficient, information coefficient and the number of observations in the final month of analysis for all firm-specific attributes using multi-index adjusted returns. Results are obtained from monthly univariate cross-sectional regressions and the data are standardised and adjusted for thin-trading and outliers. The mean information coefficient measures the average monthly correlation between expected and realised returns. The expected monthly return is computed using the monthly cross-sectional regression parameters presented in equation 6.1. The variables are arranged in descending order if the absolute value of the t-statistic. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| BTMV | 6.1704 | 0.0070 | 0.1078 | 651 |
| MTBV | -5.5676 | -0.0062 | 0.1045 | 632 |
| CEY | 4.8844 | 0.0034 | 0.0608 | 651 |
| DY | 3.3881 | 0.0038 | 0.0913 | 641 |
| LnMV | -3.1310 | -0.0047 | 0.1081 | 649 |
| P | -3.0053 | -0.0027 | 0.0660 | 562 |
| DepAmort_TA_6m | 2.9970 | 0.0056 | 0.1455 | 572 |
| MVT | -2.9751 | -0.0030 | 0.0760 | 645 |
| CFMtP | 2.9602 | 0.0027 | 0.0718 | 649 |
| EY | 2.8170 | 0.0021 | 0.0564 | 649 |
| Sales_P | 2.7579 | 0.0044 | 0.1091 | 649 |
| OPMtP | 2.6901 | 0.0030 | 0.0816 | 606 |
| Crossover1_18 | -2.5356 | -0.0009 | 0.0275 | 651 |
| AssTurn_6m | 2.5329 | 0.0013 | 0.0359 | 651 |
| NS | -2.5176 | -0.0050 | 0.1405 | 640 |
| MVT_MV_6m | 2.4503 | 0.0027 | 0.0754 | 602 |
| Sales_Emp_1yr | 2.4410 | 0.0015 | 0.0474 | 590 |
| TV_3m | 2.4170 | 0.0026 | 0.0766 | 651 |
| Reten_2yr | 2.3607 | 0.0012 | 0.0374 | 640 |
| TV_6m | 2.3247 | 0.0026 | 0.0759 | 651 |
| MTBV_2yr | -2.3010 | -0.0030 | 0.0918 | 649 |
| VO_6m | 2.2891 | 0.0025 | 0.0736 | 651 |
| MVT_MV_3m | 2.2752 | 0.0025 | 0.0783 | 651 |
| DPS | -2.2264 | -0.0018 | 0.0587 | 641 |
| MTBV_1yr | -2.2217 | -0.0026 | 0.0842 | 630 |
| VO_3m | 2.1964 | 0.0024 | 0.0773 | 646 |
| RD_EQ_1yr | -2.1404 | -0.0015 | 0.0529 | 479 |
| ICBT_6m | 2.1257 | 0.0012 | 0.0404 | 649 |
| EPS_1yr | -2.0866 | -0.0015 | 0.0541 | 649 |
| RD_TA_1yr | -2.0841 | -0.0011 | 0.0391 | 590 |
| AccRec | -2.0555 | -0.0017 | 0.0580 | 651 |
| EPS_2yrAV | -1.9950 | -0.0016 | 0.0596 | 646 |
| Borrow_6m | -1.9691 | -0.0011 | 0.0420 | 651 |
| EPS | -1.9531 | -0.0017 | 0.0591 | 444 |
| NAVpS | -1.9106 | -0.0014 | 0.0524 | 572 |
| Intan_MV | 1.8984 | 0.0018 | 0.0638 | 649 |
| Borrow_1yr | -1.8550 | -0.0011 | 0.0448 | 651 |
| OPMtP_2yr | 1.8541 | 0.0012 | 0.0449 | 649 |
| EY_1yr | -1.8122 | -0.0013 | 0.0518 | 599 |
| OPMtP_6m | 1.7929 | 0.0021 | 0.0787 | 564 |
| LnMV_2yr | -1.7680 | -0.0029 | 0.1089 | 649 |
| ICBT_1yr | 1.7486 | 0.0011 | 0.0458 | 591 |
| Reten_6m | 1.7390 | 0.0008 | 0.0353 | 649 |
| Sales_Emp_6m | 1.7261 | 0.0011 | 0.0486 | 584 |
| CFMtP_6m | 1.7257 | 0.0020 | 0.0776 | 644 |
| NCF_BP1yrDiv | -1.7104 | -0.0009 | 0.0380 | 645 |
| NCA_MV_6m | 1.6838 | 0.0019 | 0.0713 | 609 |
| NCF_6m | -1.6834 | -0.0007 | 0.0347 | 594 |
| CPS_1yr | 1.6747 | 0.0012 | 0.0487 | 651 |
| MOM_3m | -1.6637 | -0.0020 | 0.0792 | 638 |
| DIV | -1.6600 | -0.0019 | 0.0833 | 560 |
| NCF_TD_6m | -1.6538 | -0.0008 | 0.0374 | 649 |
| CFMtP_2yr | 1.6304 | 0.0012 | 0.0565 | 649 |
| INV | -1.6186 | -0.0013 | 0.0537 | 649 |
| RD_TA_6m | -1.6163 | -0.0009 | 0.0392 | 649 |
| MTBV_6m | -1.5966 | -0.0022 | 0.0919 | 649 |
| NCF_BP1yr | -1.5903 | -0.0008 | 0.0329 | 591 |

University of Cape Town

**Appendix C.6.: Univariate cross-sectional regression results for multi-index adjusted returns**
-continued

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| RD_TA_2yr | -1.5876 | -0.0011 | 0.0508 | 584 |
| CFMtP_1yr | 1.5873 | 0.0011 | 0.0494 | 649 |
| CEY_6m | 1.5807 | 0.0019 | 0.0784 | 649 |
| TV_1yr | 1.5631 | 0.0017 | 0.0790 | 651 |
| EqCapRes | -1.5608 | -0.0017 | 0.0821 | 638 |
| CPS | -1.5530 | -0.0011 | 0.0486 | 651 |
| MVT_3m | 1.5493 | 0.0019 | 0.0793 | 614 |
| NCA_MV | 1.5386 | 0.0014 | 0.0638 | 637 |
| ICBT_2yr | 1.5316 | 0.0011 | 0.0480 | 588 |
| WC | -1.5207 | -0.0017 | 0.0784 | 651 |
| RD_EQ_2yr | -1.5174 | -0.0011 | 0.0506 | 476 |
| NCF_BP1yr_6m | -1.5144 | -0.0008 | 0.0383 | 649 |
| BTMV_1yr | 1.5141 | 0.0020 | 0.0942 | 651 |
| P_2yr | -1.5109 | -0.0023 | 0.1035 | 651 |
| MVT_MV_1yr | 1.5005 | 0.0017 | 0.0780 | 591 |
| AssTurn_2yr | 1.4898 | 0.0010 | 0.0482 | 651 |
| BVpS | -1.4767 | -0.0012 | 0.0564 | 651 |
| NS_6m | -1.4732 | -0.0011 | 0.0567 | 599 |
| Quick_6m | 1.4060 | 0.0009 | 0.0443 | 488 |
| NCF_BP1yrDiv_6m | -1.4578 | -0.0006 | 0.0321 | 567 |
| Reten_1yr | 1.4528 | 0.0006 | 0.0276 | 645 |
| AssTurn_1yr | 1.4527 | 0.0009 | 0.0438 | 651 |
| ROCE_1yr | -1.4462 | -0.0008 | 0.0428 | 649 |
| NS_2yr | -1.4460 | -0.0013 | 0.0593 | 649 |
| DPS_1yr | -1.4400 | -0.0013 | 0.0666 | 649 |
| BTMV_6m | 1.4292 | 0.0022 | 0.1001 | 651 |
| VO | -1.4289 | 0.0015 | 0.0786 | 651 |
| Crossover6_12 | 1.3701 | 0.0006 | 0.0266 | 596 |
| MVT_6m | 1.3612 | 0.0017 | 0.0855 | 607 |
| BTMV_2yr | 1.3554 | 0.0020 | 0.0876 | 651 |
| CFY_2yr | 1.3383 | 0.0011 | 0.0602 | 651 |
| Sales_Emp | 1.3274 | 0.0009 | 0.0465 | 590 |
| Quick | -1.3195 | -0.0015 | 0.0802 | 484 |
| CEY_1yr | 1.2924 | 0.0010 | 0.0527 | 651 |
| DepAmort_TA | -1.2906 | -0.0025 | 0.1494 | 444 |
| MVT_MV_1m | 1.2725 | 0.0013 | 0.0737 | 594 |
| VO_1m | 1.2714 | 0.0013 | 0.0734 | 651 |
| DPS_2yr | -1.2490 | 0.0014 | 0.0808 | 649 |
| TV_1m | 1.2485 | 0.0013 | 0.0746 | 651 |
| ChEPS_P_6m | 1.2421 | 0.0008 | 0.0441 | 651 |
| NCF | -1.2287 | -0.0007 | 0.0393 | 605 |
| PEGI_2yr | -1.2231 | -0.0007 | 0.0452 | 637 |
| MVT_MV | -1.2207 | 0.0015 | 0.0859 | 594 |
| CPS_6m | 1.2192 | 0.0008 | 0.0450 | 651 |
| Crossover6_18 | 1.1973 | 0.0005 | 0.0321 | 510 |
| NPMtP_6m | 1.1538 | 0.0012 | 0.0719 | 581 |
| EPS_2yr | -1.1537 | -0.0009 | 0.0490 | 649 |
| VO_1yr | 1.1515 | 0.0013 | 0.0769 | 651 |
| Crossover1_3 | -1.1474 | -0.0005 | 0.0300 | 651 |
| TV | -1.1430 | -0.0014 | 0.0849 | 631 |
| ROEpub | -1.1428 | -0.0015 | 0.0887 | 640 |
| EqCapRes_6m | -1.1388 | -0.0011 | 0.0652 | 630 |
| NS_1yr | -1.1277 | -0.0009 | 0.0556 | 588 |
| MVT_1m | 1.1179 | 0.0012 | 0.0735 | 640 |
| Sales_P_2yr | 1.1148 | 0.0018 | 0.0979 | 587 |
| ChEPS_P_1yr | 1.1081 | 0.0008 | 0.0495 | 640 |
| MOM_18m | -1.1079 | -0.0015 | 0.0910 | 645 |
| ROCE | -1.1019 | -0.0015 | 0.0897 | 621 |

University of Cape Town

**Appendix C.6.: Univariate cross-sectional regression results for multi-index adjusted returns**
-continued

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| RD_EQ_6m | -1.0732 | -0.0007 | 0.0486 | 596 |
| NPMtP_1yr | -1.0425 | -0.0006 | 0.0426 | 640 |
| Gear_1yr | -1.0232 | -0.0005 | 0.0376 | 606 |
| BVpS_6m | -1.0193 | -0.0010 | 0.0622 | 651 |
| LnMV_1yr | -1.0088 | -0.0014 | 0.0978 | 640 |
| NPMtP_2yr | 1.0036 | 0.0006 | 0.0423 | 647 |
| ChSalelsChInv | 1.0008 | 0.0004 | 0.0297 | 651 |
| Gear_6m | -0.9805 | -0.0006 | 0.0431 | 594 |
| PPMtP_6m | 0.9749 | 0.0011 | 0.0734 | 488 |
| MVT_2yr | -0.9676 | -0.0011 | 0.0862 | 620 |
| EqCapRes_1yr | -0.8987 | -0.0010 | 0.0798 | 638 |
| Growth | -0.8849 | -0.0011 | 0.0880 | 594 |
| BVpS_2yr | -0.8820 | -0.0011 | 0.0869 | 651 |
| WC_6m | 0.8666 | 0.0005 | 0.0426 | 651 |
| BVpS_1yr | -0.8618 | -0.0010 | 0.0787 | 651 |
| TLC_TA_2yr | -0.8611 | -0.0005 | 0.0404 | 644 |
| Crossover3_12 | 0.8463 | 0.0004 | 0.0286 | 651 |
| TD_TA_6m | -0.8303 | -0.0005 | 0.0415 | 605 |
| ROCE_2yr | -0.8219 | -0.0005 | 0.0449 | 649 |
| NAVpS_6m | -0.8159 | -0.0008 | 0.0634 | 642 |
| Growth_6m | 0.8125 | 0.0004 | 0.0378 | 594 |
| WC_2yr | -0.8093 | -0.0006 | 0.0471 | 651 |
| TD_TA_1yr | -0.7934 | -0.0005 | 0.0434 | 578 |
| PPMtP_1yr | -0.7913 | -0.0005 | 0.0433 | 16 |
| DPS_6m | -0.7884 | -0.0007 | 0.0627 | 646 |
| ICBT | -0.7575 | -0.0006 | 0.0528 | 594 |
| EqCapRes_2yr | -0.7370 | -0.0009 | 0.0821 | 632 |
| LnMV_3m | -0.7355 | -0.0011 | 0.1035 | 649 |
| AssTurn | 0.6868 | 0.0005 | 0.0449 | 651 |
| Sales_P_1yr | 0.6778 | 0.0010 | 0.0972 | 645 |
| RD_TA | -0.6645 | -0.0008 | 0.0798 | 596 |
| NAVpS_1yr | -0.6644 | -0.0007 | 0.0713 | 560 |
| Sales_Emp_2yr | 0.6544 | 0.0004 | 0.0499 | 587 |
| P_1yr | -0.6527 | -0.0009 | 0.0989 | 651 |
| Quick_2yr | -0.6518 | 0.0004 | 0.0439 | 476 |
| INV_2yr | -0.6435 | -0.0005 | 0.0553 | 640 |
| RD_EQ | -0.6269 | -0.0007 | 0.0819 | 484 |
| P_1m | -0.6155 | -0.0007 | 0.0817 | 564 |
| P_3m | -0.5955 | -0.0008 | 0.0980 | 651 |
| LnMV_6m | -0.5897 | -0.0009 | 0.0984 | 645 |
| PEGI_1yr | -0.5844 | -0.0003 | 0.0438 | 643 |
| Intan_MV_6m | 0.5609 | 0.0007 | 0.0769 | 649 |
| NCF_BPIyrDiv_2yr | -0.5541 | -0.0005 | 0.0581 | 571 |
| Borrow_2yr | -0.5389 | -0.0003 | 0.0417 | 651 |
| ROEpub_1yr | -0.5375 | -0.0003 | 0.0372 | 649 |
| Sales_P_6m | 0.5170 | 0.0008 | 0.1043 | 587 |
| LnMV_1m | -0.5083 | -0.0006 | 0.0811 | 645 |
| TLC_TA_1yr | -0.4965 | -0.0003 | 0.0431 | 644 |
| ROCE_6m | -0.4913 | -0.0003 | 0.0460 | 645 |
| AccRec_2yr | -0.4850 | -0.0006 | 0.0828 | 651 |
| PEGI_6m | -0.4463 | -0.0003 | 0.0471 | 643 |
| INV_1yr | -0.4455 | -0.0003 | 0.0448 | 645 |
| CPS_2yr | 0.4433 | 0.0004 | 0.0625 | 651 |

University of Cape Town

**Appendix C.6.: Univariate cross-sectional regression results for multi-index adjusted returns**
continued

| Characteristic | Mean T-Statistic | Mean Coefficient | Mean Information Coefficient | Number of Observations in the Final Month |
|---|---|---|---|---|
| NCF_TD_2yr | -0.4244 | -0.0003 | 0.0512 | 649 |
| MOM_12m | -0.4144 | -0.0006 | 0.0933 | 649 |
| Quick_1yr | 0.4129 | 0.0003 | 0.0420 | 479 |
| TLC_TA_6m | -0.3908 | -0.0002 | 0.0427 | 639 |
| ChSalelsChAR | -0.3885 | -0.0002 | 0.0345 | 651 |
| NAVpS_2yr | -0.3864 | -0.0004 | 0.0843 | 642 |
| MOM_6m | -0.3855 | -0.0006 | 0.0865 | 638 |
| DepAmort_TA_2yr | -0.3821 | -0.0012 | 0.2638 | 602 |
| Crossover3_1 | -0.3695 | -0.0002 | 0.0370 | 651 |
| DepAmort_TA_1yr | 0.3656 | 0.0009 | 0.1929 | 651 |
| MVT_1yr | 0.3598 | 0.0004 | 0.0859 | 621 |
| OPMtP_1yr | 0.3423 | 0.0003 | 0.0571 | 607 |
| Gear | 0.3414 | 0.0005 | 0.1111 | 599 |
| Growth_1yr | -0.3403 | -0.0002 | 0.0327 | 591 |
| MOM_3m | -0.3400 | -0.0003 | 0.0716 | 640 |
| DIV_2yr | -0.3379 | -0.0003 | 0.0588 | 649 |
| EY_2yr | -0.3270 | -0.0003 | 0.0527 | 606 |
| NCA_MV_1yr | 0.3105 | 0.0002 | 0.0368 | 633 |
| NCF_2yr | -0.3082 | -0.0003 | 0.0516 | 594 |
| PPMtP | 0.3019 | 0.0003 | 0.0574 | 18 |
| Intan_MV_1yr | -0.2939 | -0.0003 | 0.0671 | 645 |
| DY_1yr | -0.2889 | -0.0003 | 0.0802 | 651 |
| NCA_MV_2yr | 0.2885 | 0.0002 | 0.0488 | 611 |
| DY_6m | 0.2877 | 0.0003 | 0.0800 | 510 |
| TLC_TA | -0.2499 | -0.0002 | 0.0615 | 644 |
| ChEPS_P_2yr | 0.2339 | -0.0002 | 0.0559 | 651 |
| ROEpub_6m | 0.2275 | 0.0001 | 0.0447 | 645 |
| Accrtoc_1yr | 0.2245 | 0.0002 | 0.0647 | 651 |
| PPMtP_2yr | 0.2157 | 0.0001 | 0.0429 | 12 |
| P_6m | -0.1904 | 0.0003 | 0.0972 | 648 |
| Borrow | 0.1974 | -0.0003 | 0.0941 | 651 |
| TV_2yr | 0.1969 | 0.0002 | 0.0838 | 651 |
| EPS_6m | -0.1856 | 0.0001 | 0.0500 | 641 |
| TD_TA_2yr | 0.1825 | 0.0001 | 0.0426 | 571 |
| NCF_1yr | 0.1810 | 0.0001 | 0.0384 | 601 |
| NCF_BP1yr_2yr | -0.1702 | -0.0002 | 0.0581 | 649 |
| TD_TA | 0.1604 | 0.0002 | 0.1030 | 586 |
| Crossover3_18 | 0.1560 | 0.0001 | 0.0332 | 651 |
| MV1_MV_2yr | 0.1526 | 0.0002 | 0.0844 | 589 |
| INV_6m | -0.1313 | 0.0001 | 0.0426 | 649 |
| Gear_2yr | 0.1130 | 0.0001 | 0.0412 | 605 |
| EY_6m | 0.1042 | 0.0001 | 0.0575 | 606 |
| NCF_TD_1yr | 0.1026 | 0.0001 | 0.0424 | 404 |
| DIV_6m | -0.0953 | -0.0001 | 0.0476 | 646 |
| NCF_TD | -0.0933 | 0.0000 | 0.0338 | 469 |
| DY_2yr | -0.0889 | -0.0001 | 0.0852 | 595 |
| WC_1yr | 0.0861 | 0.0001 | 0.0415 | 651 |
| ROEpub_2yr | -0.0848 | -0.0001 | 0.0452 | 649 |
| PEGI | -0.0728 | 0.0000 | 0.0378 | 648 |
| Intan_MV_2yr | 0.0709 | -0.0001 | 0.0698 | 641 |
| Accrtec_6m | 0.0554 | 0.0000 | 0.0571 | 651 |
| Growth_2yr | 0.0537 | 0.0000 | 0.0408 | 589 |
| NCF_BP1yr_1yr | 0.0511 | 0.0000 | 0.0382 | 589 |
| DIV_1yr | -0.0305 | 0.0000 | 0.0562 | 649 |
| NCF_BP1yrDiv_1yr | 0.0295 | 0.0000 | 0.0369 | 640 |
| NPMtP | -0.0222 | 0.0000 | 0.0572 | 645 |
| VO_2yr | -0.0165 | 0.0000 | 0.0844 | 648 |
| Reten | 0.0110 | 0.0000 | 0.0708 | 649 |

