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**AN INVESTIGATION OF FIRM SPECIFIC
AND MACROECONOMIC VARIABLES AND THEIR
INFLUENCE ON
EMERGING MARKET STOCK RETURNS**

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and presented to the School of Management Studies in fulfilment
of the requirements for the degree of

MASTER OF BUSINESS SCIENCE
(Special Field: Finance)

University of Cape Town ©

Abstract

This paper aims to expand on the growing area of asset pricing research in developed markets by extending such analyses to those nations considered to be emerging. Of late the accuracy of a previously established cornerstone of asset pricing theory, namely the Capital Asset Pricing Model (CAPM) has been questioned. The discovery of numerous firm related anomalies that have predictive power over the cross sectional variation of share returns in excess of that explained by established market proxy models has served to fuel interest and speculation as to the true robustness and exploitability of such influences. These firm specific influences have been termed 'style characteristics'.

This study employed the use of the DataStream International Emerging Market Index for the extraction of all firm specific and return data. In addition to the considered 'style' characteristics this study explores the broader systematic effects associated with changes in key macroeconomic variables. Informed by prior research, variables found to be of historical significance to the behaviour of the cross section of emerging market returns are included in this analysis. A collection of 50 style characteristics and 15 macroeconomic factors are tested over sample period spanning the 1st of January 1997 to the 31st of December 2006 comprising a total of 1273 shares from 20 emerging nations.

Returns are adjusted for risk using both CAPM and APT formulations and the ability of the 'style' factors to explain the cross-sectional variation of returns tested in a univariate setting as in Van Rensburg and Robertson (2003). Significant factors identified in the tests of unadjusted returns are endorsed by the results of the risk adjusted analyses. A correlation analysis is run thereafter in order to limit redundancy with a cluster analysis to follow in order to identify groups of factors with similar explanatory power. Factors are classified into the following groups; (1) Size, (2) Value, (3) Liquidity and (4) Miscellaneous. Of the 46 tested a final list of 14 significant style effects were documented the nature of which seem to concur with the majority of developed and developing market research. In order to assess the stationarity of the 15 candidate macroeconomic variables, Augmented Dickey Fuller tests were run on the chosen factors in order to identify testable factors as in Van Rensburg (1999). A variant of the Fama and Macbeth (1973) methodology is then employed on the 11 stationary factors identified to firstly ascertain the sensitivity of each listed share to all macroeconomic influence and thereafter be tested in a similar univariate setting as to the style factors. Five macroeconomic factors with a strong commodity focus are found to be reasonably significant at the five percent level; however upon further analysis the ability of such factors to be considered priced risk factors is refuted.

The final 15 style characteristics are then tested to develop a multifactor model so as to ascertain the robustness of such factors in a more complex setting. The analysis yielded a model comprising a total of nine factors with a strong value orientation in agreement with previous univariate tests. Finally, a more robust stepwise variant of the expected return modelling technique examined by Haugen and Baker (1996) is employed. A total of five timing models are used to derive a range of style based, macroeconomic based and hybrid expected return formulations. All style models exhibited a distinct value orientation; with Book-to-Market Value and Return on Capital employed the most frequently identifiable factors. The independent macroeconomic models showed little promise; however the hybrid models-style formulations supplemented with macroeconomic influences, more specifically the Gold Price, Oil Price and long term US interest rates served to measurably improve explanatory power. These models have varied significance with only one specification showing potential investable exploitability.

Declaration

I, David Moore, hereby declare that the work on which this thesis is based is my own 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

August 2008

Acknowledgements

The author would like to acknowledge the supervision and guidance of Professor Paul van Rensburg of the University of Cape Town. Furthermore the able assistance of the staff of the Finance Department in the School of Management Studies at the University of Cape Town with special mention owing to Mr Ryan Kruger whose aid contributed to the timely completion of this thesis.

The author also acknowledges the School of Management Studies at the University of Cape Town for permission to use the Finance Research Laboratory for data collection and analysis.

Finally, the author thanks the Postgraduate Funding Office of the University of Cape Town for the Entrance Merit Scholarship.

Contents

<i>Abstract</i>	<i>i.</i>
<i>Declaration.....</i>	<i>ii</i>
<i>Acknowledgements</i>	<i>iii</i>
<i>Contents.....</i>	<i>iv</i>
<i>List of Tables</i>	<i>viii</i>
<i>List of Figures</i>	<i>ix</i>
1. Introduction	1
1.1. Introduction	1
1.2. Motivation for research.....	4
1.3. Contribution	6
1.4. Thesis organisation.....	7
2. Theoretical Overview	1
2.1. Introduction	1
2.2. Market Efficiency and the Efficient Market Hypothesis.....	1
2.3. Market Efficiency	2
2.4. Asset Pricing and the Capital Asset Pricing Model (CAPM)	7
2.5. The Joint Hypothesis Problem.....	11
2.6. Arbitrage Pricing Theory (APT).....	11
3. Literature Review	1
3.1. Introduction	1
3.2. A brief review of US findings.....	2
3.2.1. An Explanation of CAPM style anomalies.....	3
3.3. The CAPM and APT in Emerging Markets.....	6
3.4. Silye Anomoalies in Emerging Markets.....	6

3.4.1. Earlier Seminal Work.....	6
3.4.2 More Recent Studies.....	10
3.4.3 Testing for Clusters of factors in emerging markets.....	10
3.4.4 Assesing Market Risk in Emerging Markets.....	14
3.5. Macroeconomic Shocks and Share Returns.....	18
3.5.1 Developed Market Research.....	18
3.5.2 Research in Emerging Markets.....	20
4. Data and Descriptive Statistics	1
4.1. Introduction.....	1
4.2. Data.....	1
4.2.1. Stock returns data.....	2
4.2.2. Adjustments to the stock returns data.....	3
4.2.3. Firm-specific attribute data.....	10
4.2.4. Descriptive statistics.....	16
4.3. Summary and conclusion.....	19
5. Specification of Index Models and Univariate Style Analysis.....	1
5.1. Introduction.....	1
5.2. Testing the Single- and Multi-index models.....	2
5.2.1 Data and Methodology.....	2
5.2.2. Theoretical Concerns and Critical Assumptions	5
5.3. Results.....	6
5.4. Univariate Testing of Style Factors.....	8
5.4.1. Data and methodology.....	8
5.4.2. Tests of Unadjusted returns.....	8
5.4.3. Tests of Risk-adjusted returns: CAPM.....	9
5.4.4. Tests of Risk-adjusted returns: APT.....	10
5.4.5. Comparison between unadjusted and risk-adjusted results.....	12
5.4.6. Primary Adjustment to list of firm-specific characteristics	12
5.4.7. Analysis of primary list of signnificant characteristics	13
5.4.8. Style Consistency.....	16
5.5. Results.....	17
5.5.1. Univariate Testing: Unadjusted and Risk Adjusted Results	17
5.5.2. Identification of Significant Clusters: Unadjusted Returns	24
5.5.3. Monthly Payoffs of Significant Factors	25

5.5.4	<i>Analysis of Cumulative Monthly Payoffs</i>	32
5.6	<i>Style Consistency</i>	38
5.6.1	<i>Sign Test</i>	38
5.6.2	<i>Test for Randomness</i>	39
5.7	<i>Summary and Conclusion</i>	40
6.	Univariate Analysis of Macroeconomic Influences on Return Behaviour	1
6.1.	<i>Introduction</i>	1
6.2.	<i>Identification of Candidate Factors</i>	3
6.2.1	<i>Prior Research</i>	3
6.2.2	<i>Explanation of Candidate Factors</i>	4
6.3.	<i>Adjustments to Candidate Factors prior to testing</i>	4
6.3.1.	<i>Stationarity</i>	4
6.3.2.	<i>Correlation amongst Stationary factors</i>	5
6.3.3.	<i>Results</i>	6
6.4.	<i>Univariate Testing of Macroeconomic Factors</i>	12
6.4.1	<i>Data and Methodology</i>	12
6.4.2	<i>Tests of Unadjusted Returns</i>	13
6.4.3	<i>Results</i>	15
6.5	<i>Further Analysis</i>	26
6.5.1	<i>Preliminary Commentary</i>	26
6.5.2	<i>Macroeconomic Factors as priced risk factors</i>	26
6.6.	<i>Summary and Conclusion</i>	28
7.	Multivariate Style Analysis, Timing, and Expected Return Models	1
7.1.	<i>Introduction</i>	1
7.2.	<i>Multivariate cross-sectional Regressions</i>	3
7.2.1.	<i>Introduction</i>	3
7.2.2.	<i>Methodology</i>	3
7.2.3.	<i>Results</i>	5
7.3.	<i>Multifactor Expected Return Models</i>	7
7.3.1.	<i>Data and Methodology</i>	7
7.3.1.1.	<i>Problems with Haugen and Baker (1996)</i>	9
7.3.1.2.	<i>Haugen and Baker (1996 – a revised methodology)</i>	10

7.4.	<i>Expected Return Model Construction</i>	12
7.4.1	<i>Firm-Specific Models</i>	12
7.4.2	<i>Macro-Economic Models</i>	12
7.4.3	<i>Combined Models</i>	14
7.4.4	<i>Results</i>	15
7.5.	<i>Summary and conclusion</i>	23
8.	Summary, Conclusion, and Suggested Extensions	1
8.1.	<i>Introduction</i>	<i>1</i>
8.2.	<i>Summary of results</i>	<i>2</i>
8.3.	<i>Final conclusion and suggested extensions</i>	<i>7</i>
References		1
List of Appendices		22

List of Tables

4.	Data and Descriptive Statistics	1
	<i>Table 4.1. Firm-specific Attributes.....</i>	<i>12</i>
	<i>Table 4.2. Grouping of Firm Specific Attributes</i>	<i>14</i>
	<i>Table 4.3. Descriptive Statistics of the Firm-specific Attributes</i>	<i>17</i>
5.	Specification of Index Models and Univariate Style Analysis.....	1
	<i>Table 5.1. Statistical Significance of Single- and Multi-index Models.....</i>	<i>6</i>
	<i>Table 5.2. Significance of Attributes: Unadjusted Returns</i>	<i>18</i>
	<i>Table 5.3. Significance of Attributes: CAPM (EMI) Adjusted Returns</i>	<i>19</i>
	<i>Table 5.4 Significance of Attributes: CAPM (WMI) Adjusted Returns.....</i>	<i>20</i>
	<i>Table 5.5 Final List of Significant Uncorrelated Attributes.....</i>	<i>31</i>
6.	Univariate Analysis of Macroeconomic influences on return behaviour in Emerging Markets	1
	<i>Table 6.1. Initial List of Candidate Macroeconomic Variables</i>	<i>1</i>
	<i>Table 6.2. Results of Level Unit Root Tests.....</i>	<i>6</i>
	<i>Table 6.3. Results of First Differenced Unit Root Tests.....</i>	<i>7</i>
	<i>Table 6.4. Final List of Stationary Macroeconomic Factors.....</i>	<i>11</i>
	<i>Table 6.5 Significance of Candidate Macroeconomic factors in return prediction.....</i>	<i>15</i>
7.	Multivariate Style Analysis incorporating Macroeconomic Influences and Expected Return Models	1
	<i>Table 7.1. Results of Multivariate Cross-Sectional Regressions.....</i>	<i>5</i>
	<i>Table 7.2. Constructed Expected Return Models: Style (Full Sample).....</i>	<i>15</i>
	<i>Table 7.3. Constructed Expected Return Models: Style (Restricted Sample).....</i>	<i>17</i>
	<i>Table 7.4. Constructed Expected Return Models: Macroeconomic Variables.....</i>	<i>19</i>
	<i>Table 7.5. Constructed Expected Return Models: Style and Macroeconomic Variables</i>	<i>21</i>

List of Figures

4.	Data and Descriptive Statistics	1
	<i>Figure 4.1. Graphical Depiction of changing liquidity of listed firms over sample period.....</i>	<i>8</i>
5.	Specification of Index Models and Univariate Style Analysis.....	1
	<i>Figure 5.1. Tree Diagram representing the Clusters of Monthly Payoffs: Unadjusted Returns ..</i>	<i>21</i>
	<i>Figure 5.2. Tree Diagram representing the Clusters of Monthly Payoffs: CAPM (EMI) Adj. Returns...</i>	<i>22</i>
	<i>Figure 5.3. Tree Diagram representing the Clusters of Monthly Payoffs: CAPM (WMI) Adj. Returns..</i>	<i>23</i>
	<i>Figure 5.4. Correlation Matrix of Significant Style Factors</i>	<i>27</i>
	<i>Figure 5.5. Correlation Matrix of Monthly Payoffs: Size.....</i>	<i>28</i>
	<i>Figure 5.6. Correlation Matrix of Monthly Payoffs: Value (1)</i>	<i>28</i>
	<i>Figure 5.7. Correlation Matrix of Monthly Payoffs: Value (2)</i>	<i>29</i>
	<i>Figure 5.8. Correlation Matrix of Monthly Payoffs: Liquidity.....</i>	<i>29</i>
	<i>Figure 5.9. Correlation Matrix of Monthly Payoffs: Miscellaneous</i>	<i>30</i>
	<i>Figure 5.10. Cumulative Monthly Payoffs: Size.....</i>	<i>32</i>
	<i>Figure 5.11. Cumulative Monthly Payoffs: Value (1).....</i>	<i>33</i>
	<i>Figure 5.12. Cumulative Monthly Payoffs: Value (2).....</i>	<i>34</i>
	<i>Figure 5.13. Cumulative Monthly Payoffs: Liquidity.....</i>	<i>35</i>
	<i>Figure 5.14. Cumulative Monthly Payoffs: Miscellaneous</i>	<i>36</i>
	<i>Figure 5.15 Consistency of Direction of Significant Attribute Monthly Payoffs</i>	<i>38</i>
	<i>Figure 5.16 Testing the Randomness of Monthly Payoffs</i>	<i>39</i>
6.	Univariate Cross-sectional Analysis of Macroeconomic influences on return behaviour in	
	Emerging Markets.....	1
	<i>Figure 6.1. Correlation Matrix of Final List of Stationary Macroeconomic Variables</i>	<i>9</i>
	<i>Figure 6.2. Graph of Cumulative Returns on Macroeconomic Commodities versus Returns on the DataStream International Emerging Market Index.....</i>	<i>18</i>
	<i>Figure 6.3. Graph of Cumulative Changes in US interest rates versus the Cumulative Returns upon the DataStream International Emerging Markets Index</i>	<i>19</i>
	<i>Figure 6.4. Scatter Plot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the CRB Index.....</i>	<i>20</i>
	<i>Figure 6.5. Scatter Plot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the Gold Price (\$US/ounce)</i>	<i>21</i>
	<i>Figure 6.6. Scatter Plot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the Brent Crude Oil Price (\$US/barrel)</i>	<i>22</i>
	<i>Figure 6.7. Scatter Plot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the Platinum Price (\$US/ounce).....</i>	<i>23</i>
	<i>Figure 6.8. Scatter Plot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the US 10 year Gilt</i>	<i>24</i>

7. Multivariate Style Analysis incorporating Macroeconomic Influences and Expected Return Models	1
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<i>Figure 7.1. Cumulative Monthly Payoffs to Multivariately Significant Factors</i>	<i>5</i>
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University of Cape Town

Introduction

"The recent Finance literature seems to produce many long-term return anomalies. Subjected to scrutiny, however, the evidence does not suggest that market efficiency should be abandoned. Consistent with the market efficiency hypothesis that the anomalies are chance results, apparent overreaction of stock prices to information is about as common as under reaction."

-Fama (1998, p. 304)

1.1 Introduction

The pursuit of wealth has been central to the ambitions of man for centuries, however to be classified as wealthy is to be segregated into an elite class, a categorisation that the vast majority will never attain. This is so because in order to obtain substantial wealth and returns one has to bear the burden of the risk of failure, which even fewer are able to do successfully. Establishing what is considered an adequate risk to bear for an associated return on a vested interest is critical in the accumulation of wealth. Until the arrival of what may be termed 'Modern Finance' in the mid twentieth century such a question was extremely difficult to answer.

Markowitz (1952:1959) defined the relationship between risk and return and described the concept of mean-variance efficiency as being able to determine the optimal investment opportunity for the prospective investor. No longer was return maximisation the rule of thumb for the investor in choosing amongst his/her opportunity set. Sharpe (1964) built on these theoretical foundations and formulated a model, the Capital Asset Pricing Model (CAPM) that was purported to describe the risk: return relationship in a market classified as efficient. This formulation was the pioneering work in the pricing of assets and defined the risk of any asset as its covariance with all other assets in the market, later termed the 'market portfolio'.

However, in formulating this model Sharpe made many stringent assumptions that narrowed its general applicability and so created many sceptics in the world of finance and economics as to its accuracy. Amongst the first was the work of Roll (1976) who argued that the return on any asset may be sensitive to not just one factor but in fact many.

The theory of 'one price' and Arbitrage was born, alluding to the fact that similar assets with similar risk exposures must be offering the same expected return. If they were not short selling would generate a riskless profit which would contravene market efficiency.

The APT has somewhat less rigorous assumptions than the CAPM which serves as both a strength and a weakness of the approach. Indeed the APT is more generalised than the CAPM by virtue of its relaxed assumptions; however it also provides no theoretical foundation by which to select its priced factors. The chosen factors are often sample-specific and hold little economic interpretative value detracting from the soundness of the approach in an empirical setting.

The CAPM itself even with its sweeping assumptions has struggled somewhat to hold up as an accurate generalised asset pricing model. The inferred risk: return relationship posited by Markovitz and that which forms the foundation of the CAPM has been found wanting when tested empirically. Often the generated Beta estimate has shown little or no relation to returns with evidence of other unexplained sources of variation seemingly defining the manner in which returns are generated (Fama and French, 1992 inter alia).

It is with these 'other' sources of variation that this paper is most concerned. Firm specific variables, information that describes in detail the financial well being and future prospects of the firm are believed to be the next paradigm in explaining the variation in share returns. These variables also termed 'style effects' or 'style characteristics' have been studied extensively in developed markets-Blume (1980), Banz and Reinganum (1981), Fama (1991) and the like have found numerous style factors with the power to describe part of the cross sectional variation in share returns. However, there exists far less research in an emerging market context, a gaping hole which this paper aims to fill.

The environment in which firms operate, or rather the macroeconomy with its habit of periodic fluctuation from boom to recession is another area incorporated into the study of pricing share returns. Although much work on macroeconomic shocks and stock market movements does exist in both developed and emerging market contexts, this paper's ambition is to re-assess their cross sectional explanatory impact on a broad sample of emerging shares and possibly use them to create a hybrid forecasting model that includes both firm-specific and macroeconomic influences.

This paper is closely aligned to the work of Van Rensburg and Robertson (2003) and Van Rensburg and Janari (2004) who draw upon similar characteristics-based approaches to those used by Fama and Macbeth (1973) to identify generalised sources of explanatory power over a broad sample of emerging market stocks. The ten year sample of stocks over the period (1st of January 1997 to the 31st of December 2006) is drawn from the DataStream International Emerging Market Index comprising a total of twenty six emerging nations.

All data used in this study is sourced from the DataStream International Database and presented in Chapter Four and later expanded upon in Chapter Six. DataStream itself is a public domain and updates all relevant information once such data has been made public; therefore this study remains free from look-ahead bias. Survivorship bias however is prevalent in this paper-with prior research citing its influence to be less than considerable it fails to present a major cause for concern. Once sufficient data pruning and manipulation is complete a range of testing procedures is employed that seeks to isolate sources of explanatory power that were previously unexplained by the CAPM and APT formulations.

To begin in Chapter Five, share returns will be adjusted for risk and the associated return over each month will then be run in a univariate cross-sectional regression against the sourced firm specific characteristics at the beginning of that same month in order ascertain the payoff of the exposure to such style factors. Results are scrutinised from a statistical standpoint and those characteristics deemed of suitable significance are studied further.

A similar analysis is performed on the candidate macroeconomic factors in Chapter Six, whereby their relation to emerging market stock returns is investigated. Prior to testing, suitable data transformations are performed in order to ensure testability as conducted in Van Rensburg (1999) and Fama and Macbeth (1973). Results are once again checked for statistical rigour, with those significant variables progressing to the next stage of the analysis.

Finally, Chapter Seven attempts at crafting an accurate predictive model using previously identified firm-specific characteristics, macroeconomic variables and thereafter a combination of both in a multi-factor setting are documented. A stepwise variant of the methodology of Haugen and Baker (1996) provides the essential framework for expected return model construction, with the aim being the development an optimal exploitable formulation able to accurately predict share price movements.

A summation of the paper's aims and ultimate outcomes is presented with all relevant concerns expressed regarding the present study and the potential for further analysis in a similar context.

The remainder of this chapter is set out as follows: Section 1.2 considers the author's motivation for this research and Section 1.3 discusses the proposed contribution.

1.2 Motivation for Research

Firm specific characteristics such as size, book-to-market and the like provide investors with important information. Based on these attributes shrewd investors can earmark certain equities that exhibit such traits, construct portfolios that are sufficiently well diversified and so in the near future earn abnormal returns through close monitoring and adjusting of their respective holdings. This concept is defined as 'style timing' and is already common place in developed markets due to the volumes of research undertaken on firm characteristics and their associated impact on returns.

In emerging markets however, such anomalous behaviour hasn't been sufficiently documented and so the implementation of a full style based investment strategy may be considered somewhat premature. This study's primary objective is to expand on the current literature on the topic increasing the range of firm specific measures to be tested across a more recent and up to date sample of emerging market nations. The hope is that this more comprehensive study will serve to identify the precise firm specific variables that influence the return behaviour before and after CAPM and APT based risk adjustment of emerging market equities and in so doing form the basis to enhance investment techniques in markets whose behaviour aside from being termed volatile is not well documented.

A sample of over twenty emerging nations has been gathered, drawn from the three major emerging regions across the globe namely Africa, Latin America and Asia. Data constraints have served to minimize the representation of the African region; however the sample as it stands is sufficiently broad to constitute a comprehensive study.

Furthermore, the influence of broader macroeconomic factors on share returns is an additional unexplored realm in the context of emerging market asset pricing. Previous

research in developed markets have shown a degree of co-movement between macroeconomic factor and stock markets, however emerging market research by Kwon (1997), Gjerde and Sættem (1999) and others is somewhat more country specific than their developed market counterparts, an area which this study aims to expand upon through the employment of a significantly more diversified sample. Fluctuations in interest rates, commodity prices and various other broad market characteristics are investigated. The second objective of this study is therefore to ascertain whether or not these variables, or rather shocks in these variables are able to provide significant, previously undocumented evidence of an ability to predict the cross section of share price movements.

The third objective of this study is to create a multifactor predictive model that is able to forecast share return using the estimated historical payoffs to style factors only, macroeconomic factors only and then a combination of both style and macroeconomic factors. Stemming from such analysis a well considered and detailed explanation of the results in the context of the less known emerging markets is to follow with potential avenues for future analyses also discussed.

1.3 Contribution

The aim of this paper is to make a value added contribution to asset pricing research in emerging equity markets. As discussed asset pricing theory is closely linked to the concept of market efficiency. This paper attempts to ascertain the relative efficiency of emerging equity markets through the implementation and assessment of a number of hypothetical pricing models and their ability to predict share returns based on historical information.

This testing of return predictability, as formalised in the work of Fama (1991) in the context of this thesis, aims to employ both firm-specific or style factor and macroeconomic influences to attempt to forecast share returns. By defying conventional work that defines a share's beta to the market as the lone priced risk factor, this study aims to establish whether the above style and macroeconomic effects are able to provide additional risk-based explanations concerning return variation over and above those posited by the CAPM and APT.

A significantly broad sample of emerging market nations is tested comparable to the largest studies like that of Rouwenhorst (1999) who included twenty emerging market countries. A list of forty-six style factors and fifteen macroeconomic variables were selected. Selection of variables was based on a combination of evidence from prior research and through hypothesized economic relationships as mentioned in Kennedy (2003) in order to avoid any potential data-snooping bias. The combination of a sample with large scope and numerous testable factors will hopefully provide the maximum likelihood for the discovery of significant relationships that may lend themselves to having some predictive power.

Both style and macroeconomic effects are tested independently for explanatory power over the cross section of share returns. The influence of each set of characteristics is then compared in light of their ability to formulate models able to predict the cross section of returns. Significant characteristics are then jointly tested in order to form a hybrid model that seeks to optimize explanatory power.

Notably, research of this nature is in no way as well documented or complete as that found in developed markets. There are notable gaps in certain areas of the dataset and this is somewhat of a cause for concern for the inferences to follow on the models to be output. (Appendix A.2) The author is indeed conscious of these pitfalls and made and documented any necessary data refinements in order to ensure accurate and robust testing and result generation.

All considered the finding of significant, exploitable style and macroeconomic effects in markets about which substantial knowledge has not yet been accumulated may in fact have far reaching consequences. Practical application of such constructed models in industry may provide assistance to equity analysts and portfolio managers alike in the areas of efficient portfolio selection and portfolio evaluation.

1.4 Thesis Organisation

This paper comprises a total of eight chapters. Chapter 2 provides the reader with an overview of modern finance investment theory in order to more suitably contextualise the study at hand. Well established theoretical foundations such as mean variance analysis, the Capital Asset Pricing Model and Arbitrage Pricing Theory are assessed in conjunction with

market efficiency. Critiques of the aforementioned theories in terms of style and macroeconomic influences are then documented in the context of both developed and developing markets.

A closer look at these so called ‘style’ and ‘macroeconomic’ influences then follows in Chapter 3 focused on prior work in global markets. Style effects such as Size, Value and Liquidity evident in developed markets are mentioned and compared to the results of comparative analyses in emerging nations to assess the pervasiveness of such effects across all markets. Thereafter the chapter considers the broader influence of a range of developed market macroeconomic variables and their ability to explain the cross sectional variation in returns in both developed and developing markets.

Chapter Four outlines the majority of the dataset that aims to be tested in this study. Stock Return and firm specific datasets are identified and modified sufficiently in order form the basis of the testing procedures to follow in Chapter Five, Six and Seven of this paper. All relevant data sources are discussed in detail with proposed data manipulations documented and potential biases prevalent considered.

Chapter Five assesses the ability of constructed Single and Multi-Index models to explain the time-series variation in share returns. The models are constructed using identified market proxies and predictive factors with the single index model following a CAPM formulation and the multi-index model a predefined APT specification. Both unadjusted and risk-adjusted stock returns (CAPM and APT risk) are used in replicating the methodology of Fama and Macbeth (1973) whereby chosen firm-specific attributes’ cross sectional explanatory power is assessed. Those monthly payoffs of those factors identified as having some predictive power over returns are then further scrutinized using a correlation matrix in order to remove the redundancy. Tests of style consistency and randomness then follow in order to ascertain the robustness of such influences.

Chapter Six introduces a range of developed market macroeconomic influences that have historically shown some relation to returns. As in Van Rensburg (1999) variables are adjusted for stationarity using the Augmented Dickey Fuller Test. Those factors found to exhibit stationarity are then correlated with each other and a number of global market influences in order to gauge their explanatory ability. Thereafter the remaining factors are univariately tested following the method employed in Fama and Macbeth (1973) which tests the historic exposures to these factors in explaining the cross sectional variation in share

returns. Careful consideration follows in ascertaining whether or not these factors are in fact 'priced' risk factors.

Chapter Seven seeks to construct a multifactor style-characteristics model in which all the factors remain significant in the multivariate framework. Thereafter the applicability of the previously documented influences is further explored through the crafting of a range of expected return models based on a series of autoregressive formulations. A variant of the methodology of Haugen and Baker (1996) is employed whereby a stepwise procedure is implanted in an attempt to attain model that is able to use controlled monthly slopes to forecast share returns.

Chapter Eight then presents a summary of the results evident in Chapters Five to Seven. A final conclusion is composed and some potential extensions and areas for further research considered

Theoretical Overview

“It is, of course, possible that the apparent empirical failures of the CAPM are due to bad proxies for the market portfolio...The true market portfolio will cast aside the average return anomalies of existing tests and reveal that β suffices to explain expected return.”

-Fama and French (1996, p. 1596)

2.1 Introduction

The accurate determination of security prices and their associated returns has been a fascination in the minds of experts and novices alike whenever the investment decision arises. Knowing that returns and prices follow defined patterns provides a degree of comfort to the investor in reducing uncertainty and creating the chance for prosperous trading. However, the true nature of the behaviour of stocks is still somewhat elusive with no one to date able to make investment decisions with absolute certainty based solely on public information.

The aim of this chapter is to present an overview of the key theoretical aspects relating to market efficiency and asset pricing theory in order to set the tone for the empirical investigation to follow. Firstly a discussion of what constitutes informational efficiency in financial markets is presented, after which the testing of established hypotheses is discussed at length. Asset pricing theory relating to the CAPM (Capital Asset Pricing Model) is then introduced with theoretical explanations for inconsistencies in the model's predictive power subsequently presented. Alternative asset pricing models are then examined and 'style' is more comprehensively defined with a brief summation and conclusion to end the chapter.

2.2 Market Efficiency and the Efficient Market Hypothesis

Fama (1970) alludes to the fact that the market should be an efficient allocative mechanism and so provide investors with appropriate signals so as to bring about correct resource allocation. In order to have this trait markets are assumed to “fully reflect” all available information and thereby termed ‘efficient’. A number of models are specified to more rigorously define this admirable trait that markets are thought to exude.

Expected Return or “Fair Game” models are specified as follows:

$$E(p_{j,t+1} | \Phi_t) = [1 + E(r_{j,t+1} | \Phi_t)] p_{j,t} \quad (2.1)$$

Where E is the expected value operator

$p_{j,t}$ is the price of security j at time t

$p_{j,t+1}$ is the price of security j at time $t+1$ (with reinvestment of any intermediate cash income from the security)

$r_{j,t+1}$ is the single-period return $(p_{j,t+1} - p_{j,t}) / p_{j,t}$

Φ_t is a general symbol for the set of information which is assumed to be ‘fully reflected’ in the price at time t

$\sim$ is an indication that $p_{j,t+1}$ and $r_{j,t+1}$ are random variables at time $t+1$

It is worth noting here that it is implicitly assumed that the conditions of market equilibrium can be represented in terms of expected returns.

Simply put, all information in Φ_t is fully reflected and utilised when determining equilibrium expected returns. Furthermore, such a theoretical standpoint has critical empirical implications whereby if this justification holds there can be no form of trading system or method based on Φ_t that can generate returns in excess of equilibrium. This can be represented as follows:

$$x_{j,t+1} = p_{j,t+1} - E(p_{j,t+1} | \Phi_t) \quad (2.2)$$

Where $x_{j,t+1}$ is the excess profit on security j at time $t+1$, then:

$$E(x_{j,t+1} | \Phi_t) = 0 \quad (2.3)$$

Hence, by definition, the sequence $\{x_{j,t}\}$ is a fair game with respect to the information series $\{\Phi_t\}$. Now let:

$$z_{j,t+1} = r_{j,t+1} - E(x_{j,t+1} | \Phi_t) \quad (2.4)$$

Where $z_{j,t+1}$ is the excess return on security j at time $t+1$, then:

$$E(z_{j,t+1} | \Phi_t) = 0 \quad (2.5)$$

Consequently, the sequence $\{z_{j,t}\}$ is also a fair game with respect to the information series $\{\Phi_t\}$.

Fama (1970) shows that regardless of the trading system employed provided all trades are made on the basis of prices being fully reflective of all information, the expected excess return on any stock will always be zero.

Two variations of the above model that have more significant implications concerning empirical testing are the Submartingale and Random Walk Models.