University of Cape Town

## Appendix C.7.: Correlation matrix of monthly payoffs to significant firm-specific attributes for un-adjusted returns

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the cross-sectional regression analysis using un-adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic. The firm-specific attribute data are standardised and adjusted for thin-trading and outliers Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| | P | LnMV | VO_3m | VO_6m | TV_3m | TV_6m | MVT | MVT_3m | MVT_MV_3m | MVT_MV_6m | EPS | DY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 1.000 | | | | | | | | | | | |
| LnMV | 0.650 | 1.000 | | | | | | | | | | |
| VO_3m | -0.121 | -0.223 | 1.000 | | | | | | | | | |
| VO_6m | -0.051 | -0.144 | 0.635 | 1.000 | | | | | | | | |
| TV_3m | -0.125 | -0.198 | 0.991 | 0.633 | 1.000 | | | | | | | |
| TV_6m | -0.047 | -0.106 | 0.623 | 0.989 | 0.623 | 1.000 | | | | | | |
| MVT | 0.675 | 0.803 | -0.029 | 0.108 | -0.033 | 0.119 | 1.000 | | | | | |
| MVT_3m | -0.161 | -0.216 | 0.859 | 0.703 | 0.854 | 0.695 | -0.072 | 1.000 | | | | |
| MVT_MV_3m | -0.110 | -0.212 | 0.999 | 0.638 | 0.993 | 0.617 | -0.022 | 0.854 | 1.000 | | | |
| MVT_MV_6m | -0.024 | -0.116 | 0.630 | 0.997 | 0.630 | 0.993 | 0.129 | 0.703 | 0.634 | 1.000 | | |
| EPS | 0.816 | 0.702 | -0.096 | -0.169 | -0.095 | -0.162 | 0.504 | -0.206 | -0.088 | -0.148 | 1.000 | |
| DY | -0.454 | -0.036 | -0.087 | -0.072 | -0.039 | -0.029 | -0.454 | 0.008 | -0.093 | -0.083 | -0.159 | 1.000 |
| MTBV | 0.720 | 0.610 | -0.161 | -0.229 | -0.182 | -0.233 | 0.663 | -0.257 | -0.153 | -0.198 | 0.657 | -0.617 |
| MTBV_1yr | -0.324 | -0.357 | 0.089 | 0.128 | 0.088 | 0.128 | -0.434 | 0.344 | 0.083 | 0.123 | -0.387 | 0.232 |
| MTBV_2yr | -0.018 | -0.006 | -0.113 | -0.060 | -0.097 | -0.041 | -0.188 | 0.194 | -0.107 | -0.049 | -0.064 | 0.151 |
| BTMV | -0.740 | -0.648 | 0.126 | 0.226 | 0.152 | 0.245 | -0.685 | 0.218 | 0.118 | 0.206 | -0.686 | 0.633 |
| EY | 0.039 | 0.147 | -0.140 | -0.350 | -0.136 | -0.348 | -0.280 | -0.221 | -0.144 | -0.357 | 0.401 | 0.490 |
| Reten_2yr | -0.641 | -0.480 | -0.020 | -0.050 | 0.027 | -0.006 | -0.715 | 0.053 | -0.022 | -0.056 | -0.470 | 0.600 |
| Borrow_1yr | -0.124 | -0.185 | 0.192 | -0.030 | 0.160 | -0.043 | 0.011 | 0.018 | 0.190 | -0.024 | -0.104 | -0.222 |
| Quick_6m | -0.016 | 0.060 | -0.067 | 0.041 | -0.047 | 0.076 | 0.124 | 0.022 | -0.073 | 0.047 | -0.095 | 0.090 |
| OPMtP | -0.626 | -0.771 | 0.168 | 0.206 | 0.170 | 0.266 | -0.582 | 0.289 | 0.151 | 0.263 | -0.750 | 0.137 |
| CPMtP | -0.681 | -0.704 | 0.131 | 0.235 | 0.154 | 0.229 | -0.593 | 0.267 | 0.122 | 0.210 | -0.789 | 0.274 |
| CEY | -0.527 | -0.515 | -0.013 | 0.067 | 0.015 | 0.067 | -0.633 | 0.083 | -0.018 | 0.044 | -0.467 | 0.494 |
| Intan_MV | -0.512 | -0.728 | 0.172 | 0.175 | 0.148 | 0.149 | -0.417 | 0.153 | 0.153 | 0.151 | -0.663 | -0.135 |
| NAVpS | 0.707 | 0.653 | -0.062 | -0.116 | -0.035 | -0.080 | 0.398 | -0.119 | -0.053 | -0.090 | 0.889 | 0.096 |
| DPS | 0.748 | 0.713 | -0.110 | -0.153 | -0.090 | -0.126 | 0.435 | -0.156 | -0.102 | -0.128 | 0.921 | 0.087 |
| AssTurn_6m | 0.015 | -0.158 | -0.001 | 0.085 | -0.027 | 0.071 | 0.018 | 0.188 | -0.006 | 0.006 | -0.043 | -0.264 |
| AssTurn_1yr | 0.126 | -0.142 | 0.033 | 0.175 | 0.011 | 0.156 | 0.042 | 0.244 | 0.029 | 0.182 | -0.052 | -0.392 |
| Sales_Emp_1yr | -0.108 | -0.250 | 0.083 | -0.030 | 0.075 | -0.052 | -0.283 | 0.203 | 0.081 | -0.040 | -0.047 | -0.107 |
| DepAmort_TA_6m | 0.019 | 0.182 | 0.171 | -0.036 | 0.181 | -0.027 | 0.177 | 0.174 | 0.168 | -0.037 | 0.017 | 0.050 |
| RD_EQ_2yr | 0.114 | -0.058 | -0.084 | 0.175 | -0.097 | 0.166 | 0.103 | -0.103 | -0.076 | 0.188 | 0.011 | -0.205 |
| NCF_TD_6m | -0.186 | -0.075 | -0.230 | -0.119 | -0.240 | -0.108 | -0.030 | -0.224 | -0.234 | -0.130 | -0.136 | 0.056 |
| ICBT_6m | 0.259 | 0.163 | 0.186 | 0.084 | 0.195 | 0.106 | -0.019 | 0.209 | 0.196 | 0.104 | 0.399 | 0.177 |
| ICBT_1yr | 0.480 | 0.454 | -0.003 | 0.030 | 0.001 | 0.044 | 0.268 | 0.071 | 0.006 | 0.051 | 0.505 | 0.065 |
| ICBT_2yr | 0.528 | 0.488 | -0.020 | 0.063 | -0.012 | 0.094 | 0.290 | 0.103 | -0.006 | 0.101 | 0.513 | -0.001 |
| Sales_P | -0.667 | -0.925 | 0.132 | 0.168 | 0.115 | 0.139 | -0.694 | 0.182 | 0.121 | 0.143 | -0.807 | -0.038 |
| NCF_6m | -0.113 | -0.048 | -0.266 | -0.216 | -0.256 | -0.192 | -0.092 | -0.234 | -0.264 | -0.225 | -0.088 | 0.162 |
| EPS_2yrAV | 0.839 | 0.668 | -0.096 | -0.115 | -0.091 | -0.108 | 0.513 | -0.215 | -0.057 | -0.092 | 0.971 | -0.187 |
| NCF_BP1yr_6m | -0.159 | -0.039 | -0.317 | -0.213 | -0.317 | -0.194 | -0.056 | -0.254 | -0.319 | -0.223 | -0.085 | 0.100 |
| NCF_BP1yrDiv_6m | -0.110 | -0.019 | -0.361 | -0.309 | -0.370 | -0.284 | -0.072 | -0.353 | -0.379 | -0.319 | -0.041 | 0.151 |

University of Cape Town

**Appendix C.7.: Correlation matrix of monthly payoffs to significant firm-specific attributes for un-adjusted returns**
-continued

| | MTBV | MTBV_1yr | MTBV_2yr | BTMV | EY | Reten_2yr | Borrow_1yr | Quick_6m | OPMIP | CFMIP | CEY | Intan_MV | NAVpS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | | | | |
| LnMV | | | | | | | | | | | | | |
| VO_3m | | | | | | | | | | | | | |
| VO_6m | | | | | | | | | | | | | |
| TV_3m | | | | | | | | | | | | | |
| TV_6m | | | | | | | | | | | | | |
| MVT | | | | | | | | | | | | | |
| MVT_3m | | | | | | | | | | | | | |
| MVT_MV_3m | | | | | | | | | | | | | |
| MVT MV 6m | | | | | | | | | | | | | |
| EPS | | | | | | | | | | | | | |
| DY | | | | | | | | | | | | | |
| MTBV | 1.000 | | | | | | | | | | | | |
| MTBV 1yr | -0.310 | 1.000 | | | | | | | | | | | |
| MTBV_2yr | -0.047 | 0.702 | 1.000 | | | | | | | | | | |
| BTMV | -0.910 | 0.316 | -0.017 | 1.000 | | | | | | | | | |
| EY | -0.064 | -0.022 | 0.201 | 0.013 | 1.000 | | | | | | | | |
| Reten_2yr | -0.594 | 0.372 | 0.225 | 0.704 | 0.264 | 1.000 | | | | | | | |
| Borrow_1yr | -0.018 | 0.022 | -0.345 | 0.017 | -0.229 | -0.086 | 1.000 | | | | | | |
| Quick_6m | -0.098 | 0.113 | 0.034 | 0.092 | -0.174 | -0.063 | 0.007 | 1.000 | | | | | |
| OPMIP | -0.577 | 0.345 | 0.010 | 0.660 | -0.246 | 0.437 | -0.001 | 0.001 | 1.000 | | | | |
| CFMIP | -0.636 | 0.379 | 0.131 | 0.720 | -0.215 | 0.556 | -0.168 | -0.061 | 0.902 | 1.000 | | | |
| CEY | -0.608 | 0.134 | 0.119 | 0.653 | 0.190 | 0.567 | -0.431 | -0.189 | 0.656 | 0.807 | 1.000 | | |
| Intan_MV | 0.437 | 0.052 | -0.387 | 0.483 | -0.482 | 0.224 | 0.299 | 0.017 | 0.742 | 0.601 | 0.318 | 1.000 | |
| NAVpS | 0.457 | -0.331 | -0.001 | -0.462 | 0.403 | -0.227 | -0.233 | -0.036 | -0.667 | -0.620 | -0.240 | -0.634 | 1.000 |
| DPS | 0.502 | -0.326 | -0.012 | -0.524 | 0.402 | -0.300 | 0.197 | 0.059 | -0.721 | -0.696 | -0.333 | 0.662 | 0.973 |
| AssTurn_6m | 0.079 | 0.166 | 0.266 | -0.089 | -0.155 | 0.021 | -0.049 | -0.102 | 0.133 | 0.040 | 0.003 | 0.187 | -0.048 |
| AssTurn_1yr | 0.144 | 0.111 | 0.400 | -0.186 | -0.263 | -0.110 | -0.339 | -0.100 | 0.203 | 0.159 | 0.132 | 0.097 | -0.070 |
| Sales_Emp_1yr | -0.068 | 0.075 | 0.446 | -0.016 | 0.226 | 0.213 | -0.440 | -0.324 | 0.199 | 0.275 | 0.406 | 0.006 | -0.094 |
| DepAmort_TA_6m | 0.008 | -0.068 | -0.037 | -0.096 | -0.045 | 0.134 | -0.130 | -0.011 | -0.170 | -0.095 | -0.057 | -0.159 | 0.109 |
| HD EQ 2yr | 0.152 | -0.083 | -0.352 | -0.011 | -0.408 | -0.006 | 0.178 | 0.073 | 0.015 | -0.053 | -0.143 | 0.215 | -0.033 |
| NCF_TD_6m | -0.268 | -0.115 | -0.184 | 0.213 | -0.143 | 0.003 | 0.136 | 0.088 | -0.062 | -0.035 | -0.025 | 0.215 | -0.159 |
| ICBT 6m | -0.004 | 0.045 | 0.295 | 0.025 | 0.347 | 0.030 | -0.102 | -0.117 | -0.364 | -0.279 | -0.050 | -0.375 | 0.469 |
| ICBT_1yr | 0.210 | 0.083 | 0.393 | -0.277 | 0.268 | -0.157 | -0.134 | -0.046 | -0.572 | -0.489 | -0.339 | -0.592 | 0.508 |
| ICBT_2yr | 0.349 | 0.026 | 0.310 | -0.371 | 0.253 | -0.136 | -0.287 | -0.161 | -0.488 | -0.465 | -0.260 | -0.549 | 0.534 |
| Sales_P | -0.604 | 0.299 | -0.028 | 0.634 | -0.318 | 0.427 | 0.130 | -0.056 | 0.855 | 0.783 | 0.546 | 0.835 | -0.774 |
| NCF 6m | -0.324 | -0.148 | -0.070 | 0.291 | 0.009 | 0.029 | -0.035 | 0.069 | -0.089 | -0.090 | 0.094 | 0.106 | -0.042 |
| EPS_2yrAV | 0.635 | -0.446 | -0.164 | -0.646 | 0.313 | -0.472 | -0.104 | -0.089 | -0.702 | -0.752 | -0.442 | -0.579 | 0.892 |
| NCF_BP1yr 6m | -0.241 | -0.102 | -0.040 | 0.176 | -0.064 | 0.018 | -0.046 | 0.045 | -0.089 | -0.009 | 0.070 | 0.117 | -0.066 |
| NCF_BP1yrDiv_6m | -0.244 | -0.208 | -0.099 | 0.171 | 0.013 | 0.035 | -0.076 | 0.081 | -0.157 | -0.039 | 0.096 | 0.063 | 0.003 |

University of Cape Town

**Appendix C.7.: Correlation matrix of monthly payoffs to significant firm-specific attributes for un-adjusted returns**
-continued

| | DPS | AssTurn_6m | AssTurn_1yr | Sales_Emp_1yr | DepAmort_TA_6m | RD_EQ_2yr | NCF_TD_6m | ICBT_6m | ICBT_1yr | ICBT_2yr | Sales_P | NCF_6m | EPS_2yrAV | NCF_BP1yr_6m | NCF_BP1yrDiv_6m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | | | | | | |
| LnMV | | | | | | | | | | | | | | | |
| VO_3m | | | | | | | | | | | | | | | |
| VO_6m | | | | | | | | | | | | | | | |
| TV_3m | | | | | | | | | | | | | | | |
| TV_6m | | | | | | | | | | | | | | | |
| MVT | | | | | | | | | | | | | | | |
| MVT_3m | | | | | | | | | | | | | | | |
| MVT_MV_3m | | | | | | | | | | | | | | | |
| MVT_MV_6m | | | | | | | | | | | | | | | |
| EPS | | | | | | | | | | | | | | | |
| DY | | | | | | | | | | | | | | | |
| MTBV | | | | | | | | | | | | | | | |
| MTBV_1yr | | | | | | | | | | | | | | | |
| MTBV_2yr | | | | | | | | | | | | | | | |
| BTMV | | | | | | | | | | | | | | | |
| EY | | | | | | | | | | | | | | | |
| Reten_2yr | | | | | | | | | | | | | | | |
| Borrow_1yr | | | | | | | | | | | | | | | |
| Quick_6m | | | | | | | | | | | | | | | |
| OPMIP | | | | | | | | | | | | | | | |
| CFMIP | | | | | | | | | | | | | | | |
| CEY | | | | | | | | | | | | | | | |
| Intan_MV | | | | | | | | | | | | | | | |
| NAVpS | | | | | | | | | | | | | | | |
| DPS | 1.000 | | | | | | | | | | | | | | |
| AssTurn_6m | -0.078 | 1.000 | | | | | | | | | | | | | |
| AssTurn_1yr | -0.118 | 0.596 | 1.000 | | | | | | | | | | | | |
| Sales_Emp_1yr | -0.094 | 0.440 | 0.706 | 1.000 | | | | | | | | | | | |
| DepAmort_TA_6m | 0.100 | -0.093 | 0.036 | 0.028 | 1.000 | | | | | | | | | | |
| RD_EQ_2yr | -0.007 | 0.012 | -0.036 | -0.373 | -0.149 | 1.000 | | | | | | | | | |
| NCF_TD_6m | -0.135 | -0.001 | -0.093 | -0.153 | -0.113 | 0.173 | 1.000 | | | | | | | | |
| ICBT_6m | 0.437 | 0.073 | 0.099 | 0.167 | 0.231 | -0.156 | -0.054 | 1.000 | | | | | | | |
| ICBT_1yr | 0.546 | 0.083 | 0.128 | 0.085 | 0.218 | -0.053 | -0.097 | 0.865 | 1.000 | | | | | | |
| ICBT_2yr | 0.560 | 0.154 | 0.236 | 0.166 | 0.300 | 0.024 | -0.324 | 0.600 | 0.713 | 1.000 | | | | | |
| Sales_P | -0.624 | 0.150 | 0.189 | 0.230 | -0.213 | 0.071 | 0.150 | -0.316 | -0.554 | -0.536 | 1.000 | | | | |
| NCF_6m | -0.034 | -0.061 | -0.128 | -0.038 | 0.015 | -0.003 | 0.889 | -0.010 | -0.057 | -0.245 | 0.109 | 1.000 | | | |
| EPS_2yrAV | 0.916 | -0.051 | -0.080 | -0.126 | -0.020 | 0.096 | -0.128 | 0.384 | 0.446 | 0.479 | -0.756 | -0.085 | 1.000 | | |
| NCF_BP1yr_6m | -0.077 | 0.121 | 0.004 | -0.005 | -0.126 | 0.067 | 0.937 | 0.030 | -0.092 | -0.281 | 0.104 | 0.677 | -0.090 | 1.000 | |
| NCF_BP1yrDiv_6m | 0.008 | 0.031 | -0.118 | -0.026 | -0.020 | 0.041 | 0.880 | 0.009 | -0.075 | -0.283 | 0.050 | 0.948 | -0.033 | 0.916 | 1.000 |

University of Cape Town

## Appendix C.8.: Correlation matrix of monthly payoffs to significant firm-specific attributes for single-index adjusted returns

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the cross-sectional regression analysis using single-index adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic. The firm-specific attribute data are standardised and adjusted for thin-trading and outliers Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| | P | P_2yr | LnMV | LnMV_2yr | NS | NS_1yr | VO_3m | VO_6m | TV_3m | TV_6m | MVT | MVT_MV_3m | MVT_MV_6m | EPS | EPS_1yr | DY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 1.000 | | | | | | | | | | | | | | | |
| P_2yr | 0.211 | 1.000 | | | | | | | | | | | | | | |
| LnMV | 0.791 | 0.088 | 1.000 | | | | | | | | | | | | | |
| LnMV_2yr | 0.238 | 0.874 | 0.110 | 1.000 | | | | | | | | | | | | |
| NS | 0.857 | 0.135 | 0.864 | 0.174 | 1.000 | | | | | | | | | | | |
| NS_1yr | 0.303 | 0.967 | 0.204 | 0.894 | 0.271 | 1.000 | | | | | | | | | | |
| VO_3m | -0.169 | -0.093 | -0.233 | -0.122 | -0.139 | -0.132 | 1.000 | | | | | | | | | |
| VO_6m | -0.196 | -0.095 | -0.191 | -0.173 | -0.213 | -0.171 | 0.548 | 1.000 | | | | | | | | |
| TV_3m | -0.196 | -0.111 | -0.234 | -0.142 | -0.168 | -0.150 | 0.906 | 0.556 | 1.000 | | | | | | | |
| TV_6m | -0.172 | -0.092 | -0.175 | -0.178 | -0.220 | -0.173 | 0.525 | 0.900 | 0.543 | 1.000 | | | | | | |
| MVT | 0.724 | -0.040 | 0.860 | -0.012 | 0.715 | 0.058 | -0.155 | -0.022 | -0.158 | -0.221 | 1.000 | | | | | |
| MVT_MV_3m | -0.166 | -0.091 | -0.232 | -0.122 | -0.159 | -0.152 | 0.959 | 0.550 | 0.995 | 0.529 | -0.153 | 1.000 | | | | |
| MVT_MV_6m | -0.140 | -0.087 | -0.166 | -0.159 | -0.195 | -0.152 | 0.536 | 0.896 | 0.547 | 0.919 | -0.005 | 0.542 | 1.000 | | | |
| EPS | 0.671 | 0.084 | 0.695 | 0.101 | 0.805 | 0.176 | -0.008 | -0.232 | -0.121 | -0.242 | 0.553 | -0.009 | -0.018 | 1.000 | | |
| EPS_1yr | 0.502 | 0.583 | 0.434 | 0.593 | 0.468 | 0.627 | -0.288 | -0.224 | -0.295 | -0.312 | 0.374 | -0.286 | -0.267 | 0.395 | 1.000 | |
| DY | -0.523 | -0.287 | -0.208 | -0.183 | -0.278 | -0.171 | 0.110 | 0.083 | 0.078 | 0.028 | -0.460 | -0.123 | -0.085 | -0.341 | -0.300 | 1.000 |
| MTBV | 0.765 | 0.233 | 0.691 | 0.211 | 0.764 | 0.291 | -0.120 | -0.207 | -0.149 | -0.224 | 0.681 | -0.114 | -0.177 | 0.723 | 0.517 | -0.625 |
| MTBV_6m | -0.327 | 0.235 | -0.254 | 0.191 | -0.330 | 0.191 | 0.250 | 0.430 | 0.222 | 0.445 | -0.290 | 0.229 | 0.443 | -0.369 | -0.171 | 0.287 |
| MTBV_1yr | -0.337 | 0.452 | -0.426 | 0.395 | -0.402 | 0.377 | 0.129 | 0.273 | 0.132 | 0.298 | -0.421 | 0.133 | 0.284 | -0.495 | -0.066 | 0.188 |
| MTBV_2yr | 0.056 | 0.325 | -0.147 | 0.302 | -0.097 | 0.374 | -0.031 | -0.049 | -0.040 | -0.058 | -0.145 | -0.027 | -0.053 | -0.118 | 0.497 | -0.248 |
| STMV | -0.403 | -0.289 | -0.274 | 0.255 | -0.376 | -0.309 | 0.146 | 0.236 | 0.178 | 0.268 | -0.892 | 0.139 | 0.217 | 0.771 | -0.490 | 0.666 |
| STMV_6m | 0.403 | -0.179 | 0.277 | -0.142 | 0.384 | -0.182 | -0.116 | -0.369 | -0.113 | -0.403 | 0.332 | -0.112 | -0.395 | 0.437 | 0.216 | -0.378 |
| EY | 0.178 | 0.054 | 0.111 | 0.121 | 0.374 | 0.133 | -0.041 | -0.316 | -0.059 | -0.337 | -0.198 | -0.050 | -0.323 | 0.437 | 0.131 | 0.246 |
| Rates_2yr | -0.663 | -0.044 | -0.550 | -0.086 | -0.580 | -0.122 | 0.050 | 0.066 | 0.073 | 0.114 | -0.641 | 0.046 | 0.071 | -0.568 | -0.330 | 0.531 |
| Borrow_6m | 0.013 | -0.180 | -0.071 | -0.188 | -0.181 | -0.230 | 0.146 | 0.129 | 0.135 | 0.117 | 0.094 | 0.146 | 0.141 | -0.093 | -0.058 | -0.248 |
| Borrow_1yr | -0.132 | -0.451 | -0.196 | -0.472 | -0.190 | -0.496 | 0.180 | 0.139 | 0.162 | 0.129 | 0.029 | 0.188 | 0.138 | -0.079 | -0.272 | -0.187 |
| IDPMP | 0.723 | -0.159 | -0.675 | -0.185 | -0.842 | -0.243 | -0.038 | 0.206 | -0.007 | 0.219 | -0.610 | -0.041 | 0.197 | -0.745 | -0.292 | 0.412 |
| IDPMP_6m | 0.176 | -0.317 | 0.092 | -0.350 | 0.143 | -0.297 | -0.061 | -0.209 | -0.055 | -0.232 | 0.230 | -0.076 | -0.225 | 0.164 | 0.025 | -0.286 |
| IDPMP_2yr | 0.004 | -0.423 | 0.041 | -0.591 | 0.118 | -0.403 | 0.056 | -0.105 | 0.060 | -0.113 | -0.089 | 0.048 | -0.129 | 0.180 | -0.180 | 0.261 |
| ICPMP | -0.708 | -0.101 | -0.657 | -0.120 | -0.867 | -0.169 | 0.043 | 0.211 | 0.064 | 0.239 | -0.575 | 0.042 | 0.196 | -0.694 | -0.314 | 0.419 |
| ICPMP_6m | 0.109 | -0.418 | 0.107 | -0.406 | 0.116 | -0.394 | 0.044 | -0.168 | 0.059 | -0.195 | 0.248 | 0.047 | -0.190 | 0.117 | -0.106 | -0.253 |
| IDEY | -0.648 | -0.027 | -0.606 | -0.018 | -0.657 | -0.071 | -0.045 | 0.062 | -0.011 | 0.101 | -0.684 | -0.048 | 0.062 | -0.612 | -0.253 | 0.537 |
| IDEY_6m | 0.127 | -0.397 | 0.114 | -0.387 | 0.135 | -0.375 | 0.029 | -0.191 | 0.043 | -0.216 | 0.237 | 0.033 | -0.211 | 0.150 | -0.092 | -0.270 |
| Indan_MV | -0.674 | -0.456 | -0.668 | -0.480 | -0.852 | -0.560 | 0.055 | 0.130 | 0.072 | 0.135 | -0.492 | 0.054 | 0.114 | -0.667 | -0.537 | 0.221 |
| BAVpS | 0.613 | 0.091 | 0.539 | 0.123 | 0.600 | 0.208 | -0.083 | -0.166 | -0.044 | -0.159 | 0.475 | -0.036 | -0.150 | 0.669 | 0.412 | -0.216 |
| EPS | 0.668 | 0.125 | 0.708 | 0.169 | 0.874 | 0.254 | -0.150 | -0.207 | -0.166 | -0.205 | 0.547 | -0.153 | -0.190 | 0.836 | 0.450 | -0.214 |
| BCA_MV_6m | 0.178 | -0.409 | 0.117 | -0.416 | 0.174 | -0.389 | 0.038 | -0.127 | 0.048 | -0.164 | 0.274 | 0.042 | -0.145 | 0.150 | -0.072 | -0.267 |
| MV | 0.592 | -0.087 | 0.908 | -0.095 | 0.793 | 0.050 | -0.272 | -0.203 | -0.266 | -0.176 | 0.740 | -0.273 | -0.184 | 0.816 | 0.279 | 0.044 |
| Sales_Emp_6m | 0.022 | 0.503 | -0.028 | 0.479 | 0.056 | 0.460 | -0.000 | -0.064 | -0.009 | -0.050 | -0.156 | -0.007 | -0.050 | 0.051 | 0.272 | -0.126 |
| Sales_Emp_1yr | -0.052 | 0.523 | -0.171 | 0.522 | -0.094 | 0.485 | -0.006 | -0.182 | -0.006 | -0.185 | -0.271 | -0.004 | -0.182 | -0.002 | 0.305 | -0.225 |
| DepAmort_TA_6m | 0.091 | 0.018 | 0.077 | 0.024 | 0.136 | 0.027 | 0.349 | 0.175 | 0.340 | 0.171 | 0.176 | 0.348 | 0.180 | 0.088 | 0.089 | -0.156 |
| RD_EQ_1yr | 0.136 | -0.166 | 0.158 | -0.200 | 0.104 | -0.195 | -0.125 | 0.020 | -0.137 | 0.029 | 0.197 | -0.116 | 0.029 | 0.175 | -0.241 | -0.142 |
| RD_EQ_2yr | 0.108 | -0.042 | 0.104 | -0.065 | 0.096 | -0.046 | -0.110 | 0.187 | -0.123 | 0.194 | 0.199 | -0.109 | 0.191 | 0.091 | -0.109 | -0.097 |
| MOST_6m | 0.173 | 0.320 | 0.077 | 0.308 | 0.213 | 0.227 | 0.193 | 0.048 | 0.183 | 0.054 | -0.004 | 0.200 | 0.056 | 0.234 | 0.181 | -0.133 |
| Sales_P | -0.797 | -0.090 | -0.827 | -0.133 | -0.961 | -0.241 | 0.121 | 0.177 | 0.135 | 0.179 | -0.797 | 0.121 | 0.158 | -0.816 | -0.462 | 0.237 |
| EPS_2yrAV | 0.378 | 0.020 | 0.670 | 0.050 | 0.673 | 0.124 | -0.019 | -0.105 | -0.110 | -0.196 | 0.545 | -0.089 | -0.172 | 0.972 | 0.328 | -0.340 |
| MOM_3m | -0.538 | 0.390 | -0.209 | 0.390 | -0.334 | 0.328 | 0.131 | 0.149 | 0.148 | 0.192 | -0.239 | 0.152 | 0.169 | -0.416 | 0.147 | 0.220 |
| MOM_18m | -0.153 | 0.460 | -0.223 | 0.617 | -0.232 | 0.582 | -0.028 | 0.164 | -0.023 | 0.190 | -0.275 | -0.027 | 0.172 | -0.300 | 0.104 | 0.027 |

University of Cape Town

**Appendix C.8.: Correlation matrix of monthly payoffs to significant firm-specific attributes for single-index adjusted returns**
-continued

| | MTBV | MTBV_6m | MTBV_1yr | MTBV_2yr | BTMV | BTMV_6m | EY | Reter_2yr | Borrow_6m | Borrow_1yr | OPMIP | OPMIP_6m | OPMIP_2yr | CFMIP | CFMIP_6m | CFEY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | | | | | | | |
| P_2yr | | | | | | | | | | | | | | | | |
| LnMV | | | | | | | | | | | | | | | | |
| LnMV_2yr | | | | | | | | | | | | | | | | |
| NS | | | | | | | | | | | | | | | | |
| NS_1yr | | | | | | | | | | | | | | | | |
| VO_3m | | | | | | | | | | | | | | | | |
| VO_6m | | | | | | | | | | | | | | | | |
| TV_3m | | | | | | | | | | | | | | | | |
| TV_6m | | | | | | | | | | | | | | | | |
| MVT | | | | | | | | | | | | | | | | |
| MVT_MV_3m | | | | | | | | | | | | | | | | |
| MVT_MV_6m | | | | | | | | | | | | | | | | |
| EPS | | | | | | | | | | | | | | | | |
| EPS_1yr | | | | | | | | | | | | | | | | |
| BY | | | | | | | | | | | | | | | | |
| MTBV | 1.000 | | | | | | | | | | | | | | | |
| MTBV_6m | -0.917 | 1.000 | | | | | | | | | | | | | | |
| MTBV_1yr | -0.292 | 0.667 | 1.000 | | | | | | | | | | | | | |
| MTBV_2yr | 0.129 | 0.209 | 0.667 | 1.000 | | | | | | | | | | | | |
| BTMV | -0.916 | 0.915 | 0.395 | -0.107 | 1.000 | | | | | | | | | | | |
| BTMV_6m | 0.342 | -0.872 | -0.616 | -0.253 | -0.414 | 1.000 | | | | | | | | | | |
| EY | 0.046 | -0.202 | -0.339 | -0.095 | -0.102 | 0.221 | 1.000 | | | | | | | | | |
| Reter_2yr | -0.552 | 0.221 | 0.364 | 0.091 | 0.727 | -0.273 | 0.060 | 1.000 | | | | | | | | |
| Borrow_6m | 0.068 | 0.194 | 0.143 | -0.028 | -0.105 | 0.153 | -0.246 | -0.078 | 1.000 | | | | | | | |
| Borrow_1yr | 0.048 | 0.012 | 0.060 | -0.275 | 0.025 | 0.001 | -0.265 | 0.053 | 0.631 | 1.000 | | | | | | |
| OPMIP | -0.685 | 0.296 | 0.447 | 0.092 | 0.729 | -0.081 | -0.239 | 0.559 | 0.155 | 0.066 | 1.000 | | | | | |
| OPMIP_6m | 0.181 | -0.656 | -0.508 | -0.286 | -0.218 | 0.634 | 0.029 | -0.190 | -0.139 | 0.115 | -0.111 | 1.000 | | | | |
| OPMIP_2yr | 0.130 | -0.413 | -0.517 | -0.527 | -0.056 | 0.339 | 0.451 | 0.050 | -0.220 | 0.134 | 0.054 | 0.347 | 1.000 | | | |
| CFMIP | -0.721 | 0.506 | 0.466 | 0.074 | 0.760 | -0.092 | -0.228 | 0.578 | 0.077 | -0.011 | 0.905 | -0.090 | -0.069 | 1.000 | | |
| CFMIP_6m | 0.139 | -0.602 | -0.564 | -0.415 | -0.187 | 0.789 | 0.008 | -0.163 | -0.178 | 0.122 | -0.104 | 0.934 | 0.406 | -0.261 | 1.000 | |
| CFEY | -0.752 | 0.540 | 0.504 | 0.087 | 0.747 | -0.243 | 0.043 | 0.562 | -0.189 | -0.095 | 0.789 | -0.037 | 0.207 | 0.825 | -0.034 | 1.000 |
| CFEY_6m | 0.156 | -0.624 | -0.575 | -0.405 | 0.206 | 0.812 | 0.047 | -0.155 | -0.191 | 0.118 | -0.124 | 0.943 | 0.430 | -0.084 | 0.997 | -0.042 |
| Inter_MV | -0.803 | 0.115 | 0.191 | -0.260 | 0.589 | -0.192 | 0.398 | 0.443 | 0.280 | 0.007 | 0.747 | 0.013 | 0.105 | 0.661 | 0.090 | 0.472 |
| BMVpS | 0.630 | 0.390 | -0.342 | -0.053 | -0.606 | 0.394 | 0.338 | -0.393 | -0.180 | -0.166 | -0.646 | 0.191 | 0.011 | -0.699 | 0.118 | -0.461 |
| DPS | 0.667 | -0.314 | -0.398 | -0.059 | -0.691 | 0.301 | 0.363 | -0.499 | -0.154 | -0.187 | -0.672 | 0.128 | 0.154 | -0.753 | 0.064 | -0.516 |
| MCA_MV_6m | 0.228 | -0.771 | -0.633 | -0.390 | -0.246 | 0.755 | 0.021 | -0.143 | -0.167 | 0.164 | -0.147 | 0.924 | 0.372 | -0.129 | 0.905 | -0.120 |
| DIV | 0.557 | -0.212 | 0.407 | -0.405 | -0.481 | 0.205 | 0.169 | -0.369 | -0.101 | -0.115 | -0.563 | 0.088 | 0.161 | -0.493 | 0.088 | -0.496 |
| Sales_Emp_6m | 0.004 | -0.209 | 0.042 | 0.361 | -0.037 | 0.224 | 0.241 | 0.048 | -0.433 | -0.356 | -0.077 | 0.125 | 0.052 | -0.049 | 0.015 | 0.083 |
| Sales_Emp_1yr | -0.043 | -0.217 | 0.028 | 0.474 | -0.251 | 0.234 | 0.219 | 0.199 | -0.193 | -0.404 | 0.031 | 0.064 | 0.025 | 0.076 | -0.002 | 0.229 |
| DepAmort_TA_6m | 0.153 | 0.052 | -0.093 | 0.010 | -0.134 | 0.026 | -0.120 | -0.200 | 0.155 | 0.035 | -0.151 | -0.002 | 0.070 | -0.096 | 0.049 | -0.119 |
| RD_EQ_1yr | 0.274 | 0.110 | 0.163 | -0.159 | -0.196 | -0.105 | -0.222 | -0.039 | 0.268 | 0.486 | -0.102 | -0.036 | -0.185 | -0.205 | -0.013 | -0.309 |
| RD_EQ_2yr | 0.192 | 0.161 | 0.102 | -0.001 | -0.208 | -0.151 | -0.506 | 0.034 | 0.306 | 0.299 | -0.029 | -0.144 | -0.312 | -0.076 | -0.157 | -0.141 |
| ICBT_6m | 0.141 | -0.059 | 0.091 | 0.079 | -0.089 | 0.173 | -0.190 | 0.028 | -0.191 | -0.170 | -0.329 | -0.037 | -0.186 | 0.035 | -0.092 | -0.092 |
| Sales_P | -0.772 | 0.252 | 0.425 | 0.106 | 0.763 | -0.310 | -0.243 | -0.176 | 0.088 | 0.114 | 0.793 | -0.111 | -0.325 | 0.773 | -0.101 | 0.705 |
| EPS_2yrMV | -0.670 | -0.381 | -0.508 | -0.170 | -0.726 | 0.442 | 0.396 | -0.648 | -0.124 | -0.100 | -0.722 | 0.201 | 0.209 | -0.623 | 0.146 | 0.577 |
| MOM_3m | -0.219 | 0.644 | 0.540 | 0.410 | 0.338 | -0.640 | -0.234 | 0.266 | 0.188 | -0.189 | 0.317 | -0.615 | -0.321 | 0.437 | -0.618 | 0.319 |
| MOM_18m | -0.158 | 0.414 | 0.497 | 0.592 | 0.177 | -0.403 | -0.343 | 0.257 | -0.078 | -0.262 | 0.259 | -0.415 | -0.396 | 0.510 | -0.527 | 0.319 |

University of Cape Town

**Appendix C.8.: Correlation matrix of monthly payoffs to significant firm-specific attributes for single-index adjusted returns**
-continued

| | CEY_6m | Mcap_MV | NAVpS | DPS | MCA_MV_6m | DIV | Sales_Emp_6m | Sales_Emp_1yr | DepAmort_TA_6m | RD_EQ_1yr | RD_EQ_2yr | NCBT_6m | Sales_P | EPS_2yrAV | MOM_3m | MOM_18m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | | | | | | | |
| P_2yr | | | | | | | | | | | | | | | | |
| LnMV | | | | | | | | | | | | | | | | |
| LnMV_2yr | | | | | | | | | | | | | | | | |
| NS | | | | | | | | | | | | | | | | |
| NS_1yr | | | | | | | | | | | | | | | | |
| NO_3m | | | | | | | | | | | | | | | | |
| NO_6m | | | | | | | | | | | | | | | | |
| TV_3m | | | | | | | | | | | | | | | | |
| TV_6m | | | | | | | | | | | | | | | | |
| MVT | | | | | | | | | | | | | | | | |
| MVT_MV_3m | | | | | | | | | | | | | | | | |
| MVT_MV_6m | | | | | | | | | | | | | | | | |
| EPS | | | | | | | | | | | | | | | | |
| EPS_1yr | | | | | | | | | | | | | | | | |
| DY | | | | | | | | | | | | | | | | |
| MTBV | | | | | | | | | | | | | | | | |
| MTBV_6m | | | | | | | | | | | | | | | | |
| MTBV_1yr | | | | | | | | | | | | | | | | |
| MTBV_2yr | | | | | | | | | | | | | | | | |
| BTMV | | | | | | | | | | | | | | | | |
| BTMV_6m | | | | | | | | | | | | | | | | |
| EY | | | | | | | | | | | | | | | | |
| Neten_2yr | | | | | | | | | | | | | | | | |
| Borrow_6m | | | | | | | | | | | | | | | | |
| Borrow_1yr | | | | | | | | | | | | | | | | |
| OPMtP | | | | | | | | | | | | | | | | |
| OPMtP_6m | | | | | | | | | | | | | | | | |
| OPMtP_2yr | | | | | | | | | | | | | | | | |
| CPMtP | | | | | | | | | | | | | | | | |
| CPMtP_6m | | | | | | | | | | | | | | | | |
| CFY | | | | | | | | | | | | | | | | |
| CEY_6m | 1.000 | | | | | | | | | | | | | | | |
| Mcap_MV | 0.073 | 1.000 | | | | | | | | | | | | | | |
| NAVpS | 0.143 | -0.384 | 1.000 | | | | | | | | | | | | | |
| DPS | 0.088 | -0.634 | 0.962 | 1.000 | | | | | | | | | | | | |
| MCA_MV_6m | -0.905 | 0.022 | 0.182 | 0.114 | 1.000 | | | | | | | | | | | |
| DIV | 0.095 | -0.535 | 0.583 | 0.644 | 0.083 | 1.000 | | | | | | | | | | |
| Sales_Emp_6m | 0.039 | -0.178 | 0.104 | 0.092 | -0.055 | -0.076 | 1.000 | | | | | | | | | |
| Sales_Emp_1yr | 0.009 | -0.086 | 0.008 | -0.029 | -0.114 | -0.280 | 0.755 | 1.000 | | | | | | | | |
| DepAmort_TA_6m | 0.034 | -0.049 | 0.135 | 0.099 | -0.002 | -0.106 | -0.042 | -0.072 | 1.000 | | | | | | | |
| RD_EQ_1yr | 0.040 | 0.070 | 0.091 | 0.103 | -0.057 | 0.263 | -0.530 | -0.408 | -0.070 | 1.000 | | | | | | |
| RD_EQ_2yr | -0.211 | -0.043 | 0.089 | 0.117 | -0.145 | 0.118 | -0.546 | -0.232 | 0.164 | 0.597 | 1.000 | | | | | |
| NCBT_6m | -0.070 | -0.021 | 0.293 | 0.250 | -0.143 | 0.034 | 0.442 | 0.385 | 0.122 | -0.026 | 0.031 | 1.000 | | | | |
| Sales_P | -0.113 | 0.781 | -0.728 | -0.805 | -0.156 | -0.945 | 0.034 | 0.197 | -0.155 | -0.160 | -0.139 | -0.175 | 1.000 | | | |
| EPS_2yrAV | 0.160 | -0.621 | 0.918 | 0.946 | 0.195 | 0.600 | 0.048 | -0.045 | 0.096 | 0.183 | 0.095 | 0.294 | -0.779 | 1.000 | | |
| MOM_3m | 0.027 | 0.096 | 0.202 | 0.321 | -0.005 | -0.211 | 0.076 | 0.161 | 0.051 | -0.143 | 0.047 | 0.108 | 0.260 | -0.421 | 1.000 | |
| MOM_18m | -0.528 | 0.024 | -0.181 | -0.156 | -0.506 | -0.266 | 0.373 | 0.410 | 0.014 | -0.065 | 0.154 | 0.243 | 0.309 | -0.305 | 0.570 | 1.000 |

University of Cape Town

## Appendix C.8.: Correlation matrix of monthly payoffs to significant firm-specific attributes for multi-index adjusted returns

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the cross-sectional regression analysis using multi-index adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic. The firm-specific attribute data are standardised and adjusted for thin-trading and outliers Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and a white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| | P | LnMV | MS | MO_3m | MO_6m | TV_3m | TV_6m | MVT | MVT_MV_3m | MVT_MV_6m | EPS_1yr | DY | MTBV | MTBV_1yr | MTBV_2yr | ETMV | EY | Beta_2yr | OPMtP | CFMtP | CEY | EPS | AssTurn_6m | Sales_Emp_1yr | DepAmort_TA_6m | RD_TA_1yr | RD_EQ_1yr | ICBT_6m | Sales_P | AccRec | Crossover1_18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LnMV | 0.597 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MS | 0.823 | 0.878 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MO_3m | -0.298 | -0.356 | -0.314 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MO_6m | -0.225 | -0.325 | -0.270 | 0.874 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TV_3m | -0.288 | -0.342 | -0.319 | 0.956 | 0.879 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| TV_6m | -0.216 | -0.287 | -0.248 | 0.836 | 0.983 | 0.848 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | | |
| MVT | 0.600 | 0.754 | 0.666 | -0.149 | -0.045 | -0.142 | -0.035 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | |
| MVT_MV_3m | -0.264 | -0.351 | -0.310 | 0.999 | 0.872 | 0.906 | 0.835 | -0.149 | 1.000 | | | | | | | | | | | | | | | | | | | | | | |
| MVT_MV_6m | -0.201 | -0.297 | -0.247 | 0.836 | 0.998 | 0.837 | 0.992 | -0.030 | 0.865 | 1.000 | | | | | | | | | | | | | | | | | | | | | |
| EPS_1yr | 0.226 | 0.235 | 0.256 | -0.143 | -0.340 | -0.152 | -0.330 | 0.095 | -0.141 | -0.321 | 1.000 | | | | | | | | | | | | | | | | | | | | |
| DY | -0.399 | 0.052 | -0.117 | -0.236 | -0.122 | -0.212 | -0.066 | -0.302 | -0.245 | -0.121 | -0.052 | 1.000 | | | | | | | | | | | | | | | | | | | |
| MTBV | 0.734 | 0.661 | 0.714 | -0.083 | -0.218 | -0.100 | -0.264 | 0.588 | -0.076 | -0.135 | 0.237 | -0.566 | 1.000 | | | | | | | | | | | | | | | | | | |
| MTBV_1yr | -0.322 | -0.358 | -0.351 | 0.251 | 0.258 | 0.257 | 0.258 | -0.474 | 0.250 | 0.251 | 0.161 | 0.225 | -0.302 | 1.000 | | | | | | | | | | | | | | | | | |
| MTBV_2yr | -0.200 | -0.302 | -0.212 | 0.126 | -0.114 | 0.114 | -0.139 | -0.482 | 0.125 | -0.117 | 0.553 | 0.059 | -0.126 | 0.674 | 1.000 | | | | | | | | | | | | | | | | |
| ETMV | -0.757 | -0.604 | -0.749 | 0.145 | 0.281 | 0.166 | 0.309 | -0.628 | 0.138 | 0.270 | -0.530 | 0.613 | -0.887 | 0.305 | 0.149 | 1.000 | | | | | | | | | | | | | | | |
| EY | 0.366 | 0.315 | 0.436 | -0.266 | -0.495 | -0.271 | -0.491 | -0.081 | -0.270 | -0.493 | 0.318 | 0.222 | 0.117 | -0.107 | 0.217 | -0.196 | 1.000 | | | | | | | | | | | | | | |
| Beta_2yr | -0.465 | -0.395 | -0.393 | 0.119 | 0.129 | 0.135 | 0.170 | -0.570 | 0.122 | 0.149 | -0.066 | 0.551 | -0.449 | 0.351 | 0.343 | 0.617 | 0.021 | 1.000 | | | | | | | | | | | | | |
| OPMtP | -0.619 | -0.644 | -0.609 | 0.160 | 0.344 | 0.173 | 0.347 | -0.520 | 0.158 | 0.332 | -0.189 | 0.227 | -0.535 | 0.294 | 0.056 | 0.675 | -0.401 | 0.331 | 1.000 | | | | | | | | | | | | |
| CFMtP | 0.726 | 0.609 | 0.625 | 0.172 | 0.356 | 0.195 | 0.305 | -0.510 | 0.168 | 0.276 | -0.157 | 0.252 | -0.860 | 0.345 | 0.168 | 0.721 | -0.390 | 0.335 | 0.894 | 1.000 | | | | | | | | | | | |
| CEY | -0.495 | -0.440 | -0.580 | -0.064 | 0.010 | -0.045 | 0.002 | -0.526 | -0.058 | -0.010 | -0.005 | 0.250 | -0.544 | 0.264 | 0.240 | 0.651 | -0.050 | 0.312 | 0.747 | 0.820 | 1.000 | | | | | | | | | | |
| EPS | 0.911 | 0.668 | 0.862 | -0.288 | -0.219 | -0.283 | -0.196 | 0.563 | -0.257 | -0.190 | 0.150 | -0.179 | 0.668 | -0.276 | -0.208 | -0.696 | 0.328 | -0.261 | -0.657 | -0.756 | -0.520 | 1.000 | | | | | | | | | |
| AssTurn_6m | 0.075 | -0.120 | -0.014 | 0.142 | 0.012 | 0.132 | 0.003 | -0.064 | 0.145 | 0.019 | 0.411 | -0.255 | 0.154 | 0.161 | 0.345 | -0.091 | -0.008 | 0.016 | 0.085 | -0.058 | 0.088 | -0.034 | 1.000 | | | | | | | | |
| Sales_Emp_1yr | 0.020 | -0.284 | -0.056 | -0.040 | -0.218 | 0.037 | -0.224 | -0.359 | 0.048 | -0.222 | 0.371 | -0.291 | 0.072 | 0.040 | 0.443 | -0.087 | 0.321 | 0.155 | -0.051 | 0.070 | 0.267 | -0.017 | 0.448 | 1.000 | | | | | | | |
| DepAmort_TA_6m | 0.039 | -0.004 | 0.035 | 0.393 | 0.208 | 0.364 | 0.190 | 0.121 | 0.325 | 0.215 | 0.072 | -0.174 | 0.128 | -0.130 | -0.010 | -0.110 | -0.232 | -0.143 | -0.027 | -0.042 | -0.178 | -0.032 | -0.021 | -0.070 | 1.000 | | | | | | |
| RD_TA_1yr | 0.057 | 0.146 | 0.078 | 0.004 | 0.096 | 0.021 | 0.127 | 0.124 | 0.015 | 0.125 | -0.471 | -0.012 | 0.122 | 0.028 | -0.370 | -0.062 | -0.120 | 0.085 | 0.002 | -0.026 | -0.094 | 0.142 | -0.322 | -0.325 | -0.091 | 1.000 | | | | | |
| RD_EQ_1yr | 0.122 | 0.157 | 0.133 | -0.075 | 0.015 | -0.076 | 0.025 | 0.105 | -0.064 | 0.038 | -0.364 | -0.037 | 0.181 | 0.000 | -0.279 | -0.149 | -0.204 | 0.050 | -0.127 | -0.262 | -0.547 | 0.195 | -0.164 | -0.583 | 0.080 | 0.692 | 1.000 | | | | |
| ICBT_6m | 0.217 | 0.170 | 0.270 | 0.047 | -0.050 | 0.053 | -0.039 | 0.012 | 0.054 | -0.043 | 0.249 | -0.022 | 0.189 | 0.202 | 0.339 | -0.097 | 0.204 | 0.045 | -0.370 | -0.282 | -0.553 | 0.302 | 0.225 | 0.291 | -0.128 | -0.149 | -0.002 | 1.000 | | | |
| Sales_P | -0.735 | -0.313 | -0.560 | 0.299 | 0.336 | 0.290 | 0.511 | -0.709 | 0.288 | 0.315 | -0.274 | 0.642 | -0.707 | 0.334 | 0.214 | 0.793 | -0.412 | 0.382 | 0.886 | 0.745 | 0.690 | -0.730 | 0.030 | 0.161 | -0.820 | -0.115 | -0.142 | -0.266 | 1.000 | | |
| AccRec | 0.049 | 0.538 | 0.213 | -0.202 | -0.068 | -0.176 | -0.028 | 0.035 | -0.196 | -0.046 | -0.033 | -0.016 | 0.105 | -0.457 | -0.479 | -0.158 | -0.240 | -0.277 | -0.114 | -0.017 | -0.096 | 0.056 | -0.210 | -0.285 | -0.031 | 0.109 | 0.069 | -0.186 | -0.282 | 1.000 | |
| Crossover1_18 | -0.049 | -0.057 | -0.034 | 0.164 | 0.122 | 0.169 | 0.138 | -0.157 | 0.154 | 0.142 | -0.024 | 0.025 | -0.053 | 0.090 | 0.147 | 0.096 | 0.132 | 0.201 | -0.016 | -0.042 | -0.128 | 0.045 | 0.037 | 0.185 | -0.095 | -0.129 | -0.059 | 0.513 | 0.093 | -0.085 | 1.000 |