The Submartingale Model as defined in Fama (1970) states that the expected price of a stock in the following period considering the information available in the current period is greater than or equal to the price in the current period. In the appropriate notation:

$$E(p_{j,t+1} | \Phi_t) \geq p_{j,t} \quad (2.6)$$

In terms of returns, the equivalent statement may be specified as follows:

$$E(r_{j,t+1} | \Phi_t) \geq 0 \quad (2.7)$$

The Random Walk Model is also mentioned in Fama (1970) but originally considered by Kendall (1953) describing stock price movements as random and unpredictable. Fama (1970) expanded on work by Kendall (1953) and formalised what characterises a random

walk as being the instance when the returns on shares have both their marginal and conditional probability distributions being one in the same. This is specified as follows:

$$f(r_{j,t+1} | \Phi_t) = f(r_{j,t+1}) \quad (2.8)$$

Expanding on the notion of prices ‘fully reflecting’ available information, this model addresses the very nature by which prices become fully reflective. It is assumed that successive price changes are independent and identically distributed so constituting a random walk. The Random Walk model is therefore just an extension of the Expected Return or ‘Fair Game’ model in that it provides a more detailed justification of the market environment and overall pattern of return generation.

Fama (1970) uses the fair game model and its special cases, the random walk and submartingale models, to empirically evaluate the Efficient Market Hypothesis (EMH).

2.3 Market Efficiency

Fama (1970) defines a number of sufficient conditions for market efficiency as follows:

- (i) no transaction costs for trading securities
- (ii) all available information is costlessly available to market participants, and
- (iii) all market participants agree on the implications of current information for the current price and distributions of future prices of each security.

With such conditions in place a market is deemed efficient, with prices fully reflective of all available information. However, such a strong form condition holds little weight in a real world market environment. An alternative more logical condition is suggested by Jensen (1978) who stated that prices reflect all available information to the point where marginal costs are equal to the associated marginal benefits of acting upon such information. Indeed, - many variants of the core axiom may be offered which may indeed be reasonable, however with every variation so cognisance of these adjustments must be taken prior to interpreting any results as being efficient.

Tests of Market Efficiency:

As is the case with any hypothesis, its true worth is gauged when it is rigorously applied and tested in some manner or form either empirically or theoretically. Tests of market efficiency have been sub-categorised into three groups in order to estimate at what point the information breaks down and the hypothesis falters.

Weak form Tests

Weak form tests or tests of return predictability, attempt to establish whether in fact past returns are effective predictors of future return behaviour. This area of testing explores the cross section of stock returns and seeks to find predictable patterns therein in order to generate accurate forecasts of future returns. Anomalies such as firm size and book-to-market effects fall under this ambit of return predictability with seasonal traits in stock returns such as the Monday or January effect also classified under the same ambit of research.

In addition to these results certain other methodological characteristics were found that have ramifications for the integrity of results generated. Lo and MacKinlay (1988) and Conrad and Kaul (1988) find evidence of more profound return variation in portfolios rather than individual stocks with the diversification benefits of portfolios cited as the chief cause. Furthermore, French and Roll (1986) discover that returns are far more variable when the market is open, also inferring that neither pricing errors nor the resultant noise trading that results are not sufficient causes for differences in trading and non-trading variances.

Fama (1991) concludes that the predictability of returns from past information is indeed a plausible outcome. Recent studies as indicated find apparent patterns in returns in both short and long term investment horizons, with longer term relationships being somewhat more striking and of interest to academics and practitioners alike.

Semi Strong Form Tests

Also termed 'event studies' these tests attempt to measure the speed at which information is incorporated into stock prices. The tests simply infer that there exists no prediction error in prices post the publication of financial information. Therefore, no abnormal returns can be earned as prices adjust immediately to reflect new information, as per equation 2.5:

$$E(\varepsilon_{i,t+1} | \Phi_t) = 0 \quad (2.9)$$

The methodology provides a clean means of measuring the precise rate at which prices adjust so giving a clear indication of the degree of efficiency in markets. Such tests are the least plagued by the joint hypothesis problem, discussed infra, and according to Fama (1991), “... are the cleanest evidence we have on efficiency.”

Strong Form Tests

Strong form tests or tests of private information, attempt to establish the almost assumed merits of insider trading. Simply put such examinations seek to ascertain whether or not corporate insiders are able to generate consistent abnormal returns through acting on information that is privy only to their eyes by virtue of their close association with the firm.

More recent evidence, post 1970, has found signs of market inefficiency on account of insider trading. However, these consistent abnormal returns generated may not be primarily the result of such illegal trades but more so due to inaccurate model specification. Both Banz (1981) and Seyhan (1986) present convincing arguments that support inefficiency on account of the employed model being a poor predictor of the risk-return relationship.

As is most apparent from at least two of the above three tests, tests of market efficiency and their associated results are in fact highly sensitive to the testing procedure. More specifically, tests of market efficiency are in fact joint tests of the soundness of the methodology employed. This quandary is termed the joint hypothesis problem and will be discussed in more detail in a later section.

2.4 Asset Pricing and the CAPM

In early work by Markowitz (1952) he puts forward the first theoretical justification for a defined relationship between risk and return that later forms the basis for the construction of now widely used asset pricing models. The notion of investors being solely concerned with return maximisation is rejected, with the undesirable factor defined as ‘risk’ negating such a rule. Risk is noted as the ‘variability in returns’ or dispersion of security returns around their

mean. It is this variance that through comparison with the associated level of expected return is shown to form the basis of investment appraisal.

Investors will be pleased if they acquire investments that offer the highest level of return and are of minimum variance or lowest risk. From this a simple rule of thumb is derived whereby investors base decisions on a combination of expected return and risk. Simply put, investors prefer higher returns to lower returns given a level of risk and prefer less risk to more risk for a certain level of expected return.

From this Markowitz (1952) rigorously defined what he termed efficient assets or efficient portfolios of assets. These have the characteristic of being 'mean-variance efficient', providing the highest level of return for an associated level of risk. He embraces the concept of diversification which entails the holding of groups of securities that are uncorrelated with each other in a portfolio, so enabling investors to earn higher returns for the same level of risk. Diversification serves to create a defined number of mean-variance efficient portfolios which are collectively termed Markowitz's 'efficient frontier'. The frontier represents all possible combinations of stocks that yield maximum returns for a given level of risk and so allow investors to locate thereupon on the basis of their degree of aversion towards risk.

The Capital Asset Pricing Model

This theoretical foundation is the basis for work by Sharpe (1964) and many others that attempted to establish a model for the pricing of assets in the market. In this work Sharpe (1964) postulates a similar 'efficient frontier' but adds the concept of a risk free asset to the opportunity set available to the investor. This addition serves to create the framework for the Capital Asset Pricing Model, which is often termed the Sharpe-Lintner-Mossin CAPM due to the similarity in the work of the researchers at the time of study.

Deriving the CAPM

The CAPM attempts to model prices through a theoretical construct that draws upon the principle relationships between risk and return as laid down by Markowitz (1952). The model has certain core assumptions that serve to simplify the behaviour of capital markets. These assumptions have been critiqued for being flawed in that they are excessive abstractions from reality, however it can be considered a reasonable starting point in model formation. The CAPM in addition to adhering to the assumptions of Markowitz (1952) has the following additional considerations:

- Investors follow mean-variance analysis when evaluating investments, are rational and exhibit risk aversion
- There are numerous investors, each with an individual holding which is of minimal size thus negating their influence on the market
- Investors are able to borrow and lend at the risk free rate
- No transaction costs or taxes are present – markets are frictionless
- Assets are infinitely divisible and may be held in any proportion in the portfolio
- Assets are considered tradable at market prices
- Investors have homogenous expectations of returns, co variances, etc

With these assumptions it is possible to establish what combination of assets investors will choose to hold in expected return/risk space. By virtue of the assumption of riskless lending and borrowing, investors can now hold various combinations of the risk free and risky assets in accordance with their degree of risk aversion. Graphically these combinations are grouped into a construct named the Capital Market Line, which is further developed upon when the concept of the ‘market’ portfolio is introduced.

The CML models the expected return of a portfolio of risky assets:

$$E(r_p) = r_f + \frac{\sigma_p}{\sigma_m} [E(r_m) - r_f] \quad (2.10)$$

Where $E(r_p)$ is the expected return on the portfolio of risky assets

$E(r_m)$ is the expected return on the market portfolio

r_f is the risk-free rate of return

σ_p is the standard deviation of the portfolio of risky assets

σ_m is the standard deviation of the market portfolio

Investors maximise their utility by holding in combination the riskless asset and the portfolio of assets at the point of tangency between the CML and the Markowitz efficient frontier, namely the ‘market’ portfolio. This portfolio is one in which all risky assets are included in proportion of their market value and so is therefore fully diversified.

As stated in Markowitz (1952), diversification carries the benefit of reducing unsystematic risk to zero until all that remains is systematic risk. Therefore, the total risk measures of variance and standard deviations are no longer the preferred measures of risk as they contain diversifiable risk. Only an asset's systematic risk, more precisely its co-movement with the market portfolio is its true measure of risk in equilibrium. As there is no reward for bearing unsystematic risk, rational investors will seek to gauge risk solely on the grounds of systematic risk. The CAPM formulation considers only systematic risk in its computation of the expected return on a portfolio given the return on the market portfolio and the risk free rate.

The CAPM relationship is also termed the Security Market Line (SML) and is depicted as follows:

$$E(r_i) = r_f + b_i [E(r_m) - r_f] \quad (2.11)$$

Where $E(r_p)$ is the expected return on the portfolio of risky assets

$E(r_m)$ is the expected return on the market portfolio

r_f is the risk-free rate of return

b_i is the security's covariance with the market standardised by the expected variance of the market portfolio's returns

As can be seen this formulation builds on the CML through re-specifying the associated measure of risk from total to systematic risk.

$$b_i = \frac{Cov(r_i, r_m)}{\sigma_m^2} \quad (2.12)$$

The CAPM is an equilibrium asset pricing model, and through the use of mean-variance efficiency, the following conditions are expected to hold when in equilibrium:

- (i) Beta (b), the sensitivity of security i to the market portfolio, the sole measure of systematic risk needed to explain return behaviour.
- (ii) There is a positive premium for the burden of Beta (b) risk

As can be seen, (ii) is justified as being an endorsement of the CAPM provided the relationship in (i) holds.

As previously mentioned, the CAPM is constrained in its applicability by virtue of the harsh assumptions that establish its theoretical foundation. However, irrespective of these limiting axioms, it should still be acknowledged as the first effective model detailing the behaviour of capital market returns in equilibrium.

Empirical Testing using the CAPM

The CAPM is a model that is focused on expected or ex ante returns. In reality expected returns are not directly observable, however actual or ex post returns are directly measurable. Therefore in order to translate the CAPM into a practical model the use of a Single Index model is employed in order move from expected to actual returns.

Such a model would be specified as follows:

$$(r_{i,t} - r_{f,t}) = \alpha_i + \beta_i (r_{m,t} - r_{f,t}) + \varepsilon_{i,t} \quad (2.13)$$

Where $r_{i,t}$ is the observed realised return on asset i at time t

$r_{m,t}$ is the observed realised return on the appropriate market index at time t

$r_{f,t}$ is the risk-free rate of return at time t

α_i is the excess systematic return on asset i , unaccounted for by beta

β_i is the sensitivity of the excess return on asset i to the excess return on the market

In order to employ such a model as a proxy for the CAPM, two additional assumptions must hold namely, returns must be stationary over time and the chosen index must be an accurate reflection of the true, unobserved market portfolio.

2.5 The Joint Hypothesis problem

In testing the efficiency of any market it has been established that some form of Asset Pricing Model needs to be employed as a computational guide. Therefore, if one were to employ the use of an erroneous, miss-specified asset pricing model assertions regarding the efficiency of the tested market would be flawed.

Roll (1977) inferred that market efficiency is in fact not directly testable due to this problem. On account of the composition of the market portfolio being unknown, empirical studies employ the use of a seemingly adequate proxy, be it an index or some alternative construction to act as an aggregate for the market. Roll (1977) states that if this market proxy doesn't represent all stocks in the true market portfolio and is mean variance efficient when in fact the true market portfolio is to the contrary or vice versa, no form of accurate testing may be carried out. He states that the only testable hypothesis is that the market portfolio is mean-variance efficient.

An inaccurate market proxy for the market portfolio will serve to contribute to the incorrect estimation of the beta. Flawed beta estimates will serve to generate flawed returns and so make any attempt at inferring the presence of an efficient market somewhat flawed.

2.6 The Arbitrage Pricing Model (APT)

The CAPM assumptions are onerous and whilst providing tractable solutions and very appealing linear relationship between risk and return, the model as a whole is found wanting when applied empirically. The Arbitrage Pricing Theory of Capital Asset Pricing (APT) was developed by Stephen Ross as an alternative to the CAPM. The APT has fewer restrictive assumptions and is more general in terms of its scope, allowing for the formulation of multiple risk factors to describe return behaviour. However, as the APT is not a full proof alternative to the CAPM as it has considerable flaws of its own.

Deriving the APT

The following assumptions establish the theoretical framework within which the APT functions.

- (i) Perfectly competitive markets and frictionless trading (no transaction costs nor taxes)
- (ii) Investors are characterised by non-satiation (prefer more wealth to less wealth)
- (iii) Investors have homogenous beliefs as to the return generating process being as follows:

$$r_{i,t} = E(r_{i,t}) + \sum_{k=1}^K b_{i,k} f_{k,t} + \varepsilon_{i,t} \quad (2.14)$$

Where $r_{i,t}$ is the realised return on asset i at time t

$E(r_{i,t})$ is the expected return on asset i at time t

$f_{k,t}$ is the k^{th} risk factor that impacts on asset i at time t

$b_{i,k}$ is the sensitivity of the return on asset i to factor k

$\varepsilon_{i,t}$ is the unexplained residual return on asset i at time t

In this model all securities are affected by a set of common factors, with b_i representing the direction and magnitude of the security's sensitivity to each factor.

Risk in the APT is once again measured in terms of a systematic or undiversifiable measure for every security. In the context of the APT, systematic risk is defined as the co movement of security returns with a set of common factors instead of a market portfolio-Sharpe (1964). Through diversification, much like the CAPM the APT assumes a return on a zero-investment portfolio with zero systematic risk is zero in equilibrium. The model can therefore be restated in a fully diversified form:

$$E(r_p) = \lambda_0 + \sum_{k=1}^K b_{p,k} \lambda_k \quad (2.15)$$

Where λ_0 is the expected return on a portfolio p with zero sensitivity to all factors i.e. the risk-free rate of return

λ_k is the risk premium associated with any of the common factors f

$b_{p,k}$ is the sensitivity of the return on portfolio p to factor k

However, the APT does have one significant shortcoming in that it doesn't specify the identity of the priced risk factors. It is also common place for the number and nature of these risk factors to change over time in response to a variable economic environment. Considering these above statements there exists a large amount of room for specification error when formulating and applying the model empirically.

Estimating the Factors for the APT

There are two main methods employed to determine the priced factors for the APT. The first is termed ‘factor analysis’ and entails the derivation of factors as statistical constructs based on the degree of correlation present with asset returns. The chief concern with using this approach as expressed by McElroy and Burmeister (1988) is- “The primary economic difficulty with the factor analysis approach is that the factors do not have any clean economic interpretations because they cannot be directly associated with macroeconomic variables.” This critique however is somewhat nullified by Van Rensburg and Slaney (1997) who employ a factor analytic procedure upon JSE shares and sub indices. Sub Indices, which relate to component sectors on the exchange, provide the interpretable substance that previous approaches lack, with those that have the highest loadings being used to formulate a generalised model

The alternative method employed in order to obtain the priced factors for the APT is termed the ‘pre-specified variable’ approach. This method selects variables for inclusion based on their overall economic relevance and significance with respect to the sample under scrutiny. More often than not certain macroeconomic variables are selected to be included in the model such as inflation and changes in interest rates. This approach, although seemingly more intuitive and general also has a number of short comings. As alluded to by Robertson (2002), there exists no theoretical foundation by which to specify such a model-it is seemingly sample specific and at the discretion of the researcher. The vagueness that exists serves to cast doubt on the model in an empirical setting. A model that is so changeable across varied samples is prone to the generation of spurious relationships with the associated factors being in essence meaningless an occurrence formalised in a study by Fama (1991) as factor dredging.

Similar to the CAPM, the APT model is a statement about ex ante (expected) returns. When moving from expected to realised returns, the Multi-index model is therefore employed:

$$(r_{i,t} - r_{f,t}) = \alpha_i + \beta_{factor1,t}(r_{factor1,t} - r_{f,t}) + \beta_{factor2,t}(r_{factor2,t} - r_{f,t}) + \dots + \beta_{factorK,t}(r_{factorK,t} - r_{f,t}) + \varepsilon_{i,t} \quad (2.16)$$

The assumptions of the APT state that the expected value of α_i is zero for all securities. The Multi-index model however holds that the realised value of α_i should average out to zero for a sample of historical observed returns. Again, the sample α_i values should be independent from one sample period to the next.