University of Cape Town

**Appendix C.10.1.: Correlation matrix for the performance and value cluster: Un-adjusted returns**

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the monthly cross-sectional regression analysis using un-adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.11. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| | BTMV | OPMtP | CFMtP | CEY | Intan_MV | Sales_P |
|---|---|---|---|---|---|---|
| BTMV | 1.000 | | | | | |
| OPMtP | 0.660 | 1.000 | | | | |
| CFMtP | 0.720 | 0.902 | 1.000 | | | |
| CEY | 0.653 | 0.658 | 0.807 | 1.000 | | |
| Intan_MV | 0.483 | 0.742 | 0.601 | 0.318 | 1.000 | |
| Sales_P | 0.634 | 0.855 | 0.783 | 0.546 | 0.835 | 1.000 |

**Appendix C.10.2.: Correlation matrix for the change in value cluster: Un-adjusted returns**

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the monthly cross-sectional regression analysis using un-adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.11. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted in with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| | MTBV_1yr | MTBV_2yr |
|---|---|---|
| MTBV_1yr | 1.000 | |
| MTBV_2yr | 0.702 | 1.000 |

University of Cape Town

## Appendix C.10.3.: Correlation matrix for the value; change in performance, liquidity and growth cluster: Un-adjusted returns

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the monthly cross-sectional regression analysis using un-adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.11. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| | VO_3m | VO_6m | TV_3m | TV_6m | MVT_3m | MVT_MV_3m | MVT_MV_6m | DY | EY | Retain_2yr | Borrow_1yr | Quick_6m | AssTurn_6m | AssTurn_1yr | Sales_Emp_1yr | DepAmort_TA_5yr | RD_EQ_2yr | NCF_TD_6m | ICBT_6m | ICBT_1yr | ICBT_2yr | NCF_6m | NCF_BP1yr_6m | NCF_BP1yrDiv_6m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VO_3m | 1.000 | | | | | | | | | | | | | | | | | | | | | | | |
| VO_6m | 0.835 | 1.000 | | | | | | | | | | | | | | | | | | | | | | |
| TV_3m | 0.891 | 0.693 | 1.000 | | | | | | | | | | | | | | | | | | | | | |
| TV_6m | 0.613 | 0.889 | 0.629 | 1.000 | | | | | | | | | | | | | | | | | | | | |
| MVT_3m | 0.859 | 0.703 | 0.854 | 0.696 | 1.000 | | | | | | | | | | | | | | | | | | | |
| MVT_MV_3m | 0.999 | 0.836 | 0.893 | 0.617 | 0.854 | 1.000 | | | | | | | | | | | | | | | | | | |
| MVT_MV_6m | 0.830 | 0.997 | 0.636 | 0.992 | 0.708 | 0.834 | 1.000 | | | | | | | | | | | | | | | | | |
| DY | -0.067 | -0.072 | -0.039 | -0.029 | 0.036 | -0.068 | -0.069 | 1.000 | | | | | | | | | | | | | | | | |
| EY | -0.140 | -0.350 | -0.156 | -0.548 | -0.221 | -0.144 | -0.357 | 0.490 | 1.000 | | | | | | | | | | | | | | | |
| Retain_2yr | -0.020 | -0.050 | 0.027 | -0.006 | 0.053 | -0.022 | -0.056 | 0.608 | 0.064 | 1.000 | | | | | | | | | | | | | | |
| Borrow_1yr | 0.192 | -0.030 | 0.160 | -0.043 | 0.016 | 0.190 | -0.024 | -0.222 | -0.220 | -0.068 | 1.000 | | | | | | | | | | | | | |
| Quick_6m | -0.057 | 0.041 | -0.047 | 0.076 | 0.022 | -0.075 | 0.047 | 0.090 | -0.174 | -0.053 | 0.107 | 1.000 | | | | | | | | | | | | |
| AssTurn_6m | -0.001 | 0.065 | -0.021 | 0.071 | 0.188 | -0.008 | 0.086 | -0.264 | -0.156 | 0.021 | -0.049 | -0.102 | 1.000 | | | | | | | | | | | |
| AssTurn_1yr | 0.033 | 0.175 | 0.011 | 0.156 | 0.244 | 0.022 | 0.180 | -0.310 | -0.242 | -0.110 | -0.039 | -0.109 | 0.596 | 1.000 | | | | | | | | | | |
| Sales_Emp_1yr | 0.068 | -0.050 | 0.076 | -0.057 | 0.010 | 0.081 | -0.040 | -0.107 | 0.226 | 0.213 | -0.440 | -0.521 | 0.449 | 0.706 | 1.000 | | | | | | | | | |
| DepAmort_TA_5yr | 0.171 | -0.036 | 0.181 | -0.027 | 0.174 | 0.168 | -0.037 | 0.058 | -0.045 | -0.134 | -0.150 | -0.011 | -0.039 | 0.096 | 0.088 | 1.000 | | | | | | | | |
| RD_EQ_2yr | -0.084 | 0.175 | -0.097 | 0.166 | -0.153 | -0.079 | 0.188 | -0.205 | -0.408 | -0.006 | 0.176 | 0.078 | 0.012 | -0.056 | -0.373 | -0.149 | 1.000 | | | | | | | |
| NCF_TD_6m | -0.250 | -0.119 | -0.240 | -0.108 | -0.204 | -0.234 | -0.130 | 0.056 | -0.143 | -0.002 | 0.136 | 0.088 | -0.001 | -0.088 | -0.153 | -0.118 | 0.178 | 1.000 | | | | | | |
| ICBT_6m | -0.186 | 0.084 | -0.195 | 0.108 | 0.219 | 0.196 | 0.104 | -0.177 | 0.347 | 0.030 | -0.102 | -0.117 | -0.073 | 0.099 | 0.167 | 0.231 | -0.166 | -0.164 | 1.000 | | | | | |
| ICBT_1yr | -0.038 | 0.030 | -0.001 | 0.044 | 0.071 | 0.036 | 0.051 | 0.083 | 0.288 | -0.157 | -0.134 | -0.046 | 0.083 | 0.126 | 0.085 | 0.218 | -0.059 | -0.097 | 0.686 | 1.000 | | | | |
| ICBT_2yr | -0.020 | 0.063 | -0.017 | 0.094 | 0.103 | -0.018 | 0.101 | -0.001 | 0.253 | -0.135 | -0.287 | -0.151 | 0.154 | 0.236 | 0.166 | 0.310 | 0.094 | 0.324 | 0.600 | 0.713 | 1.000 | | | |
| NCF_6m | -0.266 | -0.716 | -0.256 | -0.192 | -0.234 | -0.264 | -0.225 | 0.182 | 0.029 | 0.029 | -0.035 | 0.066 | -0.061 | -0.128 | -0.038 | 0.015 | -0.140 | 0.852 | -0.010 | -0.057 | -0.245 | 1.000 | | |
| NCF_BP1yr_6m | -0.317 | -0.713 | -0.317 | -0.194 | -0.254 | -0.319 | -0.223 | 0.100 | -0.061 | 0.018 | -0.045 | 0.045 | 0.120 | 0.004 | -0.005 | -0.125 | 0.130 | 0.937 | 0.030 | -0.092 | -0.281 | 0.977 | 1.000 | |
| NCF_BP1yrDiv_6m | -0.301 | -0.309 | -0.370 | -0.284 | -0.310 | -0.379 | -0.319 | 0.151 | 0.013 | 0.035 | -0.076 | 0.081 | -0.031 | -0.118 | -0.026 | -0.008 | 0.047 | 0.890 | 0.009 | -0.075 | -0.283 | 0.948 | 0.916 | 1.000 |

## Appendix C.10.4.: Correlation matrix for the size and value cluster: Un-adjusted returns

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the monthly cross-sectional regression analysis using un-adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.11. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town

| | P | LnMV | MVT | EPS | MTBV | NAVpS | DPS | EPS_2yrAV |
|---|---|---|---|---|---|---|---|---|
| P | 1.000 | | | | | | | |
| LnMV | 0.650 | 1.000 | | | | | | |
| MVT | 0.675 | 0.803 | 1.000 | | | | | |
| EPS | 0.816 | 0.702 | 0.504 | 1.000 | | | | |
| MTBV | 0.720 | 0.610 | 0.653 | 0.657 | 1.000 | | | |
| NAVpS | 0.707 | 0.653 | 0.398 | 0.889 | 0.457 | 1.000 | | |
| DPS | 0.746 | 0.713 | 0.435 | 0.921 | 0.502 | 0.973 | 1.000 | |
| EPS_2yrAV | 0.839 | 0.668 | 0.513 | 0.971 | 0.635 | 0.892 | 0.918 | 1.000 |

University of Cape Town

## Appendix C.10.5.: Correlation matrix for simplified list of significant variables using un-adjusted returns

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the cross-sectional regression analysis using un-adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town

| | LnMV | TV_3m | MVT_MV_6m | DY | MTBV | MTBV_2yr | BTMV | EY | Reten_2yr | Borrow_1yr | Quick_6m | CPMP | CEY | AssTurn_6m | Sales_Emp_1yr | DepAmort_TA_6m | RD_EQ_2yr | ICBT_6m | ICBT_2yr | NCF_BP1yrDiv_6m | NAVpS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LnMV | 1.000 | | | | | | | | | | | | | | | | | | | | |
| TV_3m | -0.198 | 1.000 | | | | | | | | | | | | | | | | | | | |
| MVT_MV_6m | -0.116 | 0.630 | 1.000 | | | | | | | | | | | | | | | | | | |
| DY | -0.038 | -0.039 | -0.035 | 1.000 | | | | | | | | | | | | | | | | | |
| MTBV | 0.610 | -0.182 | -0.196 | -0.617 | 1.000 | | | | | | | | | | | | | | | | |
| MTBV_2yr | -0.006 | -0.097 | -0.049 | 0.151 | -0.047 | 1.000 | | | | | | | | | | | | | | | |
| BTMV | -0.648 | 0.152 | 0.206 | 0.633 | -0.810 | -0.017 | 1.000 | | | | | | | | | | | | | | |
| EY | 0.147 | -0.126 | -0.257 | 0.490 | -0.064 | 0.201 | 0.013 | 1.000 | | | | | | | | | | | | | |
| Reten_2yr | -0.480 | 0.027 | -0.056 | 0.609 | -0.594 | 0.225 | 0.704 | 0.264 | 1.000 | | | | | | | | | | | | |
| Borrow_1yr | -0.185 | 0.160 | -0.024 | -0.222 | -0.018 | -0.349 | 0.017 | -0.229 | -0.068 | 1.000 | | | | | | | | | | | |
| Quick_6m | 0.060 | -0.047 | 0.047 | 0.090 | -0.098 | 0.034 | 0.092 | -0.174 | -0.063 | 0.007 | 1.000 | | | | | | | | | | |
| CPMP | -0.671 | 0.170 | 0.263 | 0.137 | -0.577 | 0.010 | 0.560 | -0.246 | 0.497 | -0.001 | 0.001 | 1.000 | | | | | | | | | |
| CEY | -0.515 | 0.015 | 0.044 | 0.494 | -0.608 | 0.119 | 0.553 | 0.130 | 0.567 | -0.431 | -0.169 | 0.668 | 1.000 | | | | | | | | |
| AssTurn_6m | -0.153 | -0.097 | 0.089 | -0.264 | 0.079 | 0.266 | -0.089 | -0.165 | 0.021 | -0.049 | -0.102 | 0.133 | 0.083 | 1.000 | | | | | | | |
| Sales_Emp_1yr | -0.250 | 0.075 | -0.040 | -0.107 | -0.060 | 0.445 | -0.016 | 0.226 | 0.213 | -0.440 | -0.324 | 0.199 | 0.406 | 0.440 | 1.000 | | | | | | |
| DepAmort_TA_6m | 0.182 | 0.181 | -0.037 | 0.050 | 0.030 | -0.037 | -0.096 | -0.045 | -0.134 | -0.133 | -0.011 | -0.179 | -0.057 | -0.093 | 0.028 | 1.000 | | | | | |
| RD_EQ_2yr | -0.059 | -0.097 | 0.188 | -0.205 | 0.152 | -0.352 | -0.011 | -0.408 | -0.006 | 0.178 | 0.073 | 0.015 | -0.143 | 0.012 | -0.373 | -0.149 | 1.000 | | | | |
| ICBT_6m | 0.163 | 0.195 | 0.104 | 0.177 | -0.004 | 0.225 | 0.325 | -0.347 | 0.030 | -0.102 | -0.117 | -0.364 | -0.050 | 0.073 | 0.167 | 0.231 | -0.156 | 1.000 | | | |
| ICBT_2yr | 0.488 | -0.012 | 0.101 | -0.001 | 0.349 | 0.310 | -0.371 | 0.253 | -0.136 | -0.287 | -0.161 | -0.488 | -0.260 | 0.154 | 0.188 | 0.303 | 0.024 | 0.800 | 1.000 | | |
| NCF_BP1yrDiv_6m | -0.019 | -0.370 | -0.319 | 0.151 | -0.244 | -0.099 | 0.171 | 0.013 | 0.035 | -0.076 | 0.081 | -0.157 | 0.090 | -0.031 | -0.026 | -0.020 | 0.041 | 0.309 | -0.263 | 1.000 | |
| NAVpS | 0.653 | -0.035 | -0.090 | 0.096 | 0.457 | -0.001 | -0.462 | 0.403 | -0.227 | -0.533 | -0.036 | -0.667 | -0.240 | -0.048 | -0.024 | 0.109 | -0.033 | 0.469 | 0.534 | 0.005 | 1.000 |

University of Cape Town

**Appendix C.11.1.: Correlation matrix for the change in value and performance cluster: Single-index adjusted returns**

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the monthly cross-sectional regression analysis using single-index adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.12. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town

| | *BTMV_6m* | *OPMtP_6m* | *CFMtP_6m* | *CEY_6m* | *NCA_MV_6m* | *DepAmort_TA_6m* |
|---|---|---|---|---|---|---|
| BTMV_6m | 1.000 | | | | | |
| OPMtP_6m | 0.834 | 1.000 | | | | |
| CFMtP_6m | 0.789 | 0.934 | 1.000 | | | |
| CEY_6m | 0.812 | 0.943 | 0.997 | 1.000 | | |
| NCA_MV_6m | 0.755 | 0.924 | 0.905 | 0.905 | 1.000 | |
| DepAmort_TA_6m | 0.026 | -0.062 | 0.049 | 0.034 | -0.002 | 1.000 |

**Appendix C.11.2.: Correlation matrix for the value; performance and change in growth cluster: Single-index adjusted returns**

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the monthly cross-sectional regression analysis using single-index adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.12. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town

| | *DY* | *BTMV* | *Reten_2yr* | *OPMtP* | *CFMtP* | *CEY* | *Intan_MV* | *Sales_P* |
|---|---|---|---|---|---|---|---|---|
| DY | 1.000 | | | | | | | |
| BTMV | 0.666 | 1.000 | | | | | | |
| Reten_2yr | 0.531 | 0.701 | 1.000 | | | | | |
| OPMtP | 0.412 | 0.729 | 0.559 | 1.000 | | | | |
| CFMtP | 0.419 | 0.780 | 0.578 | 0.903 | 1.000 | | | |
| CEY | 0.537 | 0.747 | 0.562 | 0.769 | 0.825 | 1.000 | | |
| Intan_MV | 0.221 | 0.599 | 0.443 | 0.747 | 0.661 | 0.472 | 1.000 | |
| Sales_P | 0.237 | 0.763 | 0.576 | 0.793 | 0.773 | 0.705 | 0.781 | 1.000 |

University of Cape Town

## Appendix C.11.3.: Correlation matrix for the size cluster: Single-index adjusted returns

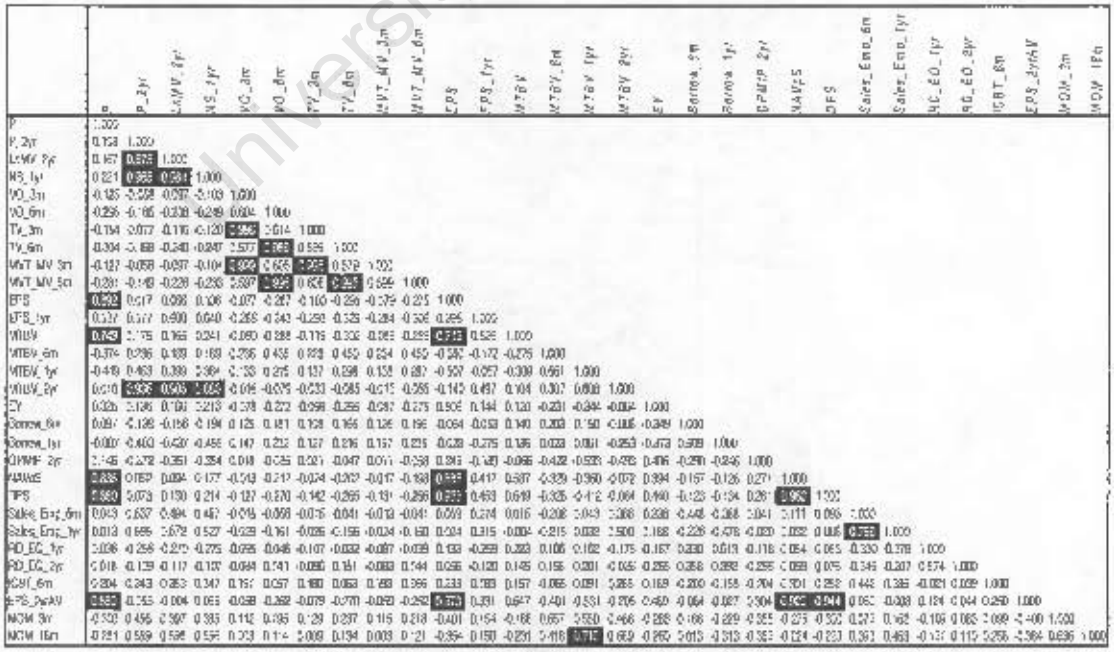
The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the monthly cross-sectional regression analysis using single-index adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.12. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town

| | *LnMV* | *NS* | *MVT* | *DIV* |
|---|---|---|---|---|
| LnMV | 1.000 | | | |
| NS | 0.884 | 1.000 | | |
| MVT | 0.860 | 0.715 | 1.000 | |
| DIV | 0.936 | 0.793 | 0.740 | 1.000 |

University of Cape Town

## Appendix C.11.4.: Correlation matrix for the momentum; value; change in size, growth, liquidity and value cluster: Single-index adjusted returns

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the monthly cross-sectional regression analysis using single-index adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.12. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town



## Appendix C.11.5.: Correlation matrix for simplified list of significant variables using single-index adjusted returns

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the cross-sectional regression analysis using single-index adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town

| | LnMV | TV_3m | MVT_MV_6m | EPS_1yr | DY | MTBV | MTBV_6m | MTBV_1yr | MTBV_2yr | BTMV | EY | Borrow_6m | Borrow_1yr | OPMrP_2yr | DPS | NCA_MV_6m | Sales_Emp_1yr | DepAmort_TA_6m | RD_EQ_1yr | RD_EQ_2yr | ICBT_6m | MOM_3m | MOM_18m | Idiosn_MV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LnMV | 1.000 | | | | | | | | | | | | | | | | | | | | | | | |
| TV_3m | -0.234 | 1.000 | | | | | | | | | | | | | | | | | | | | | | |
| MVT_MV_6m | -0.166 | 0.547 | 1.000 | | | | | | | | | | | | | | | | | | | | | |
| EPS_1yr | 0.434 | -0.295 | -0.287 | 1.000 | | | | | | | | | | | | | | | | | | | | |
| DY | -0.208 | -0.079 | -0.085 | -0.500 | 1.000 | | | | | | | | | | | | | | | | | | | |
| MTBV | 0.691 | -0.149 | -0.177 | 0.617 | -0.625 | 1.000 | | | | | | | | | | | | | | | | | | |
| MTBV_6m | -0.264 | 0.222 | 0.443 | -0.171 | 0.287 | -0.257 | 1.000 | | | | | | | | | | | | | | | | | |
| MTBV_1yr | -0.428 | 0.132 | 0.284 | -0.068 | 0.188 | -0.282 | 0.681 | 1.000 | | | | | | | | | | | | | | | | |
| MTBV_2yr | -0.147 | -0.048 | -0.093 | 0.487 | -0.246 | 0.129 | 0.909 | 0.607 | 1.000 | | | | | | | | | | | | | | | |
| BTMV | -0.614 | 0.178 | 0.217 | -0.490 | 0.606 | -0.915 | 0.251 | 0.395 | -0.107 | 1.000 | | | | | | | | | | | | | | |
| EY | 0.111 | -0.059 | -0.323 | 0.131 | 0.248 | 0.096 | -0.232 | -0.339 | -0.090 | -0.102 | 1.000 | | | | | | | | | | | | | |
| Borrow_6m | -0.071 | 0.130 | 0.141 | -0.068 | -0.249 | 0.089 | 0.194 | 0.142 | -0.028 | -0.035 | -0.288 | 1.000 | | | | | | | | | | | | |
| Borrow_1yr | -0.188 | 0.162 | 0.138 | -0.272 | -0.167 | 0.048 | 0.012 | 0.050 | -0.273 | 0.025 | -0.265 | 0.531 | 1.000 | | | | | | | | | | | |
| OPMrP_2yr | 0.044 | 0.060 | -0.128 | -0.190 | 0.251 | -0.196 | -0.412 | -0.517 | -0.501 | 0.268 | 0.451 | -0.220 | -0.134 | 1.000 | | | | | | | | | | |
| DPS | 0.705 | -0.166 | -0.190 | 0.450 | -0.214 | 0.667 | -0.314 | -0.398 | -0.059 | -0.891 | 0.363 | -0.154 | -0.187 | 0.184 | 1.000 | | | | | | | | | |
| NCA_MV_6m | 0.117 | 0.048 | -0.145 | -0.072 | -0.257 | 0.228 | -0.771 | -0.593 | -0.390 | -0.246 | 0.021 | -0.182 | 0.164 | 0.372 | 0.114 | 1.000 | | | | | | | | |
| Sales_Emp_1yr | -0.171 | -0.005 | -0.182 | 0.306 | -0.225 | -0.043 | -0.217 | 0.028 | 0.474 | -0.051 | 0.219 | -0.193 | -0.401 | 0.025 | -0.028 | -0.114 | 1.000 | | | | | | | |
| DepAmort_TA_6m | 0.077 | 0.340 | 0.160 | 0.089 | -0.158 | 0.133 | 0.050 | -0.023 | 0.010 | -0.134 | -0.120 | 0.135 | 0.035 | 0.070 | 0.099 | -0.002 | -0.072 | 1.000 | | | | | | |
| RD_EQ_1yr | 0.158 | -0.137 | 0.629 | -0.241 | -0.142 | 0.274 | 0.110 | 0.163 | -0.139 | -0.180 | -0.222 | 0.265 | 0.486 | -0.185 | 0.103 | -0.057 | -0.400 | -0.620 | 1.000 | | | | | |
| RD_EQ_2yr | 0.104 | -0.123 | 0.191 | -0.108 | -0.097 | 0.152 | 0.151 | 0.202 | -0.001 | -0.096 | -0.306 | 0.305 | 0.299 | -0.312 | 0.117 | -0.145 | -0.232 | 0.164 | 0.697 | 1.000 | | | | |
| ICBT_6m | 0.077 | 0.189 | 0.056 | 0.191 | -0.123 | 0.144 | -0.069 | 0.091 | 0.278 | -0.089 | 0.180 | -0.191 | -0.170 | -0.186 | 0.250 | -0.143 | 0.386 | 0.122 | -0.028 | 0.031 | 1.000 | | | |
| MOM_3m | -0.206 | 0.148 | 0.189 | 0.147 | 0.220 | -0.218 | 0.644 | 0.540 | 0.440 | 0.938 | -0.934 | 0.169 | 0.169 | -0.323 | -0.321 | -0.606 | 0.181 | 0.051 | -0.143 | 0.047 | 0.103 | 1.000 | | |
| MOM_18m | -0.223 | -0.028 | 0.172 | 0.134 | 0.027 | -0.159 | 0.419 | 0.697 | 0.692 | 0.177 | -0.203 | -0.028 | -0.080 | -0.396 | -0.166 | -0.508 | 0.410 | 0.014 | -0.065 | 0.154 | 0.243 | 0.576 | 1.000 | |
| Idiosn_MV | -0.661 | 0.072 | 0.114 | -0.537 | 0.221 | -0.603 | 0.115 | 0.191 | -0.260 | 0.599 | -0.398 | 0.280 | 0.257 | 0.106 | -0.634 | 0.022 | -0.010 | -0.049 | 0.015 | -0.043 | -0.321 | 0.098 | 0.024 | 1.000 |

University of Cape Town

## Appendix C.12.1.: Correlation matrix for the performance; value; change in liquidity and performance cluster: Multi-index adjusted returns

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the monthly cross-sectional regression analysis using multi-index adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.13. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town

| | VO_3m | VO_6m | TV_3m | TV_6m | MVT_MV_3m | MVT_MV_6m | DY | BTMV | OPMtP | CFMtP | CEY | DepAmort TA 6m | Sales_P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VO_3m | 1.000 | | | | | | | | | | | | |
| VO_6m | 0.674 | 1.000 | | | | | | | | | | | |
| TV_3m | 0.996 | 0.679 | 1.000 | | | | | | | | | | |
| TV_6m | 0.636 | 0.989 | 0.648 | 1.000 | | | | | | | | | |
| MVT_MV_3m | 0.999 | 0.672 | 0.996 | 0.635 | 1.000 | | | | | | | | |
| MVT_MV_6m | 0.666 | 0.986 | 0.671 | 0.992 | 0.665 | 1.000 | | | | | | | |
| DY | -0.236 | -0.122 | -0.212 | -0.066 | -0.245 | -0.121 | 1.000 | | | | | | |
| BTMV | 0.145 | 0.281 | 0.165 | 0.309 | 0.138 | 0.270 | 0.613 | 1.000 | | | | | |
| OPMtP | 0.160 | 0.344 | 0.173 | 0.347 | 0.153 | 0.332 | 0.227 | 0.675 | 1.000 | | | | |
| CFMtP | 0.172 | 0.296 | 0.195 | 0.305 | 0.166 | 0.275 | 0.262 | 0.721 | 0.894 | 1.000 | | | |
| CEY | -0.064 | 0.010 | -0.045 | 0.032 | -0.068 | -0.010 | 0.360 | 0.651 | 0.747 | 0.820 | 1.000 | | |
| DepAmort TA 6m | 0.330 | 0.208 | 0.304 | 0.190 | 0.325 | 0.215 | -0.174 | -0.110 | -0.027 | -0.042 | -0.178 | 1.000 | |
| Sales_P | 0.290 | 0.336 | 0.290 | 0.311 | 0.288 | 0.313 | 0.042 | 0.710 | 0.786 | 0.745 | 0.600 | -0.020 | 1.000 |

## Appendix C.12.2.: Correlation matrix for the value; liquidity; crossover; change in value, performance and growth cluster: Multi-index adjusted returns

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the monthly cross-sectional regression analysis using multi-index adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.13. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town

| | MVT | EPS_1yr | MTBV_1yr | MTBV_2yr | EY | Reten_2yr | AssTurn_6m | Sales_Emp_1yr | RD_TA_1yr | RD_EQ_1yr | ICBT_6m | AccRec | Crossover1_18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MVT | 1.000 | | | | | | | | | | | | |
| EPS_1yr | 0.095 | 1.000 | | | | | | | | | | | |
| MTBV_1yr | -0.474 | 0.161 | 1.000 | | | | | | | | | | |
| MTBV_2yr | -0.482 | 0.593 | 0.674 | 1.000 | | | | | | | | | |
| EY | -0.081 | 0.318 | -0.107 | 0.217 | 1.000 | | | | | | | | |
| Reten_2yr | -0.570 | -0.090 | 0.351 | 0.243 | 0.021 | 1.000 | | | | | | | |
| AssTurn_6m | -0.054 | 0.411 | 0.161 | 0.345 | -0.008 | 0.016 | 1.000 | | | | | | |
| Sales_Emp_1yr | -0.355 | 0.371 | 0.040 | 0.443 | 0.321 | 0.155 | 0.440 | 1.000 | | | | | |
| RD_TA_1yr | 0.124 | -0.471 | 0.028 | -0.370 | -0.129 | 0.085 | -0.322 | -0.325 | 1.000 | | | | |
| RD_EQ_1yr | 0.195 | -0.364 | 0.000 | -0.279 | -0.204 | 0.020 | -0.164 | -0.389 | 0.692 | 1.000 | | | |
| ICBT_6m | 0.012 | 0.249 | 0.202 | 0.309 | 0.204 | 0.085 | 0.225 | 0.291 | -0.149 | -0.008 | 1.000 | | |
| AccRec | 0.635 | -0.033 | -0.467 | -0.479 | -0.240 | -0.277 | -0.210 | -0.295 | 0.166 | 0.089 | -0.186 | 1.000 | |
| Crossover1_18 | -0.157 | -0.024 | 0.050 | 0.147 | 0.132 | 0.201 | 0.037 | 0.165 | -0.129 | -0.059 | 0.113 | -0.085 | 1.000 |

University of Cape Town

## Appendix C.12.3.: Correlation matrix for the size and value cluster: Multi-index adjusted returns

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the monthly cross-sectional regression analysis using multi-index adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic and the attribute payoffs cluster together as shown in Figure 6.13. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town

| | P | LnMV | NS | MTBV | DPS |
|---|---|---|---|---|---|
| P | 1.000 | | | | |
| LnMV | 0.597 | 1.000 | | | |
| NS | 0.803 | 0.878 | 1.000 | | |
| MTBV | 0.734 | 0.561 | 0.714 | 1.000 | |
| DPS | 0.911 | 0.698 | 0.862 | 0.686 | 1.000 |

University of Cape Town

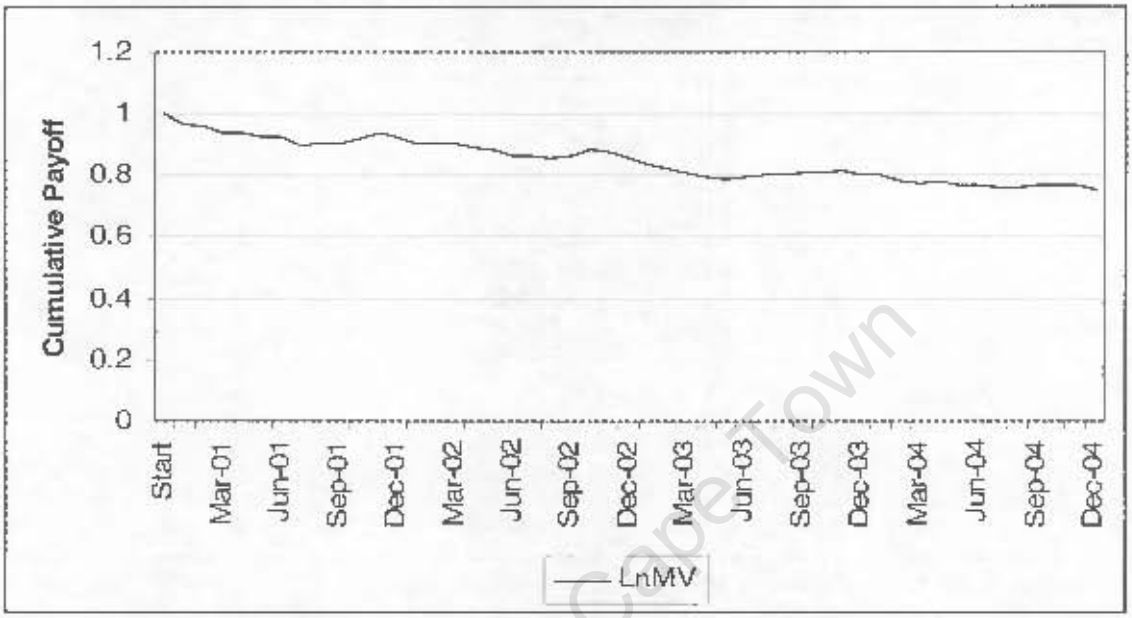
## Appendix C.12.4.: Correlation matrix for simplified list of significant variables using multi-index adjusted returns

The correlation matrix displays the Pearson correlation coefficient for monthly payoffs to firm-specific attributes obtained from the cross-sectional regression analysis using multi-index adjusted returns. Attributes are significant at the 5% level using Student's (1908) t-statistic. Correlation coefficients greater than 0.7 or less than -0.7 are highlighted with a black background and white font and indicate that the associated variables are highly correlated. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town

| | LnMV | TV_3m | MVT | MVT_MV_6m | EPS_1yr | DY | MTBV | MTBV_1yr | MTBV_2yr | BTMV | EY | Return_2yr | CEY | DPS | AssTurn_6m | Sales_Emp_1yr | DepAmort_TA_6m | RD_TA_1yr | RD_EQ_1yr | ICBT_6m | AccRec | Crossover1_18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LnMV | 1.000 | | | | | | | | | | | | | | | | | | | | | |
| TV_3m | -0.342 | 1.000 | | | | | | | | | | | | | | | | | | | | |
| MVT | 0.764 | -0.148 | 1.000 | | | | | | | | | | | | | | | | | | | |
| MVT_MV_6m | -0.297 | 0.671 | 0.060 | 1.000 | | | | | | | | | | | | | | | | | | |
| EPS_1yr | 0.229 | -0.152 | 0.009 | -0.021 | 1.000 | | | | | | | | | | | | | | | | | |
| DY | 0.062 | -0.212 | -0.306 | -0.121 | -0.052 | 1.000 | | | | | | | | | | | | | | | | |
| MTBV | 0.561 | -0.100 | 0.588 | -0.193 | 0.237 | -0.566 | 1.000 | | | | | | | | | | | | | | | |
| MTBV_1yr | -0.366 | 0.257 | -0.474 | 0.251 | 0.161 | 0.225 | -0.308 | 1.000 | | | | | | | | | | | | | | |
| MTBV_2yr | -0.302 | 0.114 | -0.482 | -0.117 | 0.593 | 0.359 | -0.135 | 0.674 | 1.000 | | | | | | | | | | | | | |
| BTMV | -0.904 | 0.135 | -0.670 | 0.270 | -0.230 | 0.813 | -0.887 | 0.336 | 0.149 | 1.000 | | | | | | | | | | | | |
| EY | -0.315 | -0.271 | -0.081 | -0.429 | 0.319 | 0.222 | 0.117 | -0.107 | 0.217 | -0.196 | 1.000 | | | | | | | | | | | |
| Return_2yr | -0.355 | 0.135 | -0.570 | 0.149 | -0.089 | 0.551 | -0.449 | 0.351 | 0.243 | 0.417 | 0.021 | 1.000 | | | | | | | | | | |
| CEY | -0.440 | -0.045 | -0.526 | -0.010 | -0.025 | 0.350 | -0.644 | 0.264 | 0.240 | 0.651 | -0.060 | 0.212 | 1.000 | | | | | | | | | |
| DPS | -0.896 | -0.299 | -0.562 | -0.190 | 0.150 | -0.178 | 0.695 | -0.275 | -0.205 | -0.656 | 0.326 | -0.261 | -0.520 | 1.000 | | | | | | | | |
| AssTurn_6m | 0.120 | 0.132 | -0.054 | 0.619 | 0.411 | -0.265 | 0.154 | 0.161 | 0.345 | -0.091 | -0.008 | 0.016 | 0.088 | -0.004 | 1.000 | | | | | | | |
| Sales_Emp_1yr | -0.221 | 0.037 | -0.355 | -0.022 | 0.371 | -0.291 | 0.072 | 0.040 | 0.442 | -0.067 | 0.321 | 0.165 | 0.267 | -0.017 | 0.440 | 1.000 | | | | | | |
| DepAmort_TA_6m | -0.031 | 0.304 | 0.121 | 0.216 | -0.672 | -0.174 | 0.128 | -0.130 | -0.010 | -0.118 | -0.232 | -0.143 | -0.178 | -0.002 | -0.021 | -0.370 | 1.000 | | | | | |
| RD_TA_1yr | 0.146 | 0.021 | 0.124 | 0.129 | -0.471 | -0.012 | 0.122 | 0.028 | -0.370 | -0.069 | -0.129 | 0.085 | -0.034 | 0.147 | -0.322 | -0.325 | -0.001 | 1.000 | | | | |
| RD_EQ_1yr | 0.157 | -0.076 | 0.196 | 0.008 | -0.264 | -0.087 | 0.181 | 0.030 | -0.279 | -0.148 | -0.204 | 0.020 | -0.347 | 0.166 | -0.164 | -0.309 | 0.080 | 0.892 | 1.000 | | | |
| ICBT_6m | 0.170 | 0.053 | 0.012 | -0.042 | 0.249 | -0.022 | 0.189 | 0.202 | 0.300 | -0.087 | 0.234 | 0.085 | -0.153 | 0.362 | 0.225 | 0.291 | -0.128 | -0.149 | -0.006 | 1.000 | | |
| AccRec | 0.538 | -0.176 | 0.635 | -0.046 | -0.002 | -0.016 | 0.195 | -0.167 | -0.179 | -0.156 | -0.240 | -0.277 | -0.036 | 0.050 | -0.210 | -0.295 | -0.001 | 0.166 | 0.069 | -0.186 | 1.000 | |
| Crossover1_18 | -0.067 | 0.169 | -0.157 | 0.142 | -0.024 | 0.025 | -0.055 | 0.350 | -0.147 | 0.088 | 0.132 | 0.201 | -0.138 | 0.045 | 0.037 | 0.125 | -0.035 | -0.129 | -0.069 | 0.115 | -0.085 | 1.000 |

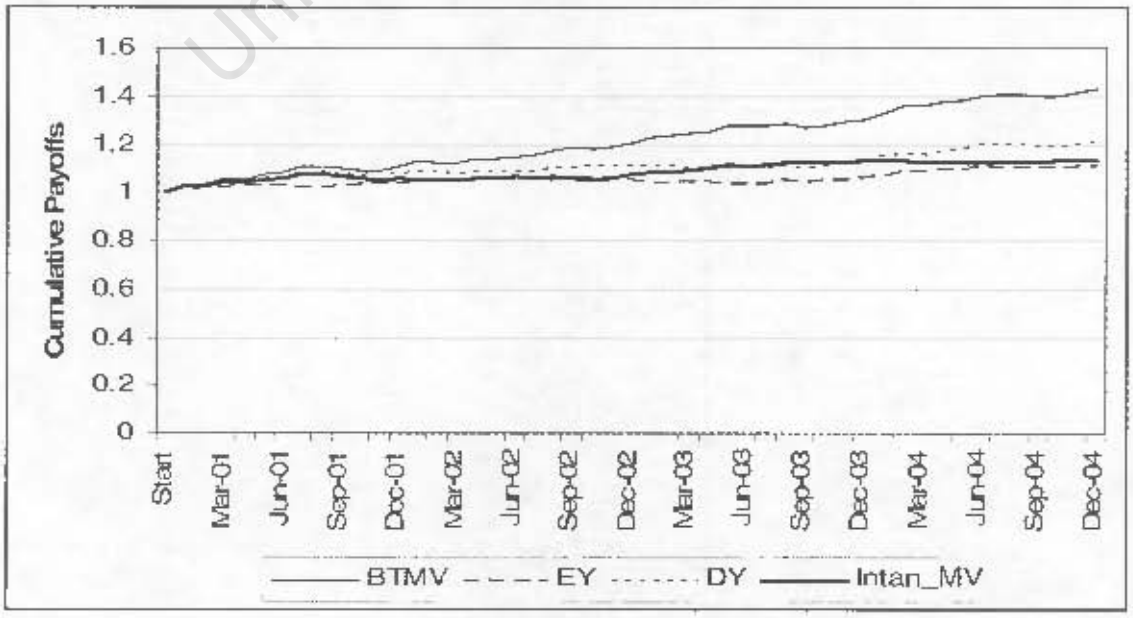
**Appendix C.13.1.: Cumulative monthly payoffs for single-index adjusted returns: Size**

The graph displays cumulative monthly payoffs for the significant variable that encompasses the size style group. The attribute is significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using single-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




**Appendix C.13.2.: Cumulative monthly payoffs for single-index adjusted returns: Value**

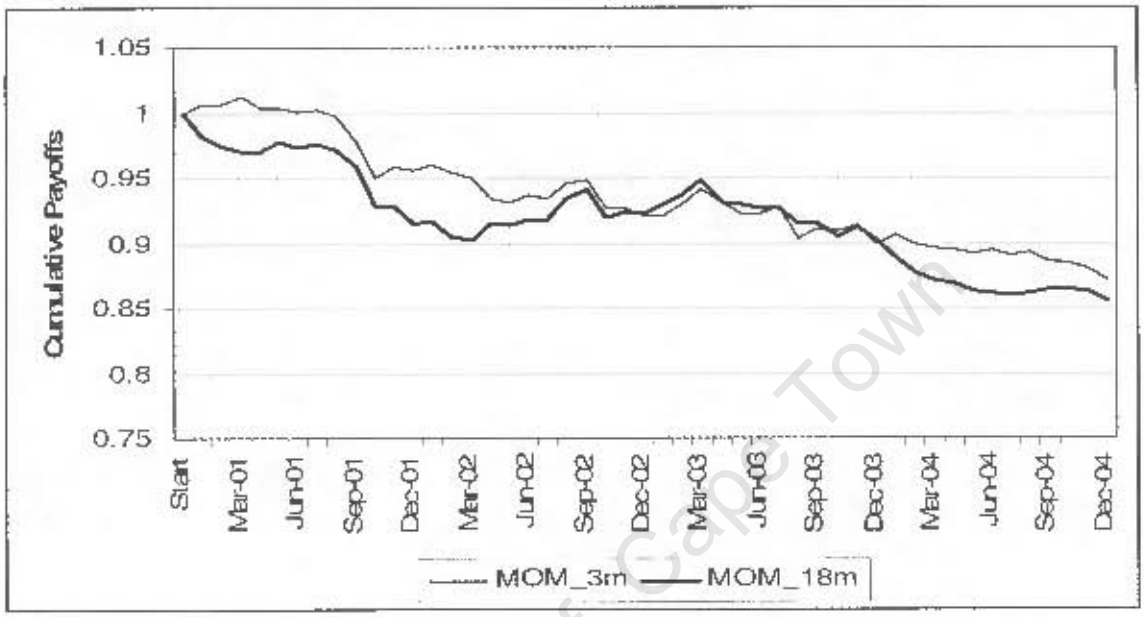
The graph displays cumulative monthly payoffs for the significant variables that encompass the value style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using single-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

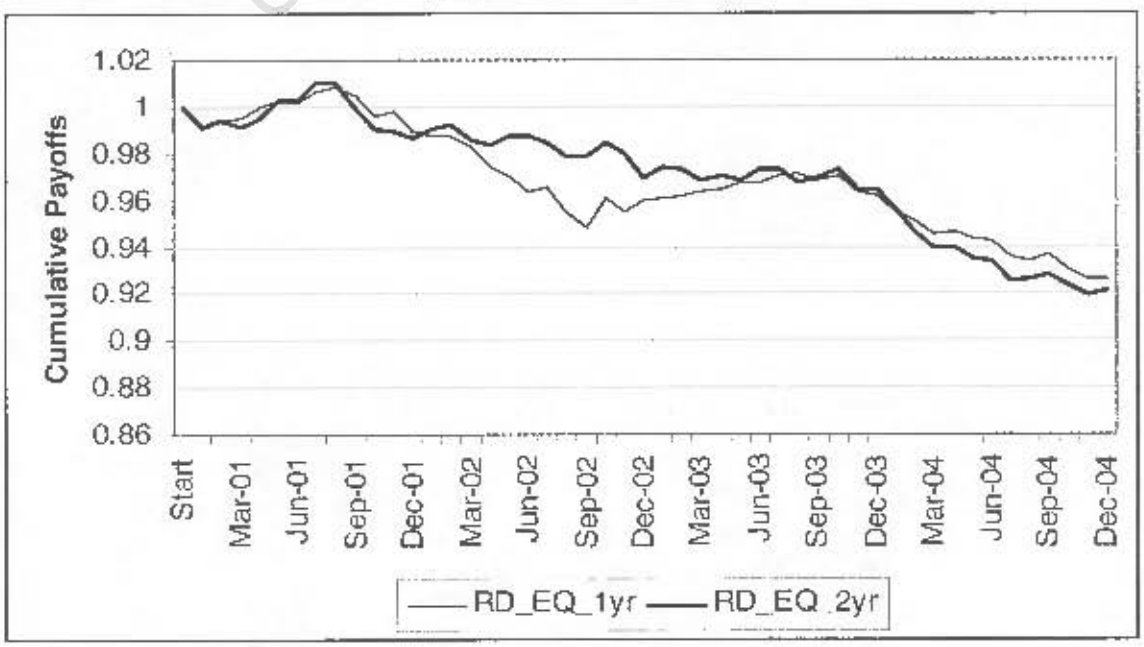
**Appendix C.13.3.: Cumulative monthly payoffs for single-index adjusted returns: Momentum**

The graph displays cumulative monthly payoffs for the significant variables that encompass the momentum style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using single-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




**Appendix C.13.4.: Cumulative monthly payoffs for single-index adjusted returns: Change in growth**

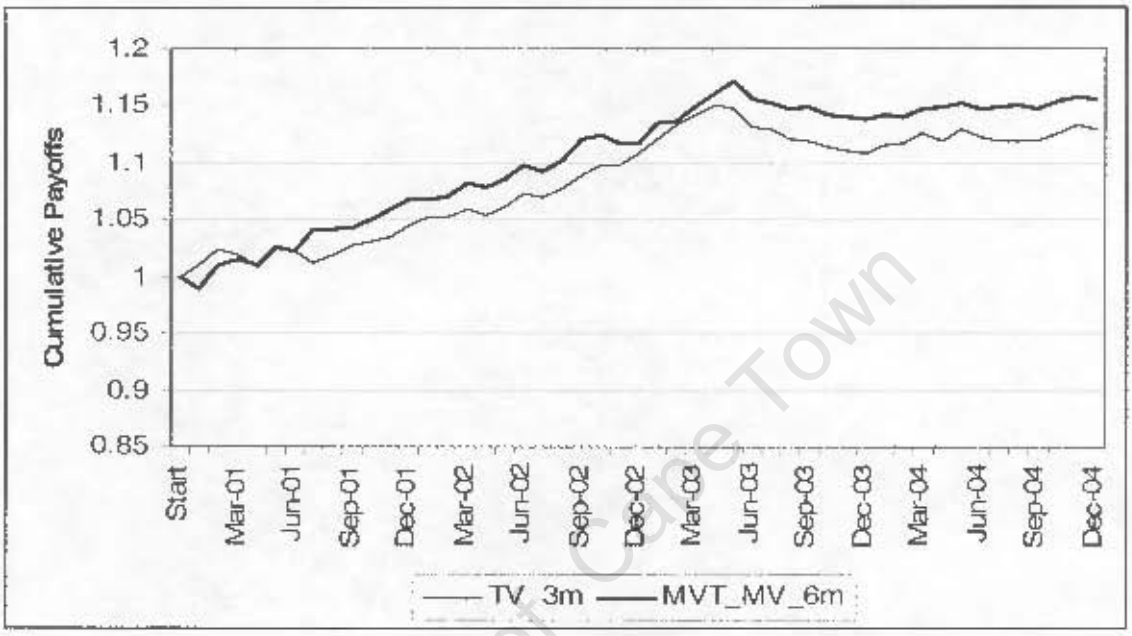
The graph displays cumulative monthly payoffs for the significant variables that encompass the change in growth style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using single-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