As can be seen from above the vast majority of literature on the APT is concerned with attempting to ascertain the optimal approach for the accurate specification of the priced factors. Many researchers have indeed found the APT formulation to yield improved results to that of the CAPM, however as previously mentioned such a formulation is prone to the generation of spurious relations and priced factors with no meaning. Therefore, one should be wary in preferring any one asset pricing model to another - both the pros and cons of the various approaches should be considered on a relative basis in light of results generated.

Literature Review

"The search for truth is more precious than its possession."

-Albert Einstein (1879-1955)

3.1 Introduction

The term emerging market is bandied about often these days, with the precise definition and context often left vague and unbounded. In order to provide focus to such a term Antoine W. van Agtmael of the International Finance Corporation of the World Bank in the late twentieth century explained an emerging, or developing, market economy as being defined as an economy with low-to-middle per capita income. It is purported that such countries in fact constitute approximately 80% of the global population, representing about 20% of the world's economies. Emerging as a word has connotations of some form of dynamic, which holds true as an emerging market as a country is one often embarking on an economic reform program that will lead it to stronger and more responsible economic performance levels, as well as transparency and efficiency in capital markets.

Financial Market Liberalisation in an Emerging Context

Emerging Markets by virtue of their very definition are dynamic nations, somewhat more volatile than the more established countries of the globe. Increased financial liberalisation concerning the implementation of improved trading regulations, opening of markets to foreign investment and fastening of numerous other control mechanisms have had significant implications in altering the behaviour of emerging markets.

As put forward in a study by Bakeart and Harvey (2000), there is significant doubt as to the degree of merit associated with the increased involvement of foreigners in emerging markets from a domestic perspective. Foreign speculators are blamed for increasing the inherent market volatility of emerging nations due to their habit of frequent surprise withdrawals that leave markets reeling. Such behaviour serves to stunt growth in such markets and hamper the implementation of effective trade liberalisation processes.

Furthermore, the effects of such capital market liberalisations on the viability of emerging nations from the perspective of institutional and fund investor is somewhat hazy as a result. Greater market integration on a global scale serves to increase the cross correlations between those markets considered emerging and the more established developed nations. This increased co-movement implies reduced benefits from the pursuance of an internationally diversified investment strategy and so downplay the attractiveness of opportunities in emerging markets as alternative portfolio allocations.

3.2 A Brief Review of findings in the US and developed markets

Evidence of style based anomalies has been somewhat abundant in studies conducted in financial markets that are considered adequately controlled and regulated such as the US.

The size effect or small firm effect is common in developed markets as identified by Reinganum (1980), Banz (1981), Banz and Reinganum (1981), Keim (1985), Kleidon and Marsh (1982), Fama (1991), Fama and French (1992). Furthermore, Stattman (1980) and Rosenberg, Reid and Lanstein (1985) find evidence of a 'value' or book to market effect later endorsed by the studies of Fama (1991), Fama and French (1992) and Chan and Lakonishok (2000). In addition a positive dividend yield effect is also alluded to in work by Litzenberger and Ramaswamy (1979), Blume (1980) and Keim (1985). Jegadeesh and Titman (1993) document a relative strength strategy related to the momentum of stocks returns and Bhandari (1988) finds a significant debt-equity effect.

Fama and French (1996) also study the impact of earnings to price, cash flow to price and sales growth on returns finding little significance refuting the results of Basu (1977) who found a considerable price to earnings effect. Du Bhandt and Thaler (1985) uncover a pattern of reversal in long term returns.

These style characteristics as with any academic assertion have not been wholeheartedly assimilated into the world of finance, at least not without some close scrutiny.

Chan and Chen (1988) infer that incorrect beta estimation can serve to create spurious size effects as in Banz (1981), who himself along with Kleidon and Marsh (1982) acknowledges the inherent instability of the effect over time. Roll (1981) cites autocorrelation and

infrequent trading as the root causes of identified small firm effects with Jegadeesh (1992) seeking a risk adjusted explanation of the size anomaly. However in testing the validity of these anomalous return effects, support for their existence has mounted. Chan, Lakonishok, Jegadeesh (1995) rule out selection bias as being a cause of the value effect with La Porta and Lakonishok (1997) considering expectational errors in the anticipation of announcements the root cause.

Ultimately from a practical perspective, the identification of these style anomalies are only valuable if one is able to make significant, even abnormal gains through investment strategies focused on these specific firm attributes. Mutual Fund managers and the like can form well defined portfolios comprising of small stocks or low P/E's and so exploit a more favourable return generating process. However, as documented in Banz (1981), Kleidon and Marsh (1982) not all of these effects are consistent over time even in a developed market context providing the investor with somewhat of a quandary.

Studies of such anomalies have been somewhat lacking in an emerging market context, perhaps due to lack of data availability or even fading interest. In recent time however a number of credible studies have been performed that serve to identify these characteristic anomalies in less regulated emerging financial markets. With this in mind a review of pertinent literature in such markets termed emerging would be most apt, aiding in the preliminary determination of the investment potential of such locations.

3.2.1 Explanations of CAPM style anomalies

3.2.2.1 Arguments for investor irrationality

The assumption of the investing agent being a perfectly consistent rational actor has been called into question as investors are subject to bouts of irrational behaviour that influence fellow investors who are seemingly rational, which in turn serves to change the underlying dynamic of the market.

In Basu (1977) a significant P/E effect is discovered whereby stocks with low P/E's outperform those with high P/E's on a risk adjusted basis. This phenomenon is explained by considering the overreaction of investors to changing market prospects. Investors tend to overestimate the attractiveness of high P/E stocks based on their future earnings forecasts and

underestimate the viability of low P/E stocks. Therefore the price of High P/E stocks are bid up becoming overvalued, while those of low P/E stocks are biased downwards and ultimately undervalued. Investors exaggerated expectations of earnings growth in High P/E stocks result in great losses when the desired growth rates are not achieved and rapid selling off takes place resulting in a downturn in performance of high P/E stocks. Simultaneously, low P/E stocks which have been undervalued are now more attractive and so, through increased buying, results in improved returns in excess of expectations.

Chan and Lakonishok (2000) also state that it is often the case that investors behave in extremes, they either under or over react to different situations. The prevalence of the value premium is discussed and how in fact such an anomaly came into being. It is perceived that investors became excessively excited in the wake of the arrival of new improved technologies and so over extrapolated the performance of growth stocks into the future. Over-investment served to bid prices of growth stocks up stamping out any potential gains to be had whilst value stocks fell out of favour, prices fell and returns rose creating a sustainable value premium in the long run. Therefore, it is plausible to assert that such unconventional behaviour by investors serves to create such return anomalies and sustains them over an extended period.

3.2.2.2 Arguments for investor rationality

There are two arguments to be considered here, firstly that investors are indeed rational and that it is mere misspecification of the selected asset pricing model that creates such style anomalies on account of size and other such effects being proxies for unexplained risk factors. This view is supported through empirical testing by Fama and French (1992) - and - Ball (1978). All find that beta is inadequate in explaining the commonplace risk return relationship in modern finance theory. However there are a number of hypotheses to the contrary that seem to refute such a position.

3.2.2.3 Arguments for methodological bias

This addresses the concern the anomaly studies have either inaccurate, mined data or employ faulty methodologies in attempting to model return behaviour.

Chan and Chen (1988) cite the improper estimation of risk in terms of beta as the ultimate cause of the firm size anomaly in the tested sample. A risk adjusted explanation of the size

effect is provided through the use of a multifactor APT instead of the single factor CAPM employed in Banz (1981). Therefore, incomplete methodologies contrive to explain the exposition of such anomalies.

Another methodological concern is expressed by Chan, Lakonishok, Jegadeesh (1995) who focus on selection bias and its impact on style based analysis. Selection bias relates to the chosen sample to be used in analysis being somewhat restricted and bias with regards to its composition. Such a dataset will contribute to the generation of spurious correlations and so produce seemingly significant results that are in fact not a true reflection of the behaviour of the population. Chan, Lakonishok, Jegadeesh (1995) seek to explain the differing returns between value and growth stocks as being the result of selection bias. A comparison of the CRSP and Compustat databases over a range of sample periods indicate a number of discrepancies between the respective data sources, however the identified value anomaly still persists and so a dispute of the value premium is unfounded on the grounds of selection bias in the context of developed markets.

3.3 The CAPM and APT in an Emerging Market context

Tests of the CAPM and APT in an Emerging Market context have been relatively scarce since the formulation of such models and the defining of certain countries as emerging. The chief reason for the lack of substantial literature in this regard is mainly due to problems with sourcing of adequate data. Information on emerging market nations has been quite scarce up until the late nineties making rigorous study difficult. Furthermore, many emerging nations have restrictions on foreign ownership and various trade regulations concerning outsiders - this suggests that even if research is to be undertaken the practicality of such studies would be limited.

3.4 Style Anomalies in Emerging Markets

3.4.1 *Earlier Seminal Work*

Tests of well established asset pricing models such as the CAPM in an emerging market context have provided somewhat varied results. In earlier work by Claessens, Dasgupta and

Glen (1995), nineteen emerging countries were studied and a number of anomalies were found that serve to undermine the theoretical construct that is the CAPM. Strong evidence favouring the influence of both firm size and trading volume on the predictability of stock returns is most evident. Dividend yield and earnings to price ratios are somewhat less significant, however it is not the strength of the relationships found that is of most interest but the signs of each relation. A positive size effect and a negative price to book effect are discovered in direct contrast to studies by Fama and French (1992), Reinganum (1981), Banz (1981) on more developed US markets.

These results however are not entirely convincing. The model used to estimate such relations serves to aggregate the data over the sample period detracting from the effectiveness of any lagged specification or dynamic intent regarding style timing. The constructed aggregation technique employed seems to exaggerate identifiable relations in terms of both size and value effects and so introduce a degree of bias. Furthermore, the multivariate analysis employed contains factors that are excessively collinear inhibiting the interpretation of the generated regression coefficients.

However, in a similar study by Patel (1997) using a methodology comparable to that of Reinganum (1981) and Jaffe, Keim and Westerfield (1989) construct portfolios based on price to book, price to earnings or size in measuring return predictability in eleven of twenty two identified markets. Firms in the lower half and lowest third of these portfolios are found to produce statistically significant excess returns over a recalculated total return index, concurring with results in conventional, developed markets. In addition the authors pose some pertinent questions as to the impact of changes in the regulatory environment and the implications on the robustness of certain firm specific effects. Apparent weaknesses in methodology cited in the paper include no adjustment being made for thin trading and the use of averaged portfolio betas. These factors may result in potential estimation bias and so detract from the credibility of the results.

In a more recent study, Rouwenhorst (1999) employs a similar portfolio construction methodology across a wider sample of twenty candidate countries and finds results that cohere with developed markets at a country-specific level. In addition to the size and value effects discovered it is asserted that emerging market equities exhibit a significant degree of price momentum. Furthermore it asserted that risk premia cannot be explained by exposures to the global market, with the associated low correlations between country return factors

indicating that premiums are locally/country orientated. Momentum portfolios are constructed based on prior six month returns in line with Jegadeesh and Titman (1993) and contribute to explaining additional anomalous return behaviour.

In a multivariate setting ranked factor portfolios diversified across the twenty markets are regressed against the MSCI world excess market return and the Fama-French (1998) High minus Low Book-to-Market portfolio in order to gauge global risk exposure. Sizeable excess returns are observed for all three factors concerned, with Size and Book-to-Market being the most statistically sound. More importantly for practitioners are the associated low pair-wise correlations between countries and regions. Potential for the construction of well diversified, successful style portfolios that are part emergent maybe a feasible outcome of such research.

From a methodological perspective, weighted portfolio construction is cited as somewhat preferable to the cross sectional regression approach of Fama and Macbeth (1973), specifically in an emerging market context. Short selling restrictions in many emerging market nations make the above mentioned unconstrained approach less viable so lending support to the defined portfolio construction method employed. Concern is also expressed with regards to the estimation of pre-ranking betas in the context of the markets studied. As is well documented, emerging markets are inherently volatile and so these pre-ranking betas, if estimated in error will have low correlation to post-ranking returns.

Liquidity is an additional style characteristic that is becoming evident in increasingly more cross-sectional return studies and is most relevant in emerging markets where investor uncertainty is far higher. Rouwenhorst (1999) studies share turnover as a proxy for liquidity and forms ranked portfolios in this regard to test for any anomalous behaviour. Unlike in Claessens, Glen and Dasgupta (1998) where a positive relation was found between seventeen of nineteen countries studied, Rouwenhorst (1999) found that there was little significant difference in returns of high and low turnover stocks. However, when stocks were grouped into the earlier established factor portfolios - size, value and momentum, - turnover effects became significant. It is discovered that data inclusion techniques create considerable sample bias that serve to generate such spurious relations and so amplify the impact of liquidity on return behaviour as in Lo and Wang (1997).

Fama and French (1998) test the pervasiveness of the value premium across a range of international markets including those considered emerging. Constructing book to market,

earnings to price, cash to price and dividend to price portfolios it is found that both single and multifactor asset pricing models were unable to explain value premia for global and country specific analyses. The study sources data from the MSCI database which accounts fully for firms that may have delisted over the sample period so negating the impact of survivorship bias. In an emerging market context the identified value premium is found to be significant and positive, again in direct contrast with Claessens, Dasgupta and Glen (1996) who find a reversal of such an effect. Further confirmation of developed market studies Banz (1981), etc. arose with the authors finding a statistically significant small firm effect. A shortened sample period and the high volatility of emerging market returns are cited as cautions with regards to excessive interpretation of asset pricing tests in emerging markets.

In a more focused study Chui and Wei (1998) analyse return behaviour in five Asian emerging markets. Firms are initially grouped into three distinct size portfolios which are then subdivided into nine groupings of stocks based on book to market ratios. The authors find no distinct relation between returns and market beta; however significant anomalous behaviour is found to be evident. Endorsing broader studies such as Rouwenhorst (1999), Fama and French (1998), both size and book to market effects are found to be effective in explaining return variation across the majority of the sample.

Summary of results from 1995-1999

Up till now evidence from emerging market style analyses have been somewhat conventional with little unexplained divergence from that of established market studies. The early work of Claessens, Dasgupta and Glen (1996) found relationships that seemingly defied convention, however the integrity of their analysis was later disputed by comparative studies. Patel (1997), Rouwenhorst (1999) and Fama and French (1998) all find significantly negative size and positive book to market effects. The above authors cite methodological differences and data sorting as the chief reason for conflict with earlier work. Fama and French (1998) identify the excessive inclusion of outliers and lack of portfolio formation as explanations for conflicting results. The use of a slightly reduced sample, differing sample periods and the inherent volatility associated with emerging markets are other plausible justifications.

3.4.2 More Recent Studies

In Serra (2000) weekly data is used to analyse similar risk factors and firm attributes across twenty one emerging markets. Correction for excessive serial correlation amongst factors, the presence of outliers and heteroskedastic behaviour were adjusted for accordingly. Market by market cross sectional regressions yielded somewhat surprising results, with only a single factor relation being correctly anticipated. Size, book to market, earnings to price and a constructed momentum measure all have relationships conflicting with established developed market literature.

The generation of such unexpected regression results may be indicative of the presence of significant co-movement between priced factors. Results do improve after firm attributes are lagged; however the significance of the regenerated t-statistics is reduced considerably. A small sample size in comparison with Claessens, Dasgupta and Glen (1996), Rouwenhorst (1999) and the like coupled with the possible inclusion of overly influential observations - Fama and French (1998) are further plausible explanations for the conflicting relationships generated.

Van der Hart, Slagter and Van Dijk (2002) attempt to determine optimal stock selection strategies through the use of an initially larger but subsequently well revised sample of emerging markets. After making adjustments to the sample for survivorship bias and insufficient market capitalisation the typical style characteristics were tested in portfolios rebalanced monthly and held for periods of six months.