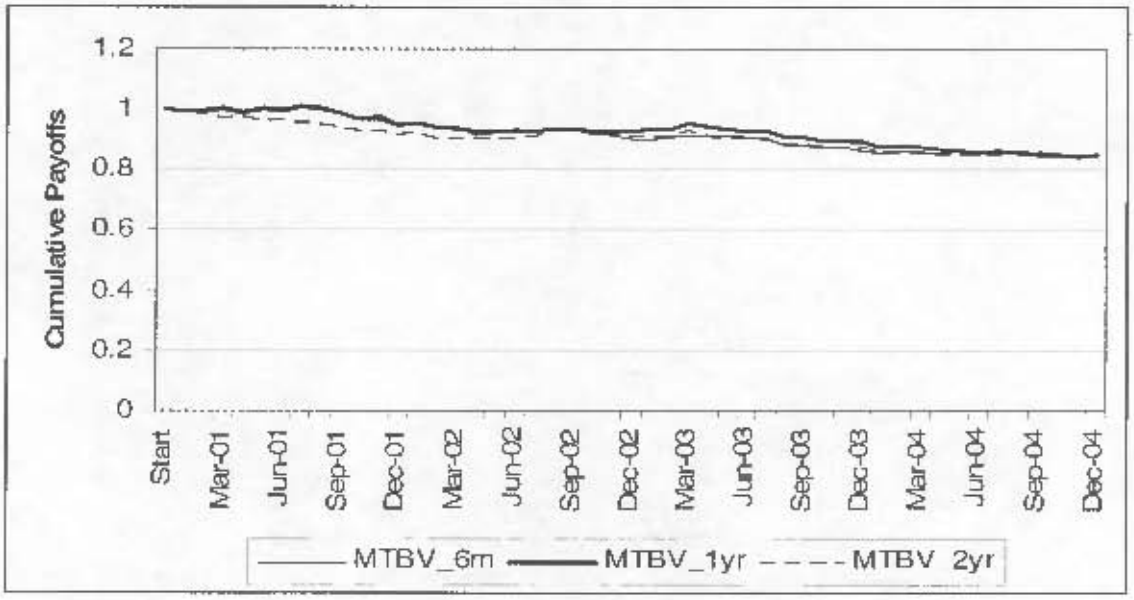
**Appendix C.13.5.: Cumulative monthly payoffs for single-index adjusted returns: Change in liquidity**

The graph displays cumulative monthly payoffs for the significant variables that encompass the change in liquidity style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using single-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




**Appendix C.13.6.: Cumulative monthly payoffs for single-index adjusted returns: Change in value**

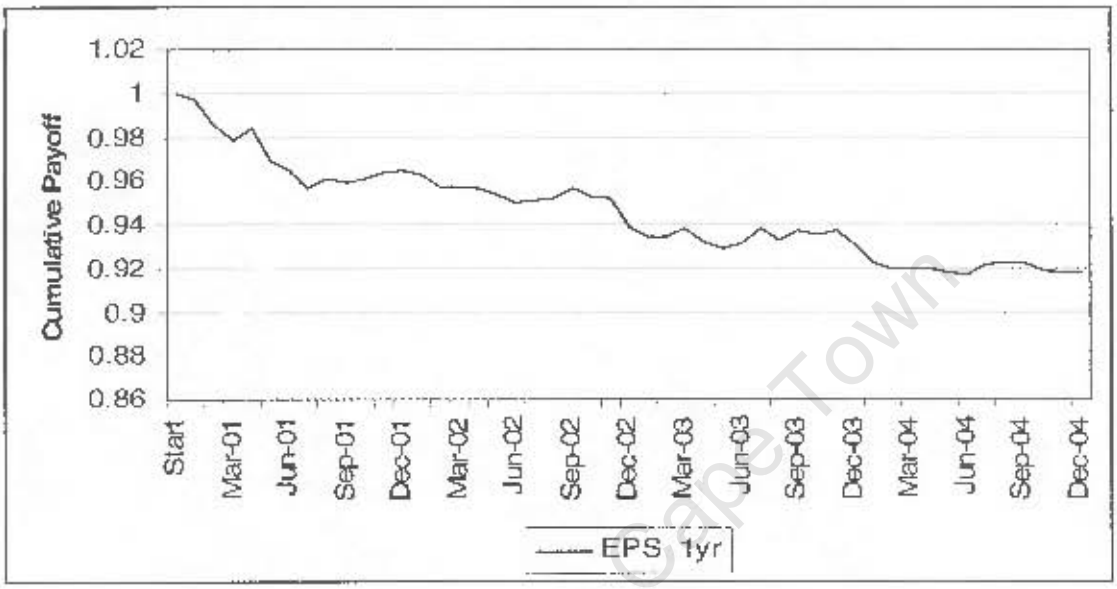
The graph displays cumulative monthly payoffs for the significant variables that encompass the change in value style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using single-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

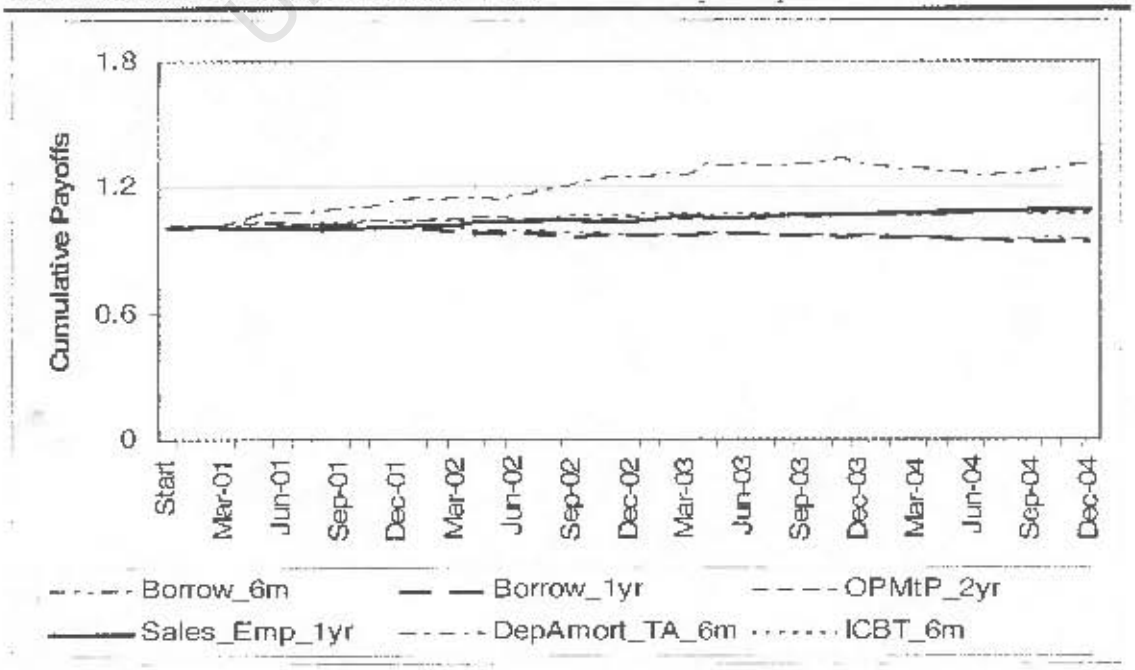
**Appendix C.13.7.: Cumulative monthly payoffs for single-index adjusted returns: Change in size**

The graph displays cumulative monthly payoff for the significant variable that encompasses the change in size style group. The attribute is significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using single-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




**Appendix C.13.8.: Cumulative monthly payoffs for single-index adjusted returns: Change in performance**

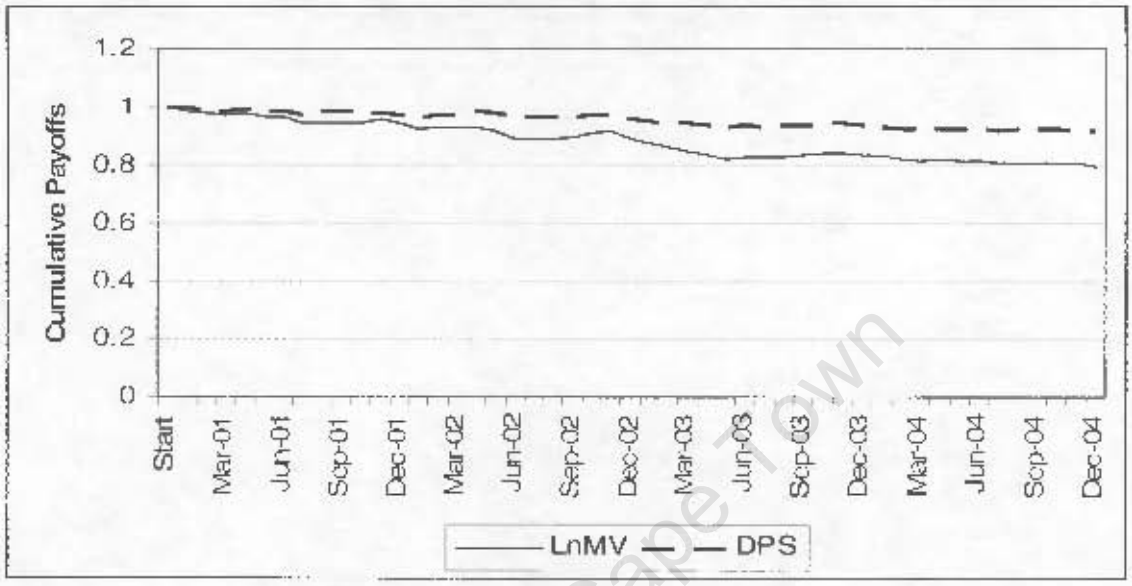
The graph displays cumulative monthly payoffs for the significant variables that encompass the change in performance style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using single-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

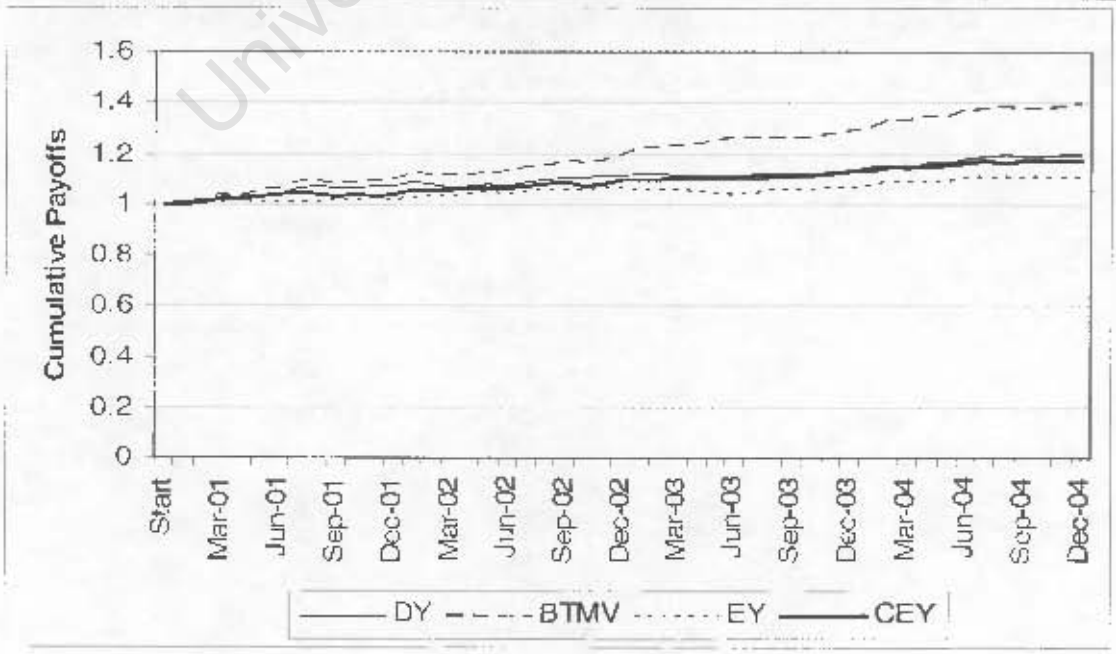
**Appendix C.14.1.: Cumulative monthly payoffs for multi-index adjusted returns: Size**

The graph displays cumulative monthly payoffs for the significant variables that encompass the size style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using multi-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




**Appendix C.14.2.: Cumulative monthly payoffs for multi-index adjusted returns: Value**

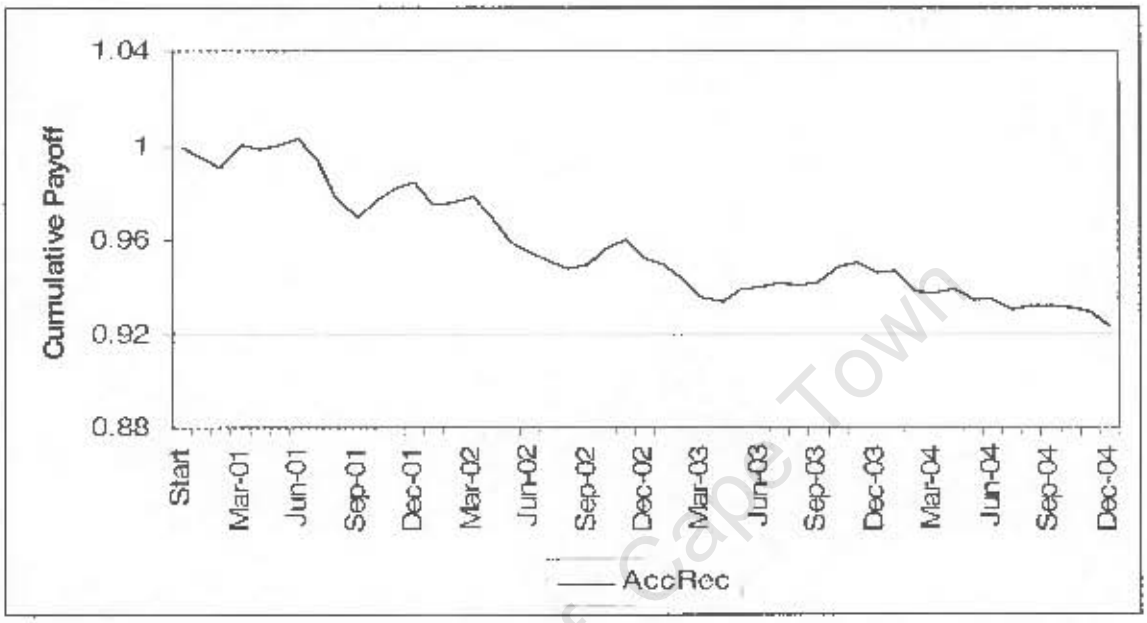
The graph displays cumulative monthly payoffs for the significant variables that encompass the value style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using multi-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

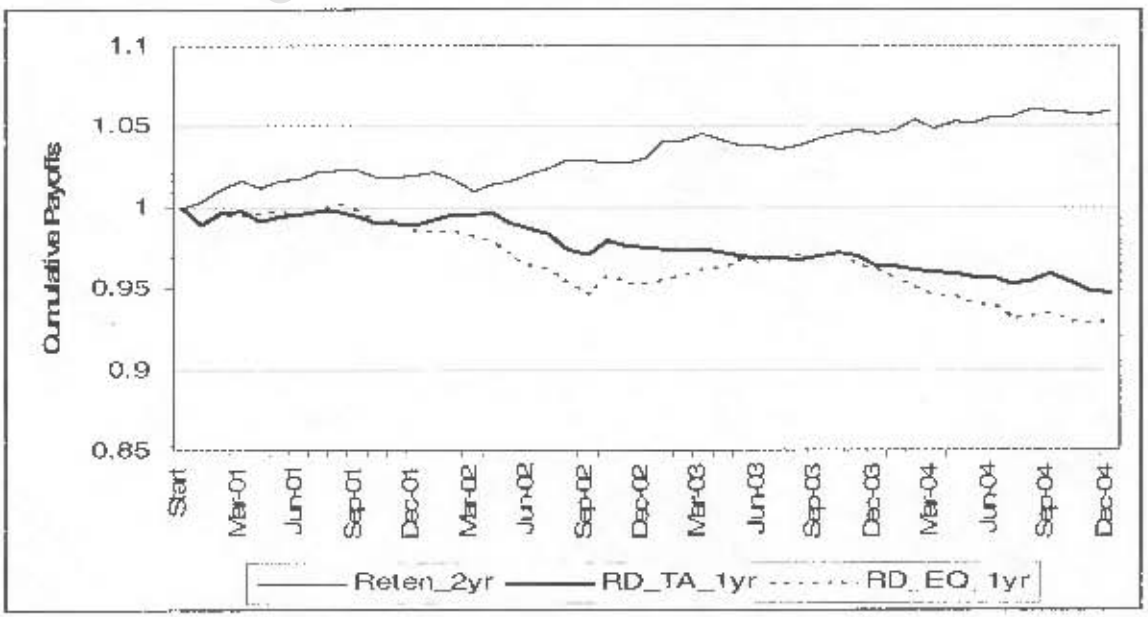
**Appendix C.14.3.: Cumulative monthly payoffs for multi-index adjusted returns: Performance**

The graph displays cumulative monthly payoffs for the significant variable that encompasses the performance style group. The attribute is significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using multi-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




**Appendix C.14.4.: Cumulative monthly payoffs for multi-index adjusted returns: Change in growth**

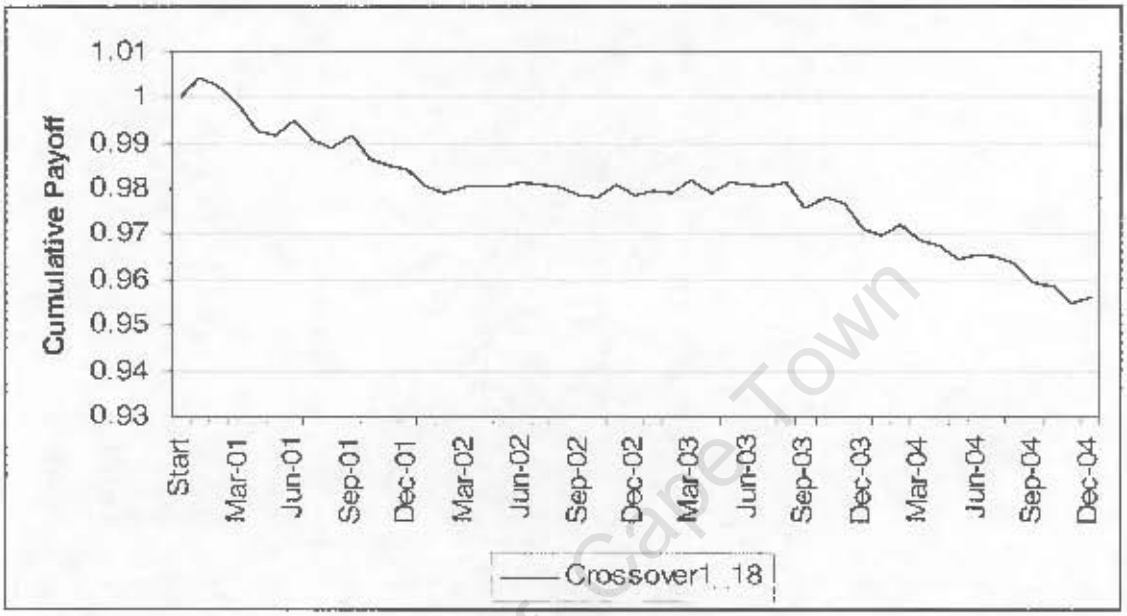
The graph displays cumulative monthly payoffs for the significant variables that encompass the change in growth style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using multi-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

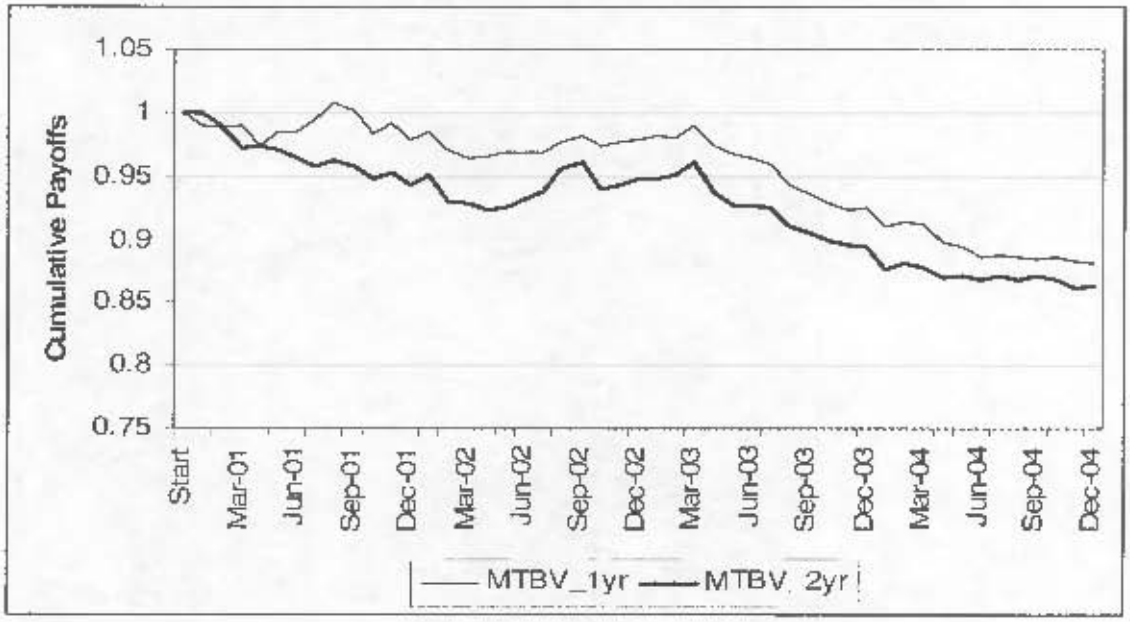
**Appendix C.14.5.: Cumulative monthly payoffs for multi-index adjusted returns: Change in momentum/ crossover**

The graph displays cumulative monthly payoffs for the significant variable that encompasses the change in momentum/ crossover style group. The attribute is significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using multi-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




**Appendix C.14.6.: Cumulative monthly payoffs for multi-index adjusted returns: Change in value**

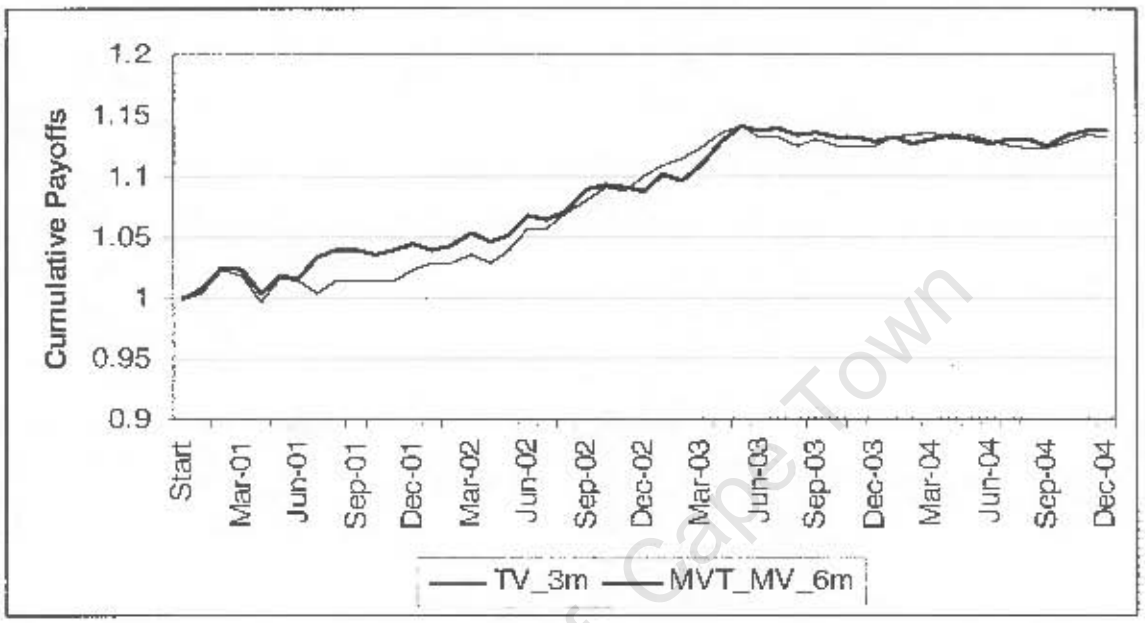
The graph displays cumulative monthly payoffs for the significant variables that encompass the change in value style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using multi-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

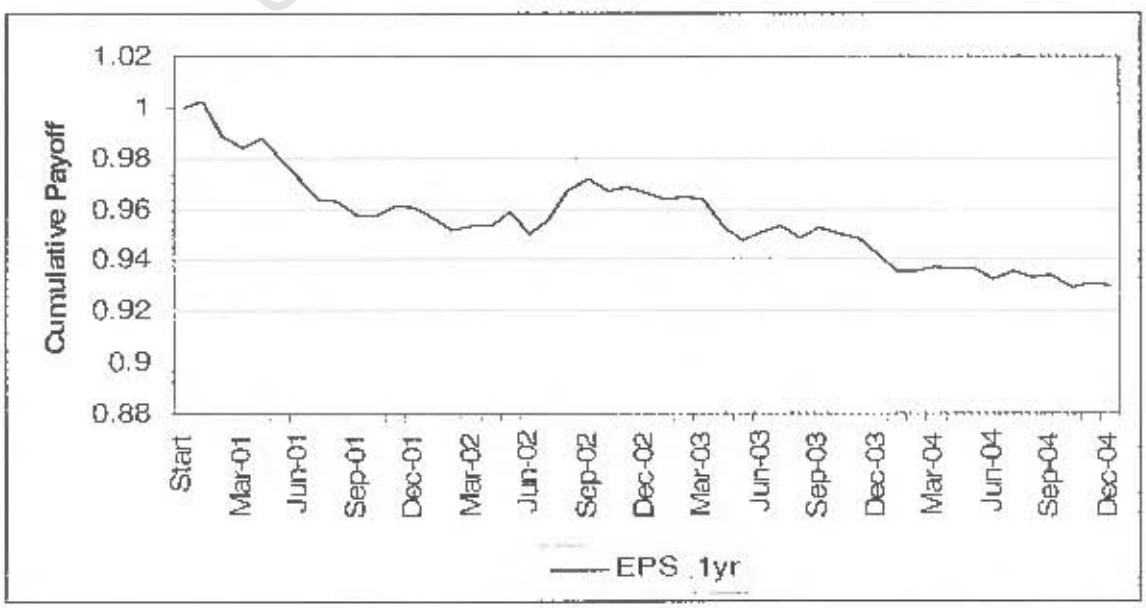
**Appendix C.14.7.: Cumulative monthly payoffs for multi-index adjusted returns: Change in liquidity**

The graph displays cumulative monthly payoffs for the significant variables that encompass the change in liquidity style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using multi-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




**Appendix C.14.8.: Cumulative monthly payoffs for multi-index adjusted returns: Change in size**

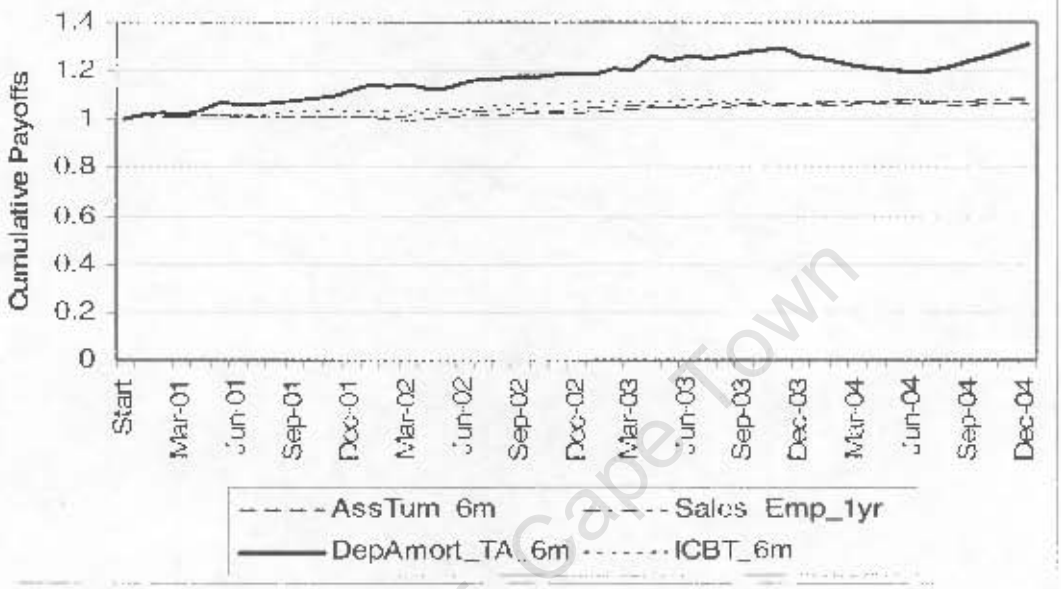
The graph displays cumulative monthly payoffs for the significant variable that encompasses the change in size style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using multi-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

**Appendix C.14.9.: Cumulative monthly payoffs for multi-index adjusted returns: Change in performance**

The graph displays cumulative monthly payoffs for the significant variables that encompass the change in performance style group. The attributes are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using multi-index adjusted returns. All payoffs begin at 1. Construction of all firm-specific variables is displayed in Table 4.1. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.




University of Cape Town

## Appendix C.15.: Comparison of in- and out-sample results

The table displays the mean monthly cross-sectional coefficients for each factor for the in-sample period from 1 January 1993 to 31 December 2000 and the out-sample period from 1 January 2001 to 31 December 2004. Results are obtained from monthly univariate cross-sectional regressions and the data are standardised and adjusted for thin-trading and outliers. A comparison of means (assuming unequal variances) t-statistic is displayed in the right-hand column. Comparison of means t-statistics significant at the 5% level of significance ($p < 0.05$) are displayed in bold italic and indicate that the means of the in- and out-sample coefficients are not equal. The variables are arranged in descending order if the absolute value of the in-sample t statistic. Out-sample variables that are significant at the 5% level of significance are displayed with their mean t-statistics in bold font. The data are obtained from Datastream International at the University of Cape Town.

| | In Sample | | Out Sample | | |
|---|---|---|---|---|---|
| Characteristic | MeanT-Statistic | Mean Coefficient | MeanT-Statistic | Mean Coefficient | Comparison of Means T-Statistic |
| AssTurn_6m | -4.4507 | -0.0022 | **2.0980** | 0.0014 | 0.9241 |
| PEGI_2yr | **-4.4409** | -0.0025 | -1.5252 | -0.0011 | -1.5503 |
| ICBT_6m | **4.1690** | 0.0026 | **3.4801** | 0.0025 | 0.1120 |
| VO_1yr | **3.9401** | 0.0040 | 1.0433 | 0.0012 | ***1.8977*** |
| MVT_MV_1yr | **3.9228** | 0.0040 | 1.3858 | 0.0015 | ***1.6775*** |
| PEGI_1yr | **-3.9059** | -0.0020 | -1.3074 | -0.0007 | ***-1.7464*** |
| AssTurn_2yr | **3.8863** | 0.0024 | 1.4036 | 0.0013 | 1.0531 |
| NCA_MV_2yr | **3.5994** | 0.0027 | 1.0974 | 0.0007 | ***1.9920*** |
| MVT_MV_6m | **3.5674** | 0.0037 | **2.5090** | 0.0030 | 0.4197 |
| VO_3m | **3.5523** | 0.0031 | **3.0497** | 0.0030 | 0.2824 |
| MVT_MV_3m | **3.5462** | 0.0031 | **3.1473** | 0.0031 | 0.2090 |
| TV_1yr | **3.5173** | 0.0036 | 1.5696 | 0.0017 | 1.2489 |
| VO_6m | **3.5125** | 0.0035 | **2.4967** | 0.0029 | 0.4745 |
| Crossover6_18 | **3.4541** | 0.0014 | 1.5839 | 0.0007 | 1.0611 |
| TV_6m | **3.4511** | 0.0036 | **2.4776** | 0.0029 | 0.4158 |
| PEGI | **-3.4078** | -0.0010 | -0.9109 | -0.0005 | -1.5793 |
| TV_3m | **3.4025** | 0.0031 | **3.1681** | 0.0031 | 0.1837 |
| Reten | **3.2851** | 0.0034 | 0.1473 | 0.0002 | ***1.7891*** |
| Reten_1yr | **3.1569** | 0.0017 | 1.9019 | 0.0009 | 1.2421 |
| MOM_1m | **-2.9986** | -0.0041 | -1.3606 | -0.0021 | -1.0085 |
| ICBT_2yr | **2.8150** | 0.0026 | **2.2304** | 0.0018 | 0.6882 |
| ChSalesChInv | **2.8000** | 0.0012 | 1.5696 | 0.0009 | 0.4192 |
| INV_1yr | **-2.7538** | -0.0015 | -0.7361 | -0.0005 | -1.1670 |
| Crossover6_12 | **2.7409** | 0.0013 | 0.9302 | 0.0005 | 0.9723 |
| AssTurn_1yr | **2.7262** | 0.0015 | **2.2185** | 0.0020 | -0.4240 |
| RD_TA | **2.6915** | 0.0025 | -1.0609 | -0.0016 | ***2.3315*** |
| ICBT_1yr | **2.6752** | 0.0024 | **2.0205** | 0.0017 | 0.5526 |
| AccRec_6m | **2.6640** | 0.0020 | 0.3530 | 0.0003 | 1.6254 |
| Crossover3_12 | **2.6314** | 0.0012 | 0.1572 | 0.0001 | ***1.8140*** |
| Reten_6m | **2.5772** | 0.0012 | 1.1396 | 0.0006 | 0.9469 |
| MVT_MV_1m | **2.5596** | 0.0019 | 1.3360 | 0.0014 | 0.3793 |
| VO_1m | **2.5503** | 0.0019 | 1.3200 | 0.0014 | 0.4043 |
| P_1m | **-2.4335** | -0.0046 | -0.8939 | -0.0014 | -1.3379 |
| TV_1m | **2.4184** | 0.0019 | 1.2225 | 0.0013 | 0.3992 |
| MVT_3m | **2.3693** | 0.0028 | **2.3235** | 0.0024 | 0.2200 |
| CPS_6m | **2.3508** | 0.0014 | 1.2778 | 0.0009 | 0.5558 |
| LnMV_1m | **-2.3361** | -0.0046 | -0.9308 | -0.0015 | -1.2213 |
| Crossover3_18 | **2.2283** | 0.0010 | 0.9906 | 0.0005 | 0.6396 |
| RD_EQ | **2.2145** | 0.0016 | 0.4891 | 0.0007 | 1.4071 |
| Sales_Emp | **-2.1948** | -0.0014 | 1.6817 | 0.0015 | ***-2.6557*** |
| NCA_MV_1yr | **2.0662** | 0.0019 | 0.9421 | 0.0002 | 1.4748 |
| TD_TA_6m | **-2.1102** | -0.0010 | 1.1915 | -0.0007 | -0.3327 |
| PEGI_6m | **-2.1052** | -0.0022 | -0.9099 | -0.0005 | -1.3983 |
| Div_6m | **2.0881** | 0.0017 | -0.6238 | -0.0005 | ***1.9027*** |
| NCF_HP1yr | **2.0560** | 0.0021 | -1.2270 | -0.0007 | ***2.3925*** |
| NS_6m | **1.9853** | 0.0010 | -1.5341 | -0.0013 | ***2.3208*** |
| MVT_6m | **1.9735** | 0.0030 | 1.4416 | 0.0019 | 0.5577 |
| RTMV_2yr | **1.9602** | 0.0041 | 1.2122 | 0.0023 | 0.6530 |
| TD_TA_2yr | **-1.9188** | -0.0008 | -1.6745 | -0.0010 | 0.3087 |
| MVT_MV_2yr | **1.8926** | 0.0020 | 0.3972 | 0.0005 | 0.9860 |
| VO_2yr | **1.8392** | 0.0020 | 0.2271 | 0.0003 | 1.0861 |
| CEY | **1.7991** | 0.0019 | **4.3159** | 0.0045 | ***-1.7547*** |
| DepAmort_TA_6m | **1.7353** | 0.0027 | **2.2132** | 0.0042 | -0.6216 |
| BTMV_1yr | **1.7181** | 0.0038 | 1.6196 | 0.0031 | 0.2473 |
| TLC_TA | **1.6534** | 0.0008 | 0.4566 | 0.0005 | 0.2710 |
| RTMV | **1.6398** | 0.0030 | **6.0038** | 0.0089 | ***-2.4736*** |
| MVT_MV | **1.6190** | 0.0017 | -0.4019 | -0.0006 | 1.3114 |
| TV_2yr | **1.6085** | 0.0017 | 0.4712 | 0.0005 | 0.7604 |
| MTBV_2yr | **-1.5595** | -0.0035 | **-2.1695** | -0.0038 | 0.1050 |
| Reten_2yr | **1.5446** | 0.0008 | **2.5412** | 0.0015 | -0.8960 |
| Crossover1_18 | **1.5253** | 0.0007 | -1.6564 | -0.0009 | ***2.2523*** |
| DY_2yr | **1.4977** | 0.0024 | -0.1760 | 0.0003 | 1.1690 |
| EY | **1.4776** | 0.0017 | **2.7147** | 0.0030 | -0.8187 |
| Quick_1yr | **1.4539** | 0.0008 | 0.5102 | 0.0003 | 0.5637 |
| Growth | **1.4509** | 0.0023 | -1.0415 | -0.0016 | ***1.7659*** |
| PPMtP_1yr | **1.4443** | 0.0008 | -0.1271 | -0.0001 | 0.9401 |
| TV | **1.4383** | 0.0016 | -0.5735 | 0.0008 | 1.3353 |
| DIV_1yr | **1.4228** | 0.0014 | -1.0019 | -0.0009 | ***1.7336*** |
| TD_TA | **1.4049** | 0.0011 | 0.7929 | 0.0014 | -0.1662 |
| ROCE_1yr | **1.3985** | 0.0011 | -0.8753 | -0.0007 | 1.6087 |
| MTBV_1yr | **-1.3939** | -0.0033 | **-2.0894** | 0.0036 | 0.0778 |
| ICBT | **1.3637** | 0.0010 | -0.5966 | 0.0005 | 1.3531 |
| EqCapRes_6m | **1.3616** | 0.0013 | -1.5151 | -0.0017 | ***2.0364*** |
| WC | **1.3552** | 0.0013 | -1.7125 | -0.0025 | ***2.1733*** |
| ROCE_6m | **1.3493** | 0.0008 | -0.8476 | -0.0006 | 1.5242 |
| NCF_TD | **1.3393** | 0.0013 | -0.1637 | -0.0001 | 1.2508 |

University of Cape Town

## Appendix C.15.: Comparison of in- and out-sample results
-continued

| Characteristic | In Sample | | Out Sample | | Comparison of Means T-Statistic |
|---|---|---|---|---|---|
| | Mean T-Statistic | Mean Coefficient | MeanT-Statistic | Mean Coefficient | |
| Growth_6m | 1.3357 | 0.0006 | 0.9359 | 0.0006 | 0.0463 |
| AccRec_1yr | 1.2888 | 0.0013 | 0.1447 | 0.0001 | 0.8027 |
| NCA_MV | 1.2859 | 0.0008 | 1.4482 | 0.0015 | -0.5982 |
| TLC_TA_2yr | -1.2804 | -0.0004 | 1.3557 | -0.0008 | 0.5034 |
| BTMV_6m | 1.2764 | 0.0032 | 1.7723 | 0.0035 | -0.1038 |
| CPS | 1.2626 | 0.0014 | -1.7546 | -0.0015 | *2.0698* |
| ChEPS_P_6m | 1.2619 | 0.0008 | 0.9702 | 0.0008 | 0.0377 |
| MVT_1yr | 1.2377 | 0.0022 | 0.1436 | 0.0002 | 0.9118 |
| Quick | 1.2115 | 0.0012 | -1.5839 | -0.0023 | *1.9894* |
| NCF_2yr | 1.1729 | 2.2128 | -0.3175 | -0.0003 | 1.1730 |
| WC_1yr | 1.1680 | 0.0007 | -0.2650 | -0.0002 | 0.9705 |
| ROEpub | 1.1529 | 0.0018 | -1.3223 | -0.0021 | *1.7515* |
| NCF_6m | -1.1006 | -0.0011 | -2.5746 | -0.0013 | 0.1679 |
| BVpS | 1.0903 | 0.0013 | -1.8012 | -0.0018 | *1.9901* |
| AssTurn | 1.0580 | 0.0006 | 0.6529 | 0.0005 | 0.0620 |
| NCF_BP1yr_2yr | -1.0506 | -0.0022 | -0.7485 | -0.0006 | -0.7018 |
| NCF_TD_6m | -1.0480 | -0.0009 | -2.5037 | -0.0015 | 0.5178 |
| NCA_MV_6m | 1.0452 | 0.0021 | 1.1300 | 0.0020 | 0.0460 |
| CPS_6m | 1.0424 | 0.0009 | 0.5052 | 0.0005 | 0.0444 |
| NS_2yr | 1.0235 | 0.0006 | -1.1860 | -0.0013 | 1.5224 |
| MTBV | -1.0168 | -0.0020 | -5.8912 | -0.0080 | *2.5509* |
| Borrow_1yr | -1.0160 | -0.0006 | -2.1754 | -0.0017 | 1.2171 |
| Borrow_2yr | -1.0126 | -0.0006 | -1.8566 | -0.0012 | 0.7409 |
| NCF_1yr | 1.0011 | 0.0300 | -1.2198 | -0.0007 | 1.0243 |
| Sales_P_2yr | 1.0006 | 0.0024 | 0.8864 | 0.0019 | 0.1648 |
| NAVpS | 0.9976 | 0.0011 | -2.4358 | -0.0022 | *2.3298* |
| TD_TA_1yr | -0.9890 | -0.0004 | -1.9710 | -0.0013 | 1.0826 |
| MTBV_6m | -0.9862 | -0.0025 | -1.6549 | -0.0030 | 0.1619 |
| EqCapRes_2yr | 0.9860 | 0.0013 | -1.5837 | -0.0022 | *1.8230* |
| NAVpS_6m | 0.9749 | 0.0019 | -1.3010 | -0.0015 | 1.6250 |
| EPS_2yrAV | 0.9741 | 0.0013 | -2.4240 | -0.0024 | *2.2429* |
| Gear_2yr | -0.9678 | -0.0005 | -1.8044 | -0.0010 | 0.6004 |
| PPMtP_6m | 0.9664 | 0.0020 | 0.8648 | 0.0015 | 0.1947 |
| AccRec_2yr | 0.9448 | 0.0011 | -1.1193 | -0.0015 | 1.4647 |
| NS_1yr | 0.9378 | 0.0005 | -1.2142 | -0.0011 | 1.5216 |
| EPS | 0.9375 | 0.0012 | -2.3212 | -0.0024 | *2.1753* |
| EqCapRes_1yr | 0.9321 | 0.0018 | -1.3954 | -0.0019 | 1.6462 |
| ROCE | 0.9220 | 0.0015 | -1.3936 | -0.0021 | 1.6462 |
| Intan_MV | 0.9133 | 0.0008 | 2.3055 | 0.0029 | -1.3417 |
| MVT_1m | 0.9066 | 0.0008 | 1.0160 | 0.0011 | -0.2453 |
| Borrow_6m | -0.9045 | -0.0005 | -1.4421 | -0.0010 | 0.6456 |
| NCF_BP1yr_1yr | 0.9035 | 0.0010 | -1.2219 | -0.0008 | 1.3755 |
| NCF_BP1yrDiv_2yr | -0.9955 | -0.0018 | -0.7924 | -0.0007 | -0.5031 |
| Crossoverf_1 | 0.8894 | 0.0006 | -0.5875 | -0.0004 | 1.0324 |
| Crossoverf_3 | -0.8801 | -0.0005 | -1.2646 | -0.0009 | 0.3776 |
| OPMtP_6m | 0.8209 | 0.0018 | 1.1792 | 0.0022 | -0.1221 |
| CEY_2yr | 0.8141 | 0.0008 | 1.5732 | 0.0015 | -0.5441 |
| VO | 0.8138 | 0.0007 | -0.5098 | -0.0007 | 0.8641 |
| EY_2yr | 0.8090 | 0.0008 | -0.1696 | -0.0002 | 0.6638 |
| NCF_BP1yrDiv | 0.7940 | 0.0008 | -0.8420 | -0.0005 | 1.1011 |
| OPMtP | 0.7809 | 0.0006 | 3.7236 | 0.0048 | *-2.4896* |
| CEY_6m | 0.7733 | 0.0018 | 1.2462 | 0.0022 | -0.1523 |
| DtV_2yr | 0.7653 | 0.0009 | -0.5058 | -0.0005 | 0.9080 |
| Growth_1yr | 0.7649 | 0.0004 | 0.3483 | 0.0002 | 0.2663 |
| NPMtP_6m | 0.7626 | 0.0015 | 0.7695 | 0.0013 | 0.0650 |
| PPMtP_2yr | 0.7614 | 0.0005 | -0.0568 | 0.0000 | 0.5254 |
| EPS_1yr | 0.7519 | 0.0007 | -1.1125 | -0.0011 | 1.3279 |
| NPMtP_1yr | 0.7352 | 0.0004 | -0.6099 | -0.0005 | 0.8991 |
| Sales_Emp_1yr | -0.7281 | -0.0005 | 2.8369 | 0.0024 | *-2.5526* |
| CPS_1yr | 0.7256 | 0.0005 | 1.4580 | 0.0013 | -0.6338 |
| DtV | 0.7234 | 0.0009 | -1.9215 | -0.0027 | *1.9270* |
| ChEPS_P_1yr | 0.7186 | 0.0006 | 1.3551 | 0.0012 | -0.5801 |
| CPMtP_6m | 0.7133 | 0.0017 | 1.3622 | 0.0024 | -0.2674 |
| NCF_BP1yrDiv_1yr | 0.6932 | 0.0007 | -1.3737 | -0.0008 | 1.2945 |
| DY_6m | 0.6919 | 0.0014 | 0.3784 | 0.0006 | 0.3123 |
| TLC_TA_6m | -0.6908 | -0.0002 | -0.3474 | -0.0002 | -0.0253 |
| Gear | -0.6854 | -0.0007 | 0.9268 | 0.0016 | -1.1398 |
| Quick_6m | 0.6823 | 0.0003 | 2.0558 | 0.0011 | -1.0791 |
| ChSalesChAR | -0.6803 | -0.0003 | -0.1799 | -0.0001 | -0.2668 |
| NCF_TD_2yr | 0.6727 | 0.0014 | -0.8117 | -0.0007 | 0.9455 |
| LnMV_2yr | -0.6709 | -0.0018 | -1.5547 | -0.0034 | 0.4710 |
| PPMtP | 0.6692 | 0.0005 | 0.5076 | 0.0006 | -0.0300 |
| NCF | 0.6555 | 0.0007 | -1.7621 | -0.0010 | 1.4333 |
| WC_2yr | 0.6518 | 0.0004 | -0.6231 | -0.0005 | 0.8908 |
| BVpS_6m | 0.6491 | 0.0006 | -1.2658 | -0.0016 | 1.4015 |
| MVT | 0.6473 | 0.0011 | -2.9077 | -0.0037 | *2.2774* |
| DY_1yr | 0.6290 | 0.0011 | 0.2726 | 0.0004 | 0.2819 |