Bekaert and Urias (1996, 1999) and De Roon, Nijman and Werker (2001) find that short selling restrictions are indeed relevant in an emerging market context. As a result Van der Hart, Slagter and Van Dijk (2002) employ a comparison between a 'winner' portfolio (one with conventionally favoured style attributes) and an equally weighted world index (EWI) in measuring excess returns. A zero cost strategy was also employed to aid in comparability with earlier research.

Earnings to Price strategies are found to generate significant excess returns comparable to Rouwenhorst (1999) in a univariate setting. Momentum effects are again discovered,

however the magnitude of their returns are considerably smaller than those uncovered in earlier studies of developed markets such as Jegadeesh and Titman (1993) and Rouwenhorst (1998). Surprisingly no small firm premiums were found as in Rouwenhorst (1999) and Patel (1998) with the authors citing the differences in data refinement as a potential contributing factor. Other strategies tested included liquidity and mean reversion which both produced unconvincing results. More interesting was the significance of the results based on analyst's earnings revisions which generated sound excess returns above that of the EWI and in a typical zero cost strategy.

A variation of the methodology employed by Lakonishok *et al.* (1994) and Chan *et al.* (1996) then followed tested a number of the more successful developed market stock selection strategies in a multivariate setting. Earnings to price, book to market, past six/twelve month returns (momentum), and earnings revisions for the current and next fiscal year (revisions) were appropriately normalised with the combination yielding superior excess returns. Furthermore, Van der Hart *et al.* endorse the findings of Rouwenhorst (1999), Serra (2000) with low cross correlations between countries indicative of the likely benefits of international diversification.

The robustness of this anomalous return behaviour in such context is later tested in Barry, Goldreyer, Lockwood and Rodriguez (2002), wherein skewness and selection bias are sighted as common pitfalls of analyses performed in emerging markets. An extended sample of thirty five emerging nations is used which are then grouped into portfolios and rebalanced annually. Again a pervasive book-market effect is found, however the size effect is found to be less robust. The work of Brown, Marsh and Kleidon (1983) in developed market studies portray a degree of scepticism with respect to size effects, inferring that the size anomaly is inherently volatile and on occasion reverses.

Aydogan and Gursoy (2000) studied a total of nineteen emerging markets in order to test for the prevalence of price to earnings and price to book return anomalies. Price to Earnings is transformed into its reciprocal for computational ease and returns looking forward are then established for three, six and twelve month time horizons. All firms are then pooled in the formation of earnings to price portfolios which are ranked in ascending order and subdivided into quintiles.

A closely aligned methodology to that of Fama and Macbeth (1973) is employed to gauge the explanatory power of such firm specific characteristics within an international CAPM framework. The standard beta coefficient is found to be insignificant, a progressive trend in both developed and emerging markets as per Fama and French (1992), Harvey (1991) - and Rouwenhorst (1999). In addition earnings to price and price to book are found to exhibit their expected relationships and do indeed have an influence of forecasting future returns. However, the statistical significance of the respective coefficients is found somewhat wanting especially over short term horizons detracting from the viability of the formulation of an investment strategy in light of the undertaken research. More promisingly though is the repeat finding of low correlations amongst sample countries when compared to their developed counterparts further suggesting the likely benefits from strategic international diversification.

De Groot and Verschoor (2002) perform a similar style based analysis on Asian emerging market countries to that of Chui and Wei (1998). The study extends the sample period analysed into more recent times providing coverage for significant economic events as documented by the authors. The methodology employed by Fama and Macbeth (1973) is implemented on an individual security basis with no portfolio construction deemed necessary. Strong pervasive size and book to market effects are found across the security returns in the chosen sample. Furthermore, the market to book variable is found to be relatively more prominent in the Asian context, a sign of value firms out performance and of possible interest to regional fund managers in the formulation of prospective investment strategies.

In a more focused study by Naranjo and Porter (2007) the benefits of including emerging markets in internationally diversified momentum strategies is scrutinised. Monthly country neutral relative strength portfolios are constructed ranked according to return from Thomson's Datastream (TDS) database for the period 1990-2004. Subsequent adjustments are then made for thin trading and survivorship bias leaving a sample of forty countries which includes eighteen that are considered emerging. Sizeable excess returns are generated from the employment of such momentum strategies in emerging markets which coheres with that of Rouwenhorst (1998) however the statistical significance of these effects is restricted to five of the eighteen emerging markets in sample. Standard single factor risk adjusted models with both country and global orientation are tested and provide little aid in explaining these abnormal returns. Furthermore in line with Serra (2000), evidence of a lack of co-movement

in share returns amongst emerging markets in country neutral portfolios is discovered. It also shown that diversification benefits extend to the holding of developed and emerging markets in combination rather than just assorted developed markets. It is ultimately determined that higher abnormal returns are generated from the pursuance of such diversified momentum strategies in an international setting.

Kargin (2002) uses a somewhat unique return generating methodology in testing for the presence of a number of style effects in an emerging market context. Value, Earnings to Price and Momentum are the chief effects tested through the use of a modified valuation model similar to that of Edwards and Bell (1961). This simple prediction method is then benchmarked against an investment strategy that involves having an equally weighted position across the sample. Significant excess returns are generated which are not unduly hampered by the presence of transaction costs. Ultimately, significant value effects are identified for those stocks seemingly undervalued irrespective of the low returns and high volatility that characterise emerging markets.

Gyung-Jan, Marthe and Shawky (2002) consider the impact of liquidity on stock price behaviour. In an emerging market context liquidity is found to exhibit a strong, positive relationship with share price performance. This relation is purported to be as a result of increased stock market liberalisation and its associated impact on economic growth which in turn positively influences liquidity. A sample of twenty seven emerging markets is studied from 1992 to 1999 sourced from the Emerging Markets Database. It is found that returns are positively related to liquidity as proxied by the turnover ratio, trading volume and a turnover-volatility multiple. These results expand on the results of earlier studies by Claessens, Dasgupta and Glen (1996) and Rouwenhorst (1999) in producing more definitive outcomes.

Desrosiers, Kortas, L-Her, Plante and Roberge (2004) analyse the potential gains to be earned from correctly timing the identified style anomalies. MSCI index data was used for a sample of twenty six emerging markets spanning a ten year period ending in 2004. Initially fixed investment strategies were implemented with relative strength and relative value strategies based on price to book and price momentum being pursued. They were found to generate considerably large positive excess returns in portfolio however these ignored the cyclical nature these style characteristics exhibit.

A statistically significant negative correlation was found between the two strategies prompting interest as to the most effective timing in the implementation of either strategy. The strategy is based on the relative risk aversion of the investor, which in turn is conditioned upon the success or failure of prior outcomes (Thaler and Johnson, (1990). Therefore after a fall in prices, a relative value strategy is pursued and subsequently after a rise in prices a relative strength strategy would be followed. The strategy which is revised monthly serves to produce a significant market risk adjusted return of 1.46% per month. This study shows promising signs of the benefits of style rotation in an emerging market context and aids in endorsing the current study's motivations and ambitions.

3.4.3 Testing for clusters of factors in emerging markets

In an emerging market context there does seem to exist areas of similar variability across certain nations. In the study performed by Van Rensburg & Acres (2006) it was found that there is a significant degree of clustering in terms of return behaviour amongst countries that are in close geographical proximity.

The cluster analysis, a technique that groups similar objects and which is described later in this paper, provided evidence of distinct differences in the behaviour of developed market countries relative to that of emerging nations. The emerging nations studied total twenty four countries, nineteen of which are included in this study. Two distinct clusters are formed, capturing firstly the variation of developed markets and secondly that variability inherent to emerging markets.

A principal components methodology was employed thereafter upon the monthly payoffs of the emerging market country indices in order to better assess the sources of variation in such a context. Such a methodology is preferred as it tends to produce uncorrelated factors and accounts for a greater percentage of variation of the chosen variables. After the above analysis is conducted it is found that emerging nations that are in close geographical proximity tend to exhibit similar degrees of variation. More specifically there exist three distinct regions of similarity, namely the Asian/Eastern region, Latin American and European Regions.

Such results do indeed serve to provide an enhanced perspective regarding market risk. The distinct clusters discovered that segregate variation and the associated low correlations across

developed and emerging nations serve to indicate great potential for the pursuance of a well diversified investment strategy.

3.4.4 Assessing the Market Risk in Emerging Markets

The chief aims of exploratory tests in this context would be to more fully explain the nature of emerging markets in general in terms of their co-movement with one another and the degree of similarity amongst each listed stock. Such a procedure serves to adequately define and assess any evidence of a multifactor structure in the aforementioned markets and hopefully serve as the basis for the more intricate model construction in the form of an APT specification to aid in risk adjustment to follow later.

As alluded to in previous chapters there are significant flaws in the formulation and application of an APT in the context of risk assessment and asset pricing. The most common pitfall being that the factor analytic approach employed gives rise to factors that are shallow statistical constructs having no worthwhile economic interpretation. McElroy and Burmeister (1988) suggest the use of macroeconomic factors in the formulation of an APT model in order create a valid linkage between defined macroeconomic events and the technique of asset pricing.

An alternative to the use of an APT is the employment of a multi-security market line (SML) approach. This approach entails the use of numerous single factor tests in order assess the risk in the market. However the integrity of such an approach is called into question in the work of Van Rensburg and Slaney (1997) who identify multifactor index models as being of greater explanatory and predictive significance than using the SML approach. They employ an analysis termed principal components in an effort to construct the desired model, and after subsequent rotations attain adequate proxies for inclusion into a multifactor model.

The rationale for the construction of such predictive models is quite interesting within in an emerging market context. With greater financial market liberalisation the stigma of isolation and the mystery associated emerging markets is being slowly whittled down. The relaxing of international trade barriers and increased globalisation serve to increase the co-movement in such nations termed emerging with that of the developed market. The two most widely advocated techniques for performing such a risk assessment are termed Cluster and Principal Components Analysis; however as will be noted such methods do have defined limitations especially in the present context.

Prior Analyses in Emerging Markets

Cluster Analysis

“Techniques for cluster analysis seek to separate a set of data into groups or clusters. Data ideal for such an analysis would yield clusters so obvious that they could be picked out, at least in small scale cases, without the need for complicated mathematical techniques and no precise definition of the term ‘cluster’.” For comprehensive reviews of such a technique see Cormack (1971).

However as previously mentioned such an analysis is best performed on a small scale in order to generate understandable, distinguishable results. This study’s sample data is however considerably large so making such an analysis of reduced value in detecting sources of common variation amongst objects in the dataset.

In Van Rensburg and Acres (2006) cluster and factor analyses are performed on the monthly returns generated by the International Classification Benchmark (ICB) market (level 1) indices of the 48 countries under consideration and the monthly returns generated by the FTSE World, FTSE Developed and FTSE Emerging Market indices. The emerging nations considered are comparable to those included in the present study therefore making the results generated worthy of close scrutiny.

The cluster analysis performed provided clear evidence of the variation in developed markets being diametrically opposed to that of emerging nations. Aside from a few dispersions two distinct clusters were discovered and named the ‘developed market indices’ and the ‘emerging market indices’. The clustering distances were found to be far smaller amongst developed indices when compared with those of emerging indices indicating the potential for a strategy of diversification firstly amongst emerging nations themselves and secondly across developed and emerging markets.

Factor Analytic Techniques: Principal Components Analysis

The second testing procedure employed in an exploratory context concerns a principal components methodology. There is somewhat of a distinction between that which is defined as principal components analysis and principal factor analysis. Principal components analysis states that all variability in any given item should be used in analysis whilst principal factor analysis considers the variability in an item that is common to another item.

The method of Principal Components Analysis or PCA draws on the concept of covariance in explaining the patterns in returns. The process involves mean adjustment and the generation of a covariance matrix which is then used as a basis for the computation of eigenvectors and eigenvalues which aid in the identification of both the direction and magnitude of relations that characterise the dataset.

Ultimately the chief ambitions of factor analytic techniques are: (1) to *reduce* the number of variables and (2) to *detect structure* in the relationships between variables, i.e. to *classify variables*.

Previous findings

Multicollinearity occurs when sets of data exhibit an above average correlation. Furthermore, singularity is when such datasets are perfectly correlated and as such indicate redundancies amongst variables and so serve to warrant their respective exclusion from the analysis. In order to identify any of these redundancies a correlation matrix of share returns is generated for this initial reason prior to conducting the principal component analysis.

Once more the work of Van Rensburg & Acres (2006) provides much needed insight into the nature of variation in emerging markets. The principal components analysis performed in the above study endorsed the findings of the cluster analysis once more finding a distinct difference in variation in developed and emerging markets.

Of interest aside from the expected grouping of developed and emerging nations are the clusters found within the above groups. Countries from specific global regions are found to cluster together and exhibit significant co-movement. Distinct regions such as Latin American, Europe and the Far East are the sub-clusters most evident. These findings agree with those of Rouwenhorst (1999) and Desrosiers (2004) which support the significance of country factors over above that of industry factors in being a chief determinant of return behaviour in emerging markets.

Remarks

There are a number of considerations that serve to inhibit the applicability of such cluster and factor analytic techniques on the dataset at hand. The sheer scope of the data makes the

interpretation of any such analysis difficult. Furthermore, previous research has indicated that sector analysis in such a context is largely fruitless. Therefore, two different market proxies are identified that may potentially serve to explain both variation inherent to emerging nations and that which is evident on a more global scale. Single and multi-index models are built and the explanatory power of these variables tested rigorously. The next section describes the model specification in more detail and thereafter the results are reviewed and interpreted.

3.5 Macroeconomic Factors

From the previous section it is evident that there are a significant number of localised firm-specific factors that have a role in explaining the variation of share returns in both emerging and developed market context. This considered, the next valid question to be asked would be whether or not there exists more generalised influences that affect all firms irrespective of their own specific traits. In both developed and emerging markets there is in fact research that serves to document such influences as fluctuations in domestic and global markets, more specifically the variation of certain key macroeconomic variables. It is purported that a number of well considered macroeconomic variables do in fact have explanatory power over the stock returns in the markets concerned.

3.5.1 Developed Market Research

Research in developed markets has aided in the identification of numerous influences on share returns that are macroeconomic in their nature. Fama (1981), Chen, Roll and Ross (1986), Pearce and Roley (1988), Chen (1991) performed studies that aim to assess the impact of changes in the macroeconomic environment on asset prices and identified many candidate factors as having explanatory power such as rates of production, unemployment, the yield spread, interest rates and inflation.

In the paper by Chen, Roll and Ross (1986) several macroeconomic variables are identified as having some measure of explanatory power on US stock returns. Using a variation of the methodology of Fama and Macbeth (1973) they proceed to assess the explanatory power of certain macroeconomic variables on share returns through the estimation of measures that gauge the defined stocks exposure to such external influences.

Of the variables tested the spread between long and short term interest rates, industrial production, changes in the risk premium and to a lesser extent measures of inflation are found to exhibit significant explanatory power. In later work by Pearce and Roley (1988) an expansion of the analysis concerning measures of inflation and their associated impact on stock returns is evident. It is found that firm-characteristics that are related to inflation serve to determine the impact of unanticipated inflation on a stock's rate of return.

Friedman (1988) considered a different selection of macroeconomic variables in his study. Using both quarterly and annual data he attempted to gauge the relationship between the Money Supply (M1 and M2) and real stock prices in the US market. He discovered both a wealth and a substitution effect, with the real quantity of money defined relative to income being positively related to the real stock price, the result posited as being a direct result of increased wealth. However this positive relation is not entirely consistent with a reversal of such a relationship evident in the US market over the studied sample period. Humpe and Macmillan (2005) in a more recent study employ co-integration techniques and find a similar positive but statistically insignificant relationship between the M1 Money Supply and stock price movement. Interestingly enough they find a similar but negative relationship for M1 in Japanese markets somewhat endorsing earlier work by Friedman (1988).

Interestingly, the results of Chen, Roll and Ross (1986) refute the significance of oil prices and exposure to innovations in real per capita consumption having a bearing on the determination of the movement of share returns. However such a study must be considered in light of recent work by Sadorsky (1999) who states that the dynamics of oil prices have changed substantially since the mid-eighties and so of late have a more influential role to play in the prediction of stock returns. Evidence is found that both oil prices and oil price volatility as measured by the GARCH model are found to have significant influence on both economic activity and stock price movements respectively.

3.5.2 Research in Emerging Markets

Research in emerging markets is less prevalent than that of their developed counterparts. A number of studies do exist whereby macroeconomic variables specific to a particular country are tested against that country's stock market returns, however few or none exist that test variables of a more developed/global nature on a large sample of different emerging nations

which is an ambition of this study. Comparative literature is listed below that is of some relevance to the current study.

Gjerde and Sættem (1999) investigate the influence of a number of macroeconomic influences well documented in developed markets upon the small open economy of Norway. They employ a Vector Autoregressive approach (VAR) in order to model the impact of the selected variables. They discover that much like in the US and Japan, unfavourable increases in the real interest rate have a significant negative impact on stock returns. Oil Prices are found to have considerable explanatory power over stock returns as found in developed markets (Sadorsky, (1999). This relation however may be sample specific and not applicable to a wide array of emerging nations as the Norwegian economy is fairly oil dependent.

In an article by Kwon (1997) the impact of a larger set of macroeconomic variables are tested upon the Korean Stock Exchange (KSE). Industrial Production, inflation, interest rates, bond yields, oil price and money supply (M1) are amongst some of the factors tested using three time series regression models over the sample period January 1980 to December 1992. Of the factors tested the term structure of interest rates, production index, foreign exchange rates, oil price and money supply are found to be of some significance. Not found to be significant are variables that capture inflation and risk premium, a notably different outcome to that of developed market research by Pearce and Roley (1988), Chen (1991) and the like.

A broader sample totalling twenty emerging nations is tested in Bilson, Brailsford, and Hooper (2001) using both a global and localised macroeconomic model. The authors note that there is little comparative research in this regard aside from Harvey (1995a) who employed the use of proxies that model global macroeconomic variation such as world inflation, world GDP, world oil prices and trade-weighted world exchange rate. The broad sample of emerging markets studied exhibited only minimal exposure to these above mentioned factors. The difference in the rationale for the construction of both models is grounded in the hypothesised level of integration of emerging markets with the rest of the world. For a global model to be of significance one would be inferring a high level of integration amongst emerging and developed nations due in part to successful liberalisations.

Ultimately the model specified included a number of local factors such as money supply, goods prices, real activity and exchange rates. A global factor proxy namely the return on a value-weighted world market index was also included. Some local factors are found to be of

significant explanatory power with Money Supply (M1), exchange rate and the return on the world market index being most noteworthy. The significance of this global index adds weight to the hypothesis of greater world market integration and serves to stimulate greater interest in the current study.

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Data and Descriptive Statistics

4.1 Introduction

This chapter presents the core of the dataset that is to be used in testing throughout this study. The data used is comprised of stock returns, a collection of firm specific variables and set of macroeconomic variables. These three datasets are used in conjunction in a cross-sectional setting later in the paper. Here they are presented separately to improve clarity and understanding of the sample selected. The nature and scope of the first two datasets, namely the stock return and firm specific series are discussed in this chapter. A discussion of the macroeconomic data employed follows in Chapter Six of this thesis.

4.2 Data

All of the return and firm specific data were obtained from DataStream International available from the Finance Research Laboratory at the University of Cape Town (School of Management Studies). Data Analysis is conducted mainly in Econometrics Views (E-Views), with certain additional analyses more easily performed in Microsoft Excel and Statistica software packages.

This study employed the use of the DataStream Emerging Markets Index for the extracting of various firm specific and return data.¹ As of the 1st of April 2007 the index had listed a total of 1538 companies from 26 emerging nations across the globe. Certain countries and their associated companies are excluded from this study on the basis of excessive trade regulations hampering the exploitation of any potential investment opportunities - Refer to Appendix A.6.

¹ The use of this dataset was endorsed through correspondence with Professor Geert Rouwenhorst whose paper entitled "Local Return Factors in Emerging Markets" employed the use of data from the same database albeit over a differing sample period.

Furthermore, there is also the problem of certain emerging nations having severely limited data. Sufficiently large amounts of missing data points, few listed shares over the sample period and insignificant representation with respect to total market capitalization justified their exclusion.

After such exclusions the number of countries is reduced to a total of 20 with a revised total of 1290 firms in the sample. Data on the emerging market countries is relatively sparse up until the late nineties from which time it becomes more complete and of sufficient detail for the purposes of this study.

4.2.1 Stock Returns data

Return data for the firms of the selected countries listed on the DataStream Emerging Markets Index was obtained for the period 1 January 1995 to 31 December 2006. The defined sample period runs from 1 January 1997 until the 31 December 2006 with the data collected for the prior two years used to construct measures such as price momentum for testing in a cross-sectional setting.

In order to allow for the comparability of results generated, all relevant price and index data was converted into US dollars with the use of spot exchange rates supplied by DataStream International. This conversion aids in mitigating the prevalence of non-uniformity in the construction of the relative return indices across the emerging markets studied.

In order to gauge the relative size of the firms listed upon the DataStream International Emerging Markets Index, the cumulative market value of the total number of listed companies is expressed as a percentage of the total market capitalization of the chosen sample for the month ended 31 December 2006. Refer to Appendix A.1 for the associated graphical representation. Of the 1290 companies to be studied that are listed on the Emerging Markets Index, seventeen are excluded for the purpose of this representation on account of insufficient data for the chosen period. From Appendix A.1 it can be seen that the biggest 100 companies listed in the index represent approximately 50% of the total market capitalization. On the 31st of December 2006, the final month in the sample period, the 1273 firms with available data have a total market capitalization of \$US 3,299 billion.

4.2.2 Adjustments to be made to stock returns data

There exist a number of sources of bias in any cross sectional study that may serve to hamper the interpretation of the results generated. Some of the common concerns identified by authors in the field are presented below with their possible impact on the integrity of the study at hand.

Data-Snooping Bias

When engaging in a detailed study, researchers often employ the results of previous studies as a benchmark or guideline in order to validate their own methodology and subsequent outcomes. As in MacKinlay (1988), Black (1993), Haugen and Baker (1996), when researchers scrutinize the characteristics of a data source along with the generated results associated with such data and furthermore attempt to construct predictive models based on past trends, data snooping will be evident. Tests of these new models that are grounded upon characteristics believed to be evident in the data analyzed can lead to the generation of results that add little value, further emphasizing existing discoveries in a static, isolated environment. In order to prevent this occurring, different data sources and varied time periods should be employed in order to make the research more dynamic and practical. The dataset employed in this study can be regarded as 'fresh' as no study of equivalent rigor has been applied in an emerging market context using a like data source.

Survivorship Bias

As previously mentioned, the number of firms in the sample increases chronologically over the sample period from 1997 where data is most sparse to 2006 where the integrity of the data is at a maximum. Therefore this study is subject to Survivorship Bias as posited by Banz and Breen (1986) with more recent work on the topic by Kothari, Shanken and Sloan (1995).

Both Banz and Breen (1986) and Kothari, Shanken and Sloan (1995) cite survivorship bias as having a significant impact on the interpretability of possible return relationships discovered. Non-survivors, namely firms that de-list over the sample period do so either as a result of underperformance or due to merger and acquisition. As a result of such a

reduction in the sample the predicted performance of those remaining firms is upwardly biased when compared with an appropriate benchmark as only the ‘winner’ firms now make up the sample. Many modern databases attempt to backfill such data, however more often than not only larger more successful firms are backfilled further exaggerating the bias already prevalent.

However, the ramification of such bias is somewhat less onerous than it seems as inferred by Davis (1994). Davis (1994) collects data from Moody’s Industrial Manuals which are of a high level of completeness and so are free from both look ahead and survivorship bias. Using a random sample of one hundred firms he is able to find relationships that have been inferred from the overwhelming majority of previous studies that have themselves been subject to survivorship bias, therefore providing sufficient evidence to counter those arguments that suggest the overall significance of such a bias.

Non-Synchronous Trading

This phenomenon occurs mainly due to the fact that not all shares are frequently traded and a fair number are relatively illiquid. The problem arises when shares trade during a month but not at the close of a month. Under the Efficient Market Hypothesis it is inferred that prices reflect all available information, however this may not be the case for those shares that did not trade at the end of the month. The shares that traded during the month but not at the end may not reflect all information by the mere fact that they haven’t traded for a certain period and so haven’t been able assimilate all relevant information. When this occurs, the computing of the associated returns from such stock is subject to a degree of bias since the information content of the price may not be reflective of the current period. Therefore, one can infer that the less frequently traded a share, the greater the potential for such a bias to exist.

This issue of either thin or irregularly traded shares is addressed further by Haugen and Baker (1996) with their “bid-ask bounce” problem. Stocks trade at bid or asked prices, and returns are generally measured from close-to-close. Assume that the underlying market value of a stock does not change during a month, t , and that the last trade of the month was at the bid. Assume furthermore that the stock continues to remain constant in price during month $t+1$. There is roughly an even chance that it will close at the asked price at the end

of $t-1$ or $t+1$. Thus, with no change in the bid-asked spread, the measured return will either be zero, or negative, for t , and either zero, or positive, for $t+1$. So returns measured over closing prices may appear to be negatively auto correlated, even when they are not. Thus, the existence of bid-asked bounce can lead a researcher to falsely conclude that last period's return has predictive power, even when successive stock returns are completely uncorrelated.

By virtue of this study employing the use of monthly data of well traded, large capitalization stocks the influence of non-synchronous trading is somewhat less of a concern.

Look Ahead Bias

Haugen and Baker (1996) also identify certain biases that may unduly influence the integrity of certain firm specific variables. The chief concern with regards to the presence of bias in financial information is termed 'Look Ahead Bias'.

Such a phenomenon occurs when certain financial ratio data that are time related, such as dividends or earnings yields are reported after the fact. When employing the use of an earnings yield as a predictive factor there will be bias present if such a factor is calculated with a figure that wasn't available at the date of prediction. The yield figure computed will have its explanatory power exaggerated on account of the delayed earnings figure reflecting a greater degree of assimilated market information on account of the lag in the time period.

DataStream International sources all its relevant financial data from the Published Accounts of the companies concerned. It reports and subsequently updates information only once such information has become public knowledge. Therefore, this study can be said to be relatively free from look-ahead bias based on such a reporting methodology being in operation.

More on Liquidity:

Dimson (1979) agrees with prevalence of bias in the estimation of relationships amongst infrequently traded shares. In line with Fisher (1966), it is purported that the tendency of

share prices to be reported at the end of periods the trades of which are infrequent result in any index constructed from such prices to exhibit significant serial correlation. This manifests itself as positive serial correlation which results in the variance of returns being downwards biased. In addition such illiquid shares also have a reduced covariance with the market further hampering accurate risk and return inference.

As is most obvious, liquidity plays an important role in any study of share prices and their associated return behaviour. Excessively illiquid stocks produce confounding results that are inaccurate and devoid of both practical and statistical application. Therefore a remedy for such bias is essential. Ibbotson (1975), Dimson (1974b) and Schwert (1977) proposed the introduction of lagged market returns as additional independent variables, whilst Marsh (1979), Schwert (1977) and Franks, Boyles and Hech (1977) calculated returns on a trade-to-trade basis regressing them over corresponding periods of variation in the market. These methods however were not a general means of solving the problem of thin trading and so Dimson (1979) attempts to correct for the bias through the employment of an aggregate coefficients approach. Such a method generated an unbiased estimate for beta as the sum of the slope coefficients in a regression of security returns on lagged, matching and leading market returns. Findings suggest that such a methodology in fact served to mitigate the bias induced on account of infrequent trading.

Alternatively, a possible solution would be to set some form of arbitrary benchmark based on the liquidity of stocks and adjust the sample accordingly in line with such criteria. Such is the case in Van Rensburg and Slaney (1997) whereby stocks with zero traded volume for more than 20 weeks out of 520 weeks available in the sample period are simply excluded. Naturally, the rigour of such criteria must be considered in line with its ramifications on overall sample size and its effect on the testing procedure of the study at hand. This is the case in Van Rensburg and Janari (2005) whereby a liquidity threshold was applied initially that reduced the sample to a size not appropriate for the testing procedure to be employed. Such a threshold has no sound theoretical foundation and is simply an arbitrary level that in context seemed most apt. Therefore, the prescription of such a trimming technique cannot be considered pervasive across similar studies and if improperly implemented may serve to materially taint the nature of the sample under scrutiny with a possible consequence being the generation of spurious relationships.

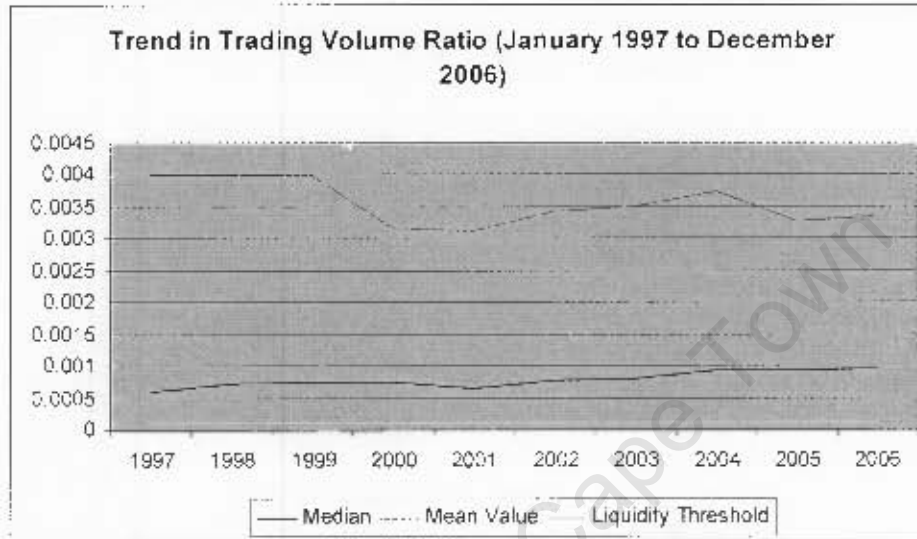
In the case of the present study liquidity is deemed not to be of significant concern as the vast majority of the firms scrutinized are relatively large, well established firms in their respective nations. Also, indices such as the DataStream Emerging Markets Index have their constituent firms' selected based on domicile and market capitalization and are constructed in such a manner as to mitigate the prevalence of infrequent trading and illiquidity.

To validate the above facts the sample was assessed via the construction of a turnover ratio filter. For each share in every month, the average number of shares traded daily for the month is divided by the number of ordinary shares outstanding at the end of the month prior to yield what is termed a 'turnover ratio', as in Van Rensburg and Robertson (2003). Shares for which this computed figure is less than 0.01% are regarded as being thinly traded and are candidates for omission from the sample for that particular month.

As can be seen from the graphical depiction below, the mean and median values of the 'trading volume ratio' are well in excess of the minimum threshold for illiquidity indicating that on average the vast majority of the 1290 firms in the sample are sufficiently liquid. This graph uses unwinsorised series data as reducing the prevalence of outliers may also trim sufficiently illiquid stocks and so introduce an element of bias concerning the nature of the firms in the sample.

Graphical Depiction of the changing liquidity of listed firms over the sample period

Figure 4.1 The graph below shows the changing magnitude of the yearly mean and median value of the Trading Volume Ratio across the sample period. Data depicted here is unwinsored, for the periods 1997 and 1998. A constant ratio was depicted for improved understanding and representation, as the true mean values were excessively large due to the emerging market crisis.



Upon closer examination it is found that the number of firms that fail to meet the specified liquidity totals one hundred and thirty in the first year of the chosen sample period and by the end falls to just over a hundred.

Therefore the balance of evidence suggests that the current sample is of a sufficiently liquid nature as to warrant the omission of any precise trading filter rules and so form a solid basis for the remainder of the study. After minor adjustments for liquidity a total of 1273 listed firms were included in sample.

Adjustment based on data integrity

As previously documented data on emerging markets is somewhat sparse and relatively incomplete when compared to their developed counterparts. This study is no exception, with certain adjustments needing to be made on account of a number of abnormalities being discovered post data sourcing.