University of Cape Town

## Appendix C.15.: Comparison of in- and out-sample results

-continued

| Characteristic | In Sample | | Out Sample | | Comparison of Means T-Statistic |
|---|---|---|---|---|---|
| | Mean T-Statistic | Mean Coefficient | MeanT-Statistic | Mean Coefficient | |
| DPS_2yr | **0.6011** | 0.0007 | -1.5521 | -0.0022 | 1.5742 |
| Borrow | **-0.5945** | -0.0004 | 0.2649 | 0.0004 | -0.5030 |
| INV_6m | **-0.5727** | 0.0003 | -0.0542 | -0.0004 | 0.2232 |
| RD_EQ_2yr | **-0.5681** | -0.0004 | **-2.0694** | -0.0016 | 1.1440 |
| DPS | **0.5659** | 0.0006 | **-2.4602** | -0.0025 | ***2.1376*** |
| EqCapRes | **0.5569** | 0.0008 | -1.9068 | -0.0027 | ***1.7375*** |
| CPS_2yr | **0.5451** | 0.0005 | 0.3174 | 0.0003 | 0.1208 |
| CEY_1yr | **0.5373** | 0.0006 | 1.2854 | 0.0013 | -0.4645 |
| RD_EQ_1yr | **-0.5363** | -0.0003 | -1.7999 | -0.0014 | 1.0928 |
| Gear_1yr | **-0.5296** | -0.0003 | -1.5098 | -0.0010 | 0.8461 |
| CFMtP_2yr | **0.5048** | 0.0005 | 1.8923 | 0.0017 | -0.9110 |
| LnMV | **-0.5012** | -0.0010 | **-3.3328** | -0.0066 | ***1.9544*** |
| DPS_6m | **0.4971** | 0.0004 | -0.4204 | -0.0005 | 0.6393 |
| Quick_2yr | **0.4945** | 0.0003 | -0.2322 | -0.0002 | 0.4933 |
| P_2yr | **-0.4918** | -0.0013 | -1.4513 | -0.0028 | 0.4703 |
| Sales_P_1yr | **0.4836** | 0.0013 | 0.6831 | 0.0014 | -0.0490 |
| DPS_1yr | **0.4834** | 0.0005 | -1.0539 | -0.0012 | 1.0998 |
| DY | **0.4831** | 0.0007 | **2.6517** | 0.0049 | ***-1.8206*** |
| NAVpS_2yr | **0.4763** | 0.0007 | -1.1489 | -0.0016 | 1.1450 |
| MOM_3m | **-0.4670** | -0.0007 | -1.0837 | -0.0018 | 0.4609 |
| ROEpub_6m | **0.4624** | 0.0002 | 0.2592 | 0.0002 | 0.0788 |
| LnMV_1yr | **-0.4619** | -0.0013 | -0.8312 | -0.0017 | 0.1340 |
| Growth_2yr | **0.4617** | 0.0002 | -0.0964 | -0.0001 | 0.3565 |
| NPMtP | **0.4610** | 0.0004 | 0.2081 | 0.0002 | 0.1005 |
| BVpS_2yr | **0.4536** | 0.0006 | -1.6259 | -0.0021 | 1.5352 |
| BVpS_1yr | **0.4478** | 0.0006 | -1.3022 | -0.0018 | 1.2704 |
| Gear_6m | **-0.4418** | -0.0002 | -0.9300 | -0.0006 | 0.4412 |
| DepAmort_TA_1yr | **0.4207** | 0.0008 | -0.0311 | 0.0001 | 0.2434 |
| RD_TA_1yr | **-0.4108** | -0.0002 | -1.8326 | -0.0014 | 1.2244 |
| CFMtP_1yr | **0.4068** | 0.0005 | 1.5641 | 0.0014 | -0.6656 |
| MVT_2yr | **0.4048** | 0.0007 | -1.1124 | -0.0013 | 0.9436 |
| NAVpS_1yr | **0.4039** | 0.0005 | -1.2030 | -0.0016 | 1.1497 |
| Intan_MV_1yr | **-0.4025** | -0.0005 | -0.2016 | -0.0003 | -0.1495 |
| WC_6m | **0.3984** | 0.0002 | 1.1498 | 0.0006 | -0.5706 |
| NCF_TD_1yr | **0.3916** | 0.0004 | **-1.1572** | -0.0007 | 0.9212 |
| MOM_18m | **-0.3844** | -0.0008 | -1.4200 | -0.0025 | 0.6714 |
| Intan_MV_2yr | **0.3774** | 0.0004 | -0.2374 | -0.0003 | 0.4139 |
| NS | **-0.3706** | -0.0004 | -0.7351 | -0.0007 | 0.2265 |
| P | **0.3432** | 0.0005 | **-3.5592** | -0.0036 | ***2.3165*** |
| P_1yr | **-0.3420** | -0.0009 | -0.6018 | -0.0011 | 0.6593 |
| DepAmort_TA_2yr | **0.3391** | 0.0006 | -0.0495 | -0.0002 | 0.1860 |
| INV | **-0.3146** | -0.0002 | **-1.2778** | -0.0012 | 0.6043 |
| EY_6m | **0.3136** | 0.0004 | 0.6812 | 0.0007 | -0.1977 |
| NPMtP_2yr | **0.3127** | 0.0002 | 0.3594 | 0.0003 | -0.1182 |
| MOM_12m | **-0.3097** | -0.0006 | -0.6902 | -0.0012 | 0.2341 |
| INV_2yr | **-0.2979** | -0.0002 | -1.6319 | -0.0015 | 1.2025 |
| Sales_P_6m | **0.2583** | 0.0007 | 0.3614 | 0.0006 | -0.0246 |
| ROEpub_2yr | **0.2450** | 0.0001 | -0.5649 | -0.0005 | 0.5986 |
| EY_1yr | **0.2447** | 0.0002 | -0.6033 | -0.0007 | 0.6712 |
| Intan_MV_6m | **0.2371** | 0.0005 | 0.2600 | 0.0005 | 0.0206 |
| NCF_BP1yrDiv_6m | **-0.1970** | -0.0002 | **-2.5877** | 0.0013 | 1.1647 |
| LnMV_3m | **-0.1790** | -0.0004 | 0.1943 | 0.0004 | -0.2617 |
| TLC_TA_1yr | **-0.1663** | -0.0001 | -1.2368 | -0.0007 | 1.0037 |
| AccRec | **-0.1631** | -0.0001 | -1.9839 | -0.0019 | 1.3339 |
| Sales_Emp_2yr | **-0.1596** | -0.0001 | 1.4049 | 0.0011 | -1.1259 |
| MOM_6m | **-0.1545** | -0.0003 | -0.4993 | -0.0009 | 0.2322 |
| OPMtP_2yr | **-0.1440** | 0.0001 | 1.5889 | 0.0013 | -1.2505 |
| P_3m | **-0.1307** | -0.0003 | 0.1790 | 0.0003 | -0.2109 |
| CFMtP | **0.1126** | 0.0001 | **3.4010** | 0.0031 | ***-2.3449*** |
| OPMtP_1yr | **0.1117** | 0.0001 | 0.8635 | 0.0009 | -0.6093 |
| ROEpub_1yr | **0.1070** | 0.0001 | -0.2278 | -0.0002 | 0.2424 |
| P_6m | **0.1030** | 0.0003 | -0.1828 | -0.0003 | 0.1871 |
| RD_TA_2yr | **-0.1017** | -0.0001 | -1.9347 | -0.0015 | 1.4620 |
| NCF_BP1yr_6m | **-0.1010** | -0.0001 | **-2.4478** | -0.0014 | 1.2294 |
| Sales_Emp_6m | **0.0786** | 0.0001 | 1.7313 | 0.0013 | -1.2779 |
| RD_TA_6m | **-0.0589** | 0.0000 | -1.9800 | -0.0013 | 1.4942 |
| ChEPS_P_2yr | **0.0509** | 0.0000 | -0.0174 | 0.0000 | 0.0494 |
| Sales_P | **-0.0435** | -0.0001 | **2.9318** | 0.0063 | ***-2.2508*** |
| RD_EQ_6m | **-0.0296** | 0.0000 | -0.7686 | -0.0005 | 0.5915 |
| DepAmort_TA | **-0.0219** | 0.0000 | -1.1898 | -0.0034 | 1.0586 |
| ROCE_2yr | **0.0165** | 0.0000 | -1.0651 | -0.0009 | 0.7919 |
| LnMV_6m | **0.0038** | 0.0000 | -0.4952 | -0.0010 | 0.3000 |
| EPS_2yr | **-0.0001** | 0.0000 | -1.0457 | -0.0011 | 0.7416 |

University of Cape Town

# Appendix D

Appendices contained in Appendix D relate to Chapter Seven, Style Timing.

## Appendix D.1.: Ljung-Box P-values for lags one to twelve of monthly payoffs to significant characteristics

The table displays the Ljung-Box P-values for lags one to twelve. Ljung-Box P-values significant at the 5% level are highlighted in bold font. The characteristics are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| Style | Characteristic | Lags | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Change in Size | CPS_6m | 0.73 | 0.94 | 0.71 | 0.85 | 0.90 | 0.95 | 0.52 | 0.61 | 0.71 | 0.76 | 0.76 | 0.77 |
| | NS_6m | 0.53 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Change in Liquidity | VC_1yr | 0.48 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| | VO_3m | 0.17 | 0.36 | 0.55 | 0.60 | 0.72 | 0.46 | 0.50 | 0.68 | 0.67 | 0.74 | 0.75 | 0.79 |
| | MVT_MV_1m | 0.01 | 0.04 | 0.00 | 0.06 | 0.06 | 0.09 | 0.14 | 0.19 | 0.22 | 0.18 | 0.24 | 0.31 |
| Performance | NCF_BP1yr | 0.84 | 0.88 | 0.95 | 0.92 | 0.90 | 0.87 | 0.93 | 0.96 | 0.79 | 0.77 | 0.83 | 0.80 |
| Change in Performance | Ass1um_6m | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | ICBT_6m | 0.62 | 0.16 | 0.25 | 0.32 | 0.43 | 0.13 | 0.18 | 0.25 | 0.27 | 0.35 | 0.33 | 0.32 |
| | Ass1um_2yr | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | ICBT_2yr | 0.10 | 0.25 | 0.20 | 0.36 | 0.51 | 0.59 | 0.12 | 0.14 | 0.03 | 0.04 | 0.06 | 0.03 |
| | ChSalesChInv | 0.19 | 0.14 | 0.24 | 0.38 | 0.12 | 0.16 | 0.20 | 0.21 | 0.27 | 0.35 | 0.40 | 0.51 |
| | INV_1yr | 0.05 | 0.12 | 0.12 | 0.05 | 0.07 | 0.09 | 0.09 | 0.11 | 0.15 | 0.18 | 0.23 | 0.25 |
| | AccRec_6m | 0.01 | 0.03 | 0.04 | 0.04 | 0.06 | 0.13 | 0.12 | 0.14 | 0.16 | 0.13 | 0.18 | 0.17 |
| | DIV_6m | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Growth | Heten | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | ND_TA | 0.10 | 0.14 | 0.22 | 0.14 | 0.17 | 0.07 | 0.08 | 0.11 | 0.15 | 0.20 | 0.18 | 0.24 |
| Change in Growth | Heten_1yr | 0.90 | 0.17 | 0.19 | 0.32 | 0.41 | 0.48 | 0.47 | 0.58 | 0.54 | 0.43 | 0.40 | 0.43 |
| | Reten_6m | 0.77 | 0.34 | 0.17 | 0.27 | 0.21 | 0.05 | 0.08 | 0.10 | 0.10 | 0.13 | 0.19 | 0.24 |
| Change in Momentum / Crossover | Crossover6_18 | 0.11 | 0.16 | 0.25 | 0.34 | 0.48 | 0.26 | 0.07 | 0.11 | 0.15 | 0.21 | 0.15 | 0.15 |
| | Crossover6_12 | 0.55 | 0.84 | 0.94 | 0.90 | 0.88 | 0.94 | 0.07 | 0.91 | 0.93 | 0.88 | 0.86 | 0.83 |
| | Crossover3_12 | 0.47 | 0.72 | 0.70 | 0.23 | 0.23 | 0.33 | 0.42 | 0.46 | 0.59 | 0.30 | 0.37 | 0.45 |
| Change in Value | PEG_2yr | 0.15 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | PEG_1yr | 0.12 | 0.03 | 0.07 | 0.12 | 0.20 | 0.25 | 0.27 | 0.32 | 0.24 | 0.25 | 0.20 | 0.18 |
| | NCA_MV_2yr | 0.25 | 0.20 | 0.32 | 0.36 | 0.41 | 0.56 | 0.61 | 0.59 | 0.67 | 0.65 | 0.69 | 0.76 |
| | TD_TA_6m | 0.01 | 0.02 | 0.02 | 0.03 | 0.06 | 0.10 | 0.15 | 0.21 | 0.23 | 0.25 | 0.32 | 0.39 |
| | NCA_MV_1yr | 0.21 | 0.25 | 0.21 | 0.34 | 0.48 | 0.28 | 0.38 | 0.41 | 0.34 | 0.58 | 0.67 | 0.75 |
| Value | PEG | 0.10 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Sales_Emp | 0.44 | 0.64 | 0.82 | 0.69 | 0.76 | 0.82 | 0.24 | 0.13 | 0.16 | 0.21 | 0.17 | 0.23 |
| Short-Term Momentum | MOM_1m | 0.25 | 0.12 | 0.14 | 0.23 | 0.25 | 0.35 | 0.46 | 0.50 | 0.59 | 0.67 | 0.53 | 0.61 |

University of Cape Town

## Appendix D.2.: Ljung-Box P-values for lags one to twelve of monthly payoffs to significant characteristics

The table displays the Ljung-Box P-values for lags one to twelve. Ljung-Box P-values significant at the 5% level are highlighted in bold font. The characteristics are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using un-adjusted returns. The analysis covers the period from 1 January 2001 to 31 December 2004. The data are obtained from Datastream International at the University of Cape Town.

| Style | Characteristic | Lags | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Value | BTMV | 0.68 | 0.39 | 0.17 | 0.25 | 0.36 | 0.47 | 0.44 | 0.47 | 0.36 | 0.40 | 0.48 | 0.55 |
| | CEY | 0.99 | 0.45 | 0.58 | 0.74 | 0.48 | 0.46 | 0.58 | 0.62 | 0.59 | 0.59 | 0.44 | 0.38 |
| | DY | 0.40 | 0.06 | 0.12 | 0.21 | 0.20 | 0.29 | 0.31 | 0.14 | 0.15 | 0.19 | 0.24 | 0.30 |
| | EY | 0.93 | 0.32 | 0.49 | 0.58 | 0.62 | 0.67 | 0.74 | 0.74 | 0.82 | 0.77 | 0.84 | 0.82 |
| Size | LnMV | 0.21 | 0.12 | 0.16 | 0.25 | 0.09 | 0.07 | **0.04** | **0.03** | **0.05** | 0.07 | **0.01** | **0.01** |
| | NAVpS | 0.17 | 0.34 | 0.32 | 0.41 | 0.43 | 0.45 | 0.56 | 0.63 | 0.72 | 0.80 | 0.86 | 0.90 |
| Performance | OPMP | 0.14 | 0.11 | 0.09 | 0.08 | 0.05 | 0.06 | 0.11 | 0.14 | 0.12 | 0.16 | 0.15 | 0.19 |
| Change in Growth | RD_EQ_2yr | 0.93 | 0.58 | 0.66 | 0.48 | 0.42 | 0.43 | 0.22 | 0.30 | 0.37 | 0.32 | 0.22 | 0.28 |
| Change in Value | MTBV_2yr | 0.98 | 1.00 | 0.91 | 0.96 | 0.99 | 0.99 | 1.00 | 1.00 | 1.00 | 0.98 | 0.75 | 0.81 |
| Change in Liquidity | TV_3m | 0.81 | 0.90 | 0.26 | 0.27 | 0.35 | 0.46 | 0.46 | 0.57 | 0.58 | 0.66 | 0.73 | 0.80 |
| | MVT_MV_6m | 0.30 | 0.59 | 0.53 | 0.30 | 0.42 | 0.50 | 0.55 | 0.45 | 0.30 | 0.39 | 0.38 | 0.34 |
| Change in Performance | ICBT_6m | 0.30 | 0.43 | 0.61 | 0.31 | 0.44 | 0.52 | 0.62 | 0.70 | 0.79 | 0.85 | 0.86 | 0.88 |
| | Sales_Emp_1yr | 0.95 | 1.00 | 0.93 | 0.96 | 0.97 | 0.94 | 0.93 | 0.96 | 0.89 | 0.91 | 0.94 | 0.96 |
| | NCF_BP1yrDiv_6m | 0.42 | 0.61 | 0.70 | 0.82 | 0.89 | 0.86 | 0.40 | 0.41 | 0.44 | 0.54 | 0.61 | 0.63 |
| | ICBT_2yr | 0.74 | 0.32 | 0.43 | 0.60 | 0.70 | 0.62 | 0.73 | 0.37 | 0.47 | 0.55 | 0.49 | 0.13 |
| | DepAmort_TA_6m | 0.51 | 0.21 | 0.32 | 0.38 | 0.45 | 0.50 | 0.61 | 0.69 | 0.78 | 0.84 | 0.79 | 0.84 |
| | Borrow_1yr | 0.35 | 0.43 | 0.33 | 0.43 | 0.51 | 0.47 | 0.13 | 0.05 | **0.05** | 0.08 | 0.10 | 0.08 |
| | AssTurn_6m | 0.11 | 0.08 | 0.16 | 0.25 | 0.36 | 0.41 | 0.51 | 0.61 | 0.69 | 0.75 | 0.82 | 0.85 |
| | Quick_6m | 0.08 | 0.15 | 0.27 | 0.42 | 0.54 | 0.67 | 0.77 | 0.85 | 0.89 | 0.93 | 0.92 | 0.93 |

University of Cape Town

**Appendix D.3..: Autocorrelations of lags one to twelve of monthly payoffs to out of sample significant characteristics**

The table displays the Pearson product-moment coefficient between characteristic payoffs and lags one to twelve. Autocorrelations significant at the 5% level using the statistic defined in equation 7.2. are highlighted in bold font. The characteristics are significant at the 5% level using Student's (1908) t-statistic. The monthly payoffs are obtained from the monthly cross-sectional regression analysis using un-adjusted returns. The analysis covers the period from 1 January 1993 to 31 December 2000. The data are obtained from Datastream International at the University of Cape Town.

| Style Group | Characteristic | Lags | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Size | LnMV | 0.019 | 0.018 | 0.077 | -0.021 | -0.015 | **-0.278** | -0.149 | -0.039 | 0.095 | 0.015 | -0.07 | 0.056 |
| | NAVpS | 0.109 | 0.031 | 0.09 | 0.014 | -0.026 | **-0.256** | -0.116 | 0.047 | 0.063 | -0.033 | -0.003 | 0.016 |
| Value | BTMV | 0.061 | 0.103 | 0.079 | 0.047 | 0.09 | -0.155 | -0.163 | 0.057 | 0.024 | 0.068 | -0.029 | -0.042 |
| | CFY | -0.046 | 0.029 | 0.031 | **0.22** | -0.088 | -0.022 | -0.123 | -0.006 | -0.056 | 0.111 | -0.023 | -0.024 |
| | DY | 0.145 | 0.168 | 0.116 | 0.11 | 0.059 | -0.119 | -0.175 | 0.057 | 0.019 | 0.036 | -0.063 | -0.084 |
| | EY | 0.044 | 0.164 | 0.039 | 0.081 | -0.183 | -0.048 | -0.006 | -0.093 | -0.074 | 0.049 | -0.041 | -0.168 |
| Performance | OPMIP | 0.027 | 0.184 | 0.077 | 0.139 | -0.022 | -0.093 | -0.377 | 0.004 | -0.02 | -0.035 | -0.012 | 0.056 |
| Change in Growth | RD_EQ_2yr | 0.032 | 0.003 | -0.056 | **-0.221** | 0.013 | -0.171 | -0.077 | -0.003 | -0.039 | 0.076 | 0.026 | 0.134 |
| Change in Value | MTBV_2yr | 0.036 | 0.035 | 0.066 | 0.056 | 0.047 | -0.192 | -0.132 | -0.007 | 0.049 | -0.002 | -0.104 | 0.04 |
| Change in Liquidity | TV_3m | 0.122 | 0.025 | -0.009 | 0.08 | -0.035 | 0.173 | 0.003 | 0.014 | 0.071 | 0.041 | -0.083 | 0.044 |
| | MVT_MV_6m | 0.043 | 0.007 | -0.007 | 0.116 | 0.037 | **0.235** | 0.034 | -0.011 | 0.019 | -0.015 | -0.078 | 0.001 |
| Change in Performance | ICBT_6m | 0.015 | 0.191 | -0.066 | -0.074 | -0.04 | **-0.221** | -0.038 | 0.024 | 0.09 | 0.018 | 0.111 | 0.164 |
| | Sales_Emp_1yr | 0.083 | 0.12 | 0.198 | -0.051 | -0.191 | -0.032 | -0.115 | -0.145 | 0.102 | -0.009 | -0.076 | 0.016 |
| | NCF_BP1yrDiv_6m | 0.071 | 0.019 | -0.016 | 0.066 | 0.072 | -0.067 | 0.111 | 0.016 | 0.087 | 0.022 | 0.064 | 0.102 |
| | ICBT_2yr | 0.168 | -0.004 | 0.101 | -0.06 | -0.033 | -0.057 | **-0.258** | 0.075 | **0.245** | 0.033 | 0.072 | 0.174 |
| | DepAmort_TA_6m | **0.227** | 0.173 | 0.052 | 0.114 | 0.151 | 0.14 | 0.006 | -0.048 | 0.037 | 0.017 | -0.029 | -0.006 |
| | Borrow_1yr | -0.064 | -0.299 | 0.144 | 0.095 | 0.115 | -0.031 | **-0.232** | 0.108 | 0.158 | 0.024 | 0.004 | 0.028 |
| | AssTurn_6m | **0.338** | **0.267** | **0.285** | **0.283** | 0.165 | 0.137 | 0.077 | 0.057 | -0.04 | -0.059 | -0.029 | -0.035 |
| | Quick_6m | 0.166 | -0.08 | -0.003 | 0.076 | 0.057 | -0.021 | -0.151 | 0.101 | 0.092 | -0.041 | -0.093 | -0.053 |

University of Cape Town