The DataStream International Index is a value weighted index that tracks approximately 1538 stocks across twenty six emerging nations. Stocks are listed, de-listed and then re-listed frequently whether as a result of financial difficulty or the general volatility inherent to emerging capital markets. This dynamic nature of the index allows for discrepancies to crop up in both price and return information sourced from such regions. Therefore, the dataset was adjusted accordingly by removing all those firms that in months after delisting have remained on the index at last recorded prices and generate associated zero returns. The removal of these firms is critical as they may serve to dampen or possibly create spurious relationships in the regressions to follow in Chapters Five and Six.

After all adjustments were considered on the grounds of inadequate liquidity and data integrity a total of 1273 firms from twenty emerging nations remained over the sample period extending from the 1st of January 1997 to 31st December 2006.

Outliers and their Influence:

The presence of outliers amongst the collected returns data gives rise to additional grounds for alteration. According to Barnett and Lewis (1984) an ‘outlier’ is defined to be an observation in a set of data that appears to be inconsistent with the remainder of that set of data. They emphasize that ‘appears to be inconsistent’ is a crucial subjective consideration made by the observer with the chief concern being whether such observations are in fact members of the main population.

The inclusion of outliers in any form of regression procedure can have disastrous consequences. Such extreme observations shift the fit of the ordinary least squares regression line and in so doing tend to explain considerably less of the variation amongst observations. Furthermore these influential observations bias both the sensitivities and the

magnitude of the coefficients of the respective independent variables so making any form of inference with respect to both the nature and impact of proposed relationships wildly inconclusive.

A suitable method of accommodation for such contaminants is defined as ‘winsorisation’. A two step winsorisation procedure is employed in this study in order to mitigate the effects of these outliers in later statistical tests to be performed on this dataset. The procedure entails the calculating of the mean and standard deviation of the returns data in the sample and then the systematic excluding of those observation that are in excess of three standard deviations greater than the mean. Once this step is accomplished, a new mean and standard deviation is calculated and the originally excluded observations returned to the dataset being bounded to three standard deviations either side of the new mean.

As mentioned above the integrity of the data improves over the sample period. Not every single firm is listed throughout the period under study. In the first month of the sample period there exists return data for 720 firms which increases considerably over the ten year period to 1264 firms in the final month. Refer to Appendix A2 where the precise breakdown of the number of companies in the sample with return information for the last month of each twelve month sample period is presented.

4.2.3 Firm-Specific Attribute data

Firm-Specific data relates to the detailed financial information that serves to characterize the nature, condition and prospects of companies. These measures can be grouped and classified according to precisely how they describe the firm. They can be accounting line items such as Total Assets, financial ratios like Price: Earnings or technical indicators that communicate the dynamic nature of the firm such as Price Momentum. They also fall under various other pseudonyms, collectively being called ‘style characteristics’ as a result of the descriptive ability they possess with regards to the behaviour of stock returns.

Here again the data for 1273 firms were sourced from DataStream International from the period 1st January 1995 to the 31st December 2006, with the two additional years being sourced prior to the commencement of the sample period for the construction of a number of the style characteristics.

The collection of firm specific variables constructed and chosen for inclusion in this study includes those that are most commonly significant in similar emerging market and developed market studies. The set of characteristics was selected in order to sufficiently represent the broad firm attributes such as size, value, growth, liquidity and momentum. In addition the characteristics were chosen so as to remove double-counting and the inclusion of attributes that are highly correlated with others which in regression may exhibit strong signals of multicollinearity.

The methods employed in constructing these measures along with their designated code can be found in Table 1 and 2 below. Many of the firm attributes are sourced directly from DataStream International with the remainder being constructed using DataStream International data.

Outliers are once more appropriately adjusted for using a similar winsorisation procedure to that employed on the stock return data. Such a procedure serves to remove those extreme observations that may alter the nature of generated relationships without reducing the overall sample size.

Table 4.1 Firm-specific Attributes

The table below shows the list of firm-specific attributes tested and their respective codenames used in this thesis. The data were extracted from DataStream International.

CODE USED	STYLE CHARACTERISTIC
A_Turn	Asset Turnover
BTMV	Book to Market Value
CFtP	Cashflow to Price
CFtTD	Cashflow to Total Debt
DY	Dividend Yield
DtMVE	Total Debt to Market Value of Equity
Diffdivtp6	6 month change in Dividend to Price
Diffdivtp12	12 month change in Dividend to Price
Diffdivtp24	24 month change in Dividend to Price
EPS	Earnings per Share
12_EPS	12 month difference in EPS
24_EPS	24 month difference in EPS
6_EPS	6 month difference in EPS
EY	Earnings Yield
ICBT	Interest Cover Before Tax
LnMV	Ln of Market Value
LnP	Ln of Price
MOM_12M	12-month Momentum in Returns
MOM_18M	18-month Momentum in Returns
MOM_1M	1-month Momentum in Returns
MOM_24M	24-month Momentum in Returns
MOM_3M	3-month Momentum in Returns
MOM_6M	6-month Momentum in Returns
MTBV	Market Value to Book Value

MVTrade	Market Value Traded
MVTradeMV	Market Value Traded to Market Value
MVTMV_1	1-month growth in Market Value Traded to Market Value
MVTMV_3	3-month growth in Market Value Traded to Market Value
MVTMV_6	6-month growth in Market Value Traded to Market Value
MVTMV_12	12-month growth in Market Value Traded to Market Value
NS	Number of Shares in Issue
P	Price
Payout	Payout Ratio
PC	Price to Cash
PE	Price Earnings Ratio
Quick	Quick Assets Ratio
ROCE	Return on Capital Employed
ROE	Return on Equity (published)
SalestP	Sales-to-Price ratio
TDtTA	Total Debt to Total Assets
TLtTA	Total Loan Capital to Total Assets
TV	Trading Volume Ratio
VO	Absolute Trading Volume
VO_1	1-month growth in Trading Volume
VO_3	3-month growth in Trading Volume
VO_6	6-month growth in Trading Volume
VO_12	12-month growth in Trading Volume

Table 4.2 Grouping of Firm Specific Attributes

The table below shows the corresponding groups into which all the listed firm specific attributes from Table 4.1(a) have been sorted. Each group models a certain behavioural aspect regarding the nature and overall description of the firm.

STYLE GROUP	CODE USED	STYLE CHARACTERISTIC
MOMENTUM	MOM_12M	12-month Momentum in Returns
	MOM_18M	18-month Momentum in Returns
	MOM_1M	1-month Momentum in Returns
	MOM_24M	24-month Momentum in Returns
	MOM_3M	3-month Momentum in Returns
	MOM_6M	6-month Momentum in Returns
LIQUIDITY	MVTMV_1	1-month growth in Market Value Traded to Market Value
	MVTMV_3	3-month growth in Market Value Traded to Market Value
	MVTMV_6	6-month growth in Market Value Traded to Market Value
	MVTMV_12	12-month growth in Market Value Traded to Market Value
	VO_1	1-month growth in Trading Volume
	VO_3	3-month growth in Trading Volume
	VO_6	6-month growth in Trading Volume
	VO_12	12-month growth in Trading Volume
	TV	Trading Volume Ratio
SIZE	LnMV	Ln of Market Value
	ICBT	Interest Cover Before Tax
	MVTrade	Market Value Traded
	MVTradeMV	Market Value Traded to Market Value
	VO	Absolute Trading Volume
	NS	Number of Shares in Issue
VALUE	BTMV	Book to Market Value
	CFtP	Cashflow to Price

	CFtTD	Cashflow to Total Debt
	DY	Dividend Yield
	DtMVE	Total Debt to Market Value of Equity
	EPS	Earnings per Share
	EY	Earnings Yield
	PC	Price to Cash
	Payout	Payout Ratio
	PE	Price Earnings Ratio
	Quick	Quick Assets Ratio
	SalestP	Sales-to-Price ratio
	TDtTA	Total Debt to Total Assets
	TLtTA	Total Loan Capital to Total Assets
GROWTH	12_EPS	12 month difference in EPS
	24_EPS	24 month difference in EPS
	6_EPS	6 month difference in EPS
	Diffdivtp6	6 month difference in Dividends to Price
	Diffdivtp12	12 month difference in Dividend to Price
	Diffdivtp24	24 month difference in Dividends to Price
	ROCE	Return on Capital Employed
	ROE	Return on Equity (published)
	A__Turn	Asset Turnover

4.2.4 Descriptive Statistics

In order to gain a better understanding of the nature of the firm specific data used in this analysis, all significant descriptive statistical measures were calculated for each attribute and reported in Table 4.3. The statistics are computed across the entire sample period January 1997 to December 2006 after the two step winsorisation procedure has been completed.

Deakin (1976) examines the distributional properties of a number of financial ratios so as to establish whether or not they can be used for statistical inference. All eleven examined, some of which are also included in this study, are found to have non-normal distributions even after logarithmic and root transformations are employed. Therefore, the distributions of these ratios are somewhat skew with Frecka and Hopwood (1983) citing outliers as the probable cause and their subsequent removal as plausible solution.

For each one of the attributes considered in this study the associated median value is in fact lower in magnitude than the corresponding mean value, indicating definite right (positive) skewness. As many of the measures have a non-negative bound this skewness is expected and should not pose any problems for the majority of the tests on these attributes in this paper as a normal distribution is not a specific requirement.

Table 4.3 Descriptive Statistics of Firm Specific Attributes

The table below is representation of the key statistical attributes of the firm specific factors selected to be employed in this study. The associated measures are all calculated after the two-step winsorisation procedure has been completed in order to mitigate the influence of extreme observations. The data were extracted from DataStream International for the sample period spanning the 1st of January 1999 to the 31st of December 2006. Refer to Table 1 for definitions of all firm specific attributes. In addition the Jacque Bera test for normality p-value is specified with the null hypothesis for this test being that the population follows a normal distribution. At the 5% significance level, all p-values in excess on 0.05 result in the null hypothesis being upheld and the population considered normal. The contrary is true for p-values less than 0.05, whereby the population is then inferred to be non-normal.

Code	Mean	Med	Std Dev	Kurt	Skew	Min	Max	JacB
A_Turn	0.64	0.51	0.52	3.66	1.10	-0.10	2.12	0.00
BTMV	0.95	0.65	1.11	8.04	1.85	-3.06	5.01	0.00
Cps	787.91	4.57	2721.86	17.31	3.36	-11889.85	13837.59	0.00
CFtTD	19.76	0.29	225.76	309.72	16.87	0.00	4420.70	0.00
DY	2.81	1.69	3.61	7.46	2.01	0.00	17.21	0.00
DtMVE	1.60	0.04	3.59	30.01	4.80	0.00	27.25	0.00
EPS	180.65	1.61	665.17	24.33	4.63	-170.27	3892.01	0.00
12_EPS	2.4	0.002	81.99	24.13	0.16	-442.52	448.98	0.00
24_EPS	4.61	0.09	109.55	20.59	0.25	-544.29	555.87	0.00
6_EPS	1.39	0.00	55.04	31.05	0.23	-338.65	341.36	0.00
EY	1.91	0.03	7.40	34.15	5.37	-1.00	52.87	0.00
ICBT	289.66	3.82	3995.90	430.84	19.76	-17421.00	92456.68	0.00
LnMV	9.42	9.04	2.89	2.73	0.33	0.78	18.07	0.00
LnP	0.33	0.27	2.01	3.29	-0.13	-5.54	6.24	0.00
MOM_12M	0.35	0.13	1.13	107.97	8.08	-0.99	19.29	0.00
MOM_18M	0.57	0.21	1.89	176.75	10.72	-0.99	37.71	0.00
MOM_1M	0.05	0.0005	0.82	1009.758	30.26	-0.99	29.33	0.00
MOM_24M	0.823	0.30	2.54	133.31	9.58	-0.99	42.196	0.00
MOM_3M	0.187	0.025	2.161	514.74	21.671	-0.99	54.79	0.00
MOM_6M	0.37	0.06	3.45	379.77	18.57	-0.99	75.805	0.00
MTBV	2.37	1.32	6.68	83.05	6.58	-66.04	71.51	0.00

MVTrade	5093.52	268.57	17832.39	56.05	6.78	-25.00	167548.5	0.00
MVTradeMV	45781.52	0.01	162963.2	16.51	3.82	0.00	779910.9	0.00
MVTMV_1	2.54	-0.007	9.255	31.88	5.18	-1.00	64.37	0.00
MVTMV_3	3.58	0.017	14.57	46.99	6.34	-1.00	121.12	0.00
MVTMV_6	4.14	0.01	16.21	40.67	5.90	-1.00	125.593	0.00
MVTMV_12	2.38	0.00	8.69	31.61	5.16	-1.00	60.23	0.00
NS	107979.7	14.3802	420112.5	24.19545	4.63	7.90	2420017	0.00
P	7.28	1.31	16.96	18.78	3.89	0.00	96.89	0.00
PC	7.54	5.49	14.46	14.24	0.983	-57.87	73.75	0.00
PE	2.86	0.09	9.67	35.93	5.26	-9.60	80.93	0.00
Quick	1.27	0.88	1.95	115.70	9.23	0.02	28.87	0.00
ROCE	10.77	9.22	11.1	5.37	0.49	-24.45	46.12	0.00
ROE	12.28	12.19	22.8	10.86	-0.70	-90.83	114.770	0.00
SalestP	32.005	0.99	134.02	20.34	4.311	-596.06	674.28	0.00
TDtTA	0.24	0.22	0.189	2.87	0.66	0.00	0.797	0.00
TV	0.005	0.0007	0.03	162.18	12.25	0.00	0.42	0.00
VO	2919.26	232.50	8357.96	22.52	4.33	-0.70	50357.26	0.00
VO_1	2.60	0.00	9.49	32.42	5.21	-58.33	66.57	0.00
VO_3	4.01	0.03	17.65	59.27	7.13	-152.13	164.24	0.00
VO_6	4.06	0.04	17.62	57.31	7.01	-3.00	161.73	0.00
VO_12	4.55	0.07	17.85	42.53	6.04	-1.00	141.24	0.00

4.3 Summary and Conclusion

This chapter introduces the majority of the selected dataset used for testing in this paper. The dataset presented comprised of stock return and firms specific data. A number of adjustments were made to both stock return and firm specific data in order aid in testability and result generation. Stock Returns were assessed for thin trading, however this was found to be less of a concern than in previous studies. Subsequent adjustments were in fact made to remove shares with insufficient return information and those with observations of excessive magnitude. In all a total of 17 shares were removed providing a final sample of 1273 stocks.

The nature of the data and its respective source is assessed and inherent biases identified properly documented. It is evident that this study is free from Look-Ahead and Data-Snooping Bias, however it is nevertheless subject to Survivorship Bias.

Furthermore, in order to properly mitigate the effect of outliers present the process of winsorisation is employed. Under this procedure both stock return and firm specific data observations are restricted to a number of deviations around their mean value in order to safeguard against spurious observations impacting negatively on results. A limit of 100% is imposed on all stock return information.

Descriptive Statistics of all firm specific variables are presented that show evidence of distinct positive skewness amongst the majority of variables. Such an anomaly is of little consequence in light of the testing methods employed in Chapters Five, Six and Seven.

**Specification of Index Models and
Univariate Style Analysis**

5.1 Introduction

In the prior research reviewed in chapter three of this paper there is considerable evidence that justifies the existence of certain firm specific anomalous characteristics that explain return behaviour in an emerging market context. These so-called anomalies are found to explain variation that is seemingly unexplained by the CAPM, considered the metaphorical pillar in the theory of asset pricing. This chapter seeks to test empirically for the presence of such return anomalies across the currently selected sample.

This study possesses a number of distinguishing features that distinguish it from prior studies. Firstly, the broadness of the sample rivals any previous study performed on 'emerging' nations. Secondly, the array of firm specific variables analysed in this study is far greater than those of earlier studies and so will hopefully serve to broaden the understanding of return behaviour in such markets.

Ultimately the aim of this chapter is to undertake a univariate cross-sectional style analysis and in so doing identify style-based factors with significant explanatory power. These style anomalies, in order to be classified as such, need to be able to explain the variation in returns before and after adjustments made for systematic risk. The methodology employed follows that of Fama and Macbeth (1973) where the pooled time-series regression coefficients and t-statistics are assessed.

Firstly though two forms of index models are specified in order gauge the degree of systematic risk in the aforementioned markets. Both the single and multi index models

constructed employ well researched market proxies that can be considered satisfactory benchmarks for the chosen sample.

The remainder of the chapter is comprised of section 5.2 which outlines the raw returns and the building and testing of the index models. Section 5.3 presents the results and a discussion of the tested index models. Section 5.4 then provides a detailed outline of the univariate testing procedure to be undertaken on the specified sample with the subsequent results presented in Section 5.5 with Section 5.6 indicating the outcome of the style consistency assessment. Section 5.7 summarizes and concludes.

5.2. Testing the Single and Multi index models

5.2.1 Data and Methodology

Single Index Models

Monthly return data for all selected stocks listed on the DataStream International Emerging Markets Index over the sample period 1 January 1997 to 31 December 2006 is used in testing the of the Single Index Model. All returns from across the several emerging nations documented are converted to US dollars for ease of comparison and final interpretation.

As discussed in Roll (1976) any test of market efficiency is a joint test of the accuracy of both the asset pricing model used and the selected market proxy. In this study the chosen market proxies are the DataStream International Emerging Markets Market Index and DataStream International World Index. These indices are well documented and due to the relative sparseness of information in an emerging market context are the most appropriate benchmarks to be used in this study. The correlation between these indices is approximately 0.623 indicating that there is indeed variation that may be specific to emerging nations that is unexplained on a global scale and vice versa.

The DataStream International Emerging Markets index as previously mentioned comprises twenty six emerging nations being somewhat of a more localised proxy that omits the influence of the more developed markets on return behaviour in an emerging context. The

DataStream International World Index is far broader being made up of a large sample of both developed and developing countries. The inclusion of such an Index may provide unexpected explanatory assistance in terms of emerging market return patterns and possibly identify aforementioned signs of the greater integration of financial markets across the globe.

The 3 month or 90 day US Treasury Bill is used as a proxy for the risk free rate in computing excess returns for each individual stock and both the DataStream International Emerging Markets Market Index and DataStream International World Index.

A variation of the market model employed by Sharpe (1964) is used in this study in order to gauge the commonality in variation amongst listed emerging market stocks. The model specified below is in 'excess return' format as it aids in testing the statistical significance of those sources of variation seemingly unexplained by the co-movement of stocks with some market proxy, more specifically the abnormal return.

Excess monthly returns for the period 1 January 1997 to 31 December 2006 for each of the 1273 stocks included in the sample are regressed firstly against the monthly excess returns of the DataStream Emerging Markets proxy. Thereafter, the realised returns are then regressed with the DataStream World Market proxy.

The return generating process is specified as follows:

$$R_{it} - R_f = \alpha_i + \beta_i (R_{mt} - R_f) + \varepsilon_{it} \quad (5.1)$$

Where,

$R_{it} - R_f$	=	realised returns on assets i in period t
α_i	=	the constant term
β_i	=	the estimated beta coefficient of asset i
$R_{mt} - R_f$	=	the returns on a 'market portfolio' in period t (in this case proxied by the DataStream International Emerging Markets Index and thereafter by the DataStream International World Index)
ε_{it}	=	random error term

If a share was not listed or returns data was not available for part of the ten-year period, a regression equation is still estimated using the returns data that are available.

Each regression yields an R^2 , an R^2 -adjusted, a p-value statistic, and a time-series of residuals.

Multi Index Model

Once more monthly return data for all selected stocks listed on the DataStream International Emerging Markets Index over the sample period 1 January 1997 to 31 December are converted to US dollars as is the convention. A multifactor model is employed in order to attempt to better explain the variation of returns in such a volatile setting.

The regression equation takes the form

$$R_{it} - R_f = \alpha_i + \beta_{iemi} (R_{emit} - R_f) + \beta_{iwmi} (R_{wmit} - R_f) + \varepsilon_{it} \quad (5.2)$$

Where,

$R_{it} - R_f$	=	realised returns on assets i in period t
α_i	=	the constant term
β_{iemi}	=	beta coefficient showing sensitivity to the EMI
$R_{emit} - R_f$	=	represents the realised return on DataStream International Emerging Markets Index (EMI) in period t
β_{iwmi}	=	beta coefficient showing sensitivity to the WMI
$R_{wmit} - R_f$	=	represents the realised return on DataStream International World Markets Index (WMI) in period t

The Multi-index model uses the two market proxies in combination as explanatory variables with the US 3 month Treasury bill rate being once again used as a proxy for the risk-free rate.

Each regression yields an R^2 , an R^2 -adjusted, a p-value statistic, and a time-series of residuals.

Further testing is then performed in order to test the effectiveness of both models in terms of explaining the unknown variation in each setting. These ‘second level’ tests follow the same procedure as those previous except that in this case the respective residuals of each model are used as dependent variables for competing models. Therefore, the multi-index model’s residuals are regressed on the explanatory variables for each of the two separate single-index models and then each of the single index model’s residuals regressed on the explanatory variables of the multi-index model.

Once more each regression yields an R^2 , an R^2 -adjusted, a p-value statistic, and a time-series of residuals.

5.2.2 Theoretical Concerns and Critical Assumptions

There are certain key assumptions of any form of regression model that need to be adhered to in order to obtain significant and interpretable results. The model is constrained to those critical assumptions that underpin any statistically sound regression analysis:

- The predictors must be linearly independent, i.e. one must not be able to express any predictor as a linear combination of another
- The error terms or residuals must be normally distributed
- The error terms must be independent and random i.e. $E(\varepsilon_{it}, \varepsilon_{jt}) = 0$ for all t where $i \neq j$
- The variance of the error terms must be constant

If such assumptions are violated there can be significant implication with regards to the accuracy of the coefficients generated. Heteroscedasticity occurs when successive error terms are correlated with one another, whilst multicollinearity is evident where numerous explanatory variables are correlated with one another and so disturb accurate result generation (evident in a multifactor setting). The implications of either being present are somewhat dire – as beta coefficients are estimated in error either under or over estimates of their true value with associated high standard errors and insignificant t-stats. In the case of the current study normality is not cited as a concern, with the associated Jarque Bera statistics indicating that all the examined residuals resemble that of a normal distribution. Due to the structure of data collection, namely consecutive months, there is cause for concern that

heteroscedasticity may be a problem. White's test and associated adjustment for this phenomenon are considered amongst the best possible remedies, however the overall statistical impact of these adjustments on the integrity of the output generated is fairly minimal.

5.3 Results

Testing the Single and Multi Index models

As mentioned earlier, there are two chief sources of variation that are used firstly in a single regression setting and then in a multiple setting in order to explain the underlying behaviour of stock returns in this sample of emerging markets.

The table below reflects the respective averages of R^2 , adjusted R^2 and the overall F-statistic from each set of regressions at each level. In addition the total number of significant regressions generated is represented based on a 5% level of significance.

Table 5.1: Statistical Significance of the Single- and Multi-Index Models

The table below shows the averages across all the included companies in the sample of the R^2 , adjusted R^2 and the F-statistics from the time-series regressions. The first level regressions comprise of testing the excess monthly returns data in both a Single and Multiple setting. The Single Index market proxy is initially the DataStream International Emerging Markets Index, with the DataStream International World Markets Index being an alternative proxy tested in addition in a similar setting. These two indices are then combined in a Multi Index model and the associated regression statistics generated. The second level regressions then regress the residuals from the first set of regressions on the excess returns of the alternative model's proxies. The US 90 day Treasury Bill is employed as an aggregate risk free rate benchmark.

Regression	μR^2	$\mu \text{Adj} R^2$	F-Statistic	% sig reg.
Single-Index Model (EMI)	11.8%	10.13%	13.65	72%
Multi-Index residuals on Single-Index Model	0.14%	-1.18%	0.016	< 5%
Single-Index Model (WMI)	8.99%	7.32%	9.37	66%
Multi-Index residuals on Single-Index Model	0.09%	-1.90%	0.005	< 2%
Multi-Index Model	13.59%	10.65%	7.64	69%

Single-Index residuals(EMI) on Multi-Index Model	2.56%	1.43%	0.70	9%
Single-Index residuals(WMI) on Multi-Index Model	5.71%	4.57%	2.72	43%

First Level Tests:

As can be seen from the table above, the multi-index model has the highest R^2 (13.59%) and adjusted R^2 (10.65%), indicating that even when additional explanatory variables are added the forgone degrees of freedom do not sufficiently hamper the statistical power of the model.

Furthermore not only does the multi-index model explain more of the nature of the behaviour of the excess stock returns, it also has a comparatively similar number of significant regressions (890 of the 1273) compared to 929 and 851 of the Single-Index models using the emerging and world market index proxies respectively.

Second Level Tests:

The second level tests aim to establish whether or not the competing model explains some of the unexplained variation of its rival. From the table above it is evident that the multi-index model explains only a very small portion of the variation unexplained by either of the single-index models, 2.56% and 5.71% respectively. It is however evident that the multi-index model does in fact explain additional variation not explained by either of the single factor formulations, resulting the multi-index formulation being of greater superiority.

In addition the tests of the multi-index residuals on the single-index models yield even less convincing results. Both of the single-index models and their associated market proxies explain very little of the variation in the residuals of the multi-index model, 0.14% and 0.09%. When these tests are then adjusted for degrees of freedom both R^2 values become negative, a clear indication of a poorly fitted model.

5.4 Univariate Style Testing of Factors

This next section aims to test all of the identified firm-specific characteristics mentioned in Table 4.1. The analysis tests the attributes over the entire sample period using time-series cross-sectional regressions against two types of return data, unadjusted and risk adjusted return data.

5.4.1 Data and Methodology

The data employed for this analysis is as described in Chapter Four of this study. The monthly returns data were adjusted as discussed in Chapter Four and comprised a total of 1273 listed stocks sourced from the DataStream International Emerging Markets Index for the sample period 1 January 1997 to 31 December 2006. A range of fifty firm specific attributes are sourced and constructed. The cross-sectional distribution of each style characteristic in each month is then standardised in order to enhance the comparability of the slope coefficients output from the regressions to follow. In technical terms, standardisation involves the adjusting of each distribution in such a way that it yields a mean of zero and a standard deviation of one.

In order to accommodate the effect of systematic risk as modelled by the CAPM and APT, appropriate market proxies, factor proxies and a risk free rate are sourced. As per the previous section, single and multi index models were constructed in order to measure the impact of the systematic component of risk.

The sections that follow describe the tests performed on firstly the unadjusted returns and secondly on those adjusted for risk via the respective models.

5.4.2 Tests of Unadjusted Returns

This section aims to test the significance of the style characteristics listed in Chapter Four on returns that have undergone no adjustment for systematic risk. The methodology of Fama

and Macbeth (1973) is followed closely, with the model upon which the Ordinary Least Squares (OLS) regressions are to be run specified as follows:

$$r_{i,t+1} = \gamma_{0,t+1} + \gamma_{1,t+1} A_t + \varepsilon_{i,t+1} \quad (5.3)$$

Where,

- $r_{i,t+1}$ = realized return on share i for month $t + 1$
- $\gamma_{0,t+1}$ = constant intercept term
- $\gamma_{1,t+1}$ = cross-sectional slope coefficient estimated from the regression
- A_t = standardised value of the attribute of the share at end of each month t
- $\varepsilon_{i,t+1}$ = residual error

The return characteristic at the beginning of every month is therefore regressed against the realised return on the share over that period. Such an analysis is repeated for every month in the sample and so provides a chronological series of coefficients that represent the ‘payoff’ of each firm specific attribute. Statistical tests in the form of the Students t-test are then applied to the generated coefficients in order to ascertain their overall significance. Coefficients that fail such a testing criterion are deemed to be statistically indifferent from zero and so provide no basis for any form of inference.

5.4.3 Tests of Risk Adjusted Returns: CAPM - Single Index Model

This section adjusts aggregate share returns for market or systematic risk through the formulation of an appropriate model with defined market proxies. The aim of this risk-adjusting procedure is to explain the variation that is inherent in return data which is unexplained by the specified single factor models. The tests to follow attempt to discern whether or not the chosen firm-specific attributes are in any way able to explain this unexplained variation that is seemingly unsystematic in its nature.

Two independent single factor models are specified using the DataStream International Emerging Markets Index and DataStream International World Markets Index as their respective market proxies.

The return generating process is specified as follows:

$$R_{it} - R_f = \alpha_i + \beta_i (R_{mt} - R_f) + \varepsilon_{it} \quad (5.4)$$

Where,

- $R_{it} - R_f$ = realised returns on assets i in period t
- α_i = the constant term
- β_i = the estimated beta coefficient of asset i
- $R_{mt} - R_f$ = the returns on a 'market portfolio' in period t (in this case proxied by the DataStream International Emerging Markets Index and thereafter by the DataStream International World Index)
- ε_{it} = random error term (captures variation unexplained by β_i)

Therefore, in order to gauge the variation that is unexplained by the above model, one should combine those sources of disturbance that are not defined as systematic. Through the summation of the α_i and the random error term ε_{it} one is able to quantify patterns in the returns data that are at present unexplained and hence specify an appropriate model that has been appropriately adjusted for risk.

Therefore the associated risk adjusted return is calculated as follows:

$$(\alpha_i + \varepsilon_{i,t+1}) = (R_{it} - R_f) - \beta_i (R_{mt} - R_f) \quad (5.5)$$

A similar univariate cross sectional analysis is now performed on these risk adjusted returns with $(\alpha_i + \varepsilon_{i,t+1})$ being substituted as the new dependent variable. The regression equations take the form:

$$\alpha_i + \varepsilon_{i,t+1} = \gamma_{0,t+1} + \gamma_{1,t+1} A_t + e_{i,t+1} \quad (5.6)$$

In this instance $\varepsilon_{i,t+1}$ represents the random error term from risk adjustment whilst $e_{i,t+1}$ is the error term for this new regression equation. From the regression a time series of slope coefficients, t-stats and beta values are estimated in order to statistically test for the significance of the chosen factors.

5.4.4 Tests of Risk Adjusted Returns: APT - Multi Index Model

The third and final test employs the use of the previously specified multi-factor model to establish whether significance is still evident after risk adjustment. As is the case with the two single factor risk adjustment procedures time series regressions are run over the period 1st January 1997 through to the 31st December 2006.

Model Specification:

$$R_{it} - R_f = \alpha_i + \beta_{iemi} (R_{emit} - R_f) + \beta_{iwmi} (R_{wmit} - R_f) + \varepsilon_{it} \quad (5.7)$$

Where,

$R_{it} - R_f$	=	realised returns on assets i in period t
α_i	=	the constant term
β_{iemi}	=	beta coefficient showing sensitivity to the EMI
$R_{emit} - R_f$	=	represents the realised return on DataStream International Emerging Markets Index (EMI) in period t
β_{iwmi}	=	beta coefficient showing sensitivity to the WMI
$R_{wmit} - R_f$	=	represents the realised return on DataStream International World Markets Index (WMI) in period t

The risk-adjusted returns are then calculated through the summation of those sources of variation that are unexplained by the fitted model. This is equivalent to the adding of each α_i with the associated error term $\varepsilon_{i,t}$ serving to create a time series of returns that are adjusted for a significant component of systematic risk.

As is the case with the previous tests, the multifactor risk adjusted return is calculated using the following procedure:

$$(\alpha_i + \varepsilon_{i,t+1}) = (R_{it} - R_{ft}) - \beta_{iemi} (R_{emit} - R_{ft}) + \beta_{iwm} (R_{wmit} - R_{ft}) \quad (5.8)$$

A similar series of cross sectional univariate tests are then performed on these risk adjusted returns employing the regression model specified below:

$$\alpha_i + \varepsilon_{i,t+1} = \gamma_{0,t+1} + \gamma_{1,t+1} A_t + e_{i,t+1} \quad (5.9)$$

In this instance $\varepsilon_{i,t+1}$ represents the random error term from risk adjustment whilst $e_{i,t+1}$ is the error term for this new regression equation. From the regression a time series of slope coefficients, t-stats and beta values are estimated in order to statistically test for the significance of the chosen factors.

5.4.5 Comparison between adjusted and unadjusted results

In comparing the results from the three sets of univariate cross sectional analyses certain consideration must be taken as to the manner in which the risk adjusted returns were in fact computed. As the associated betas for all the risk adjusted tests were calculated from the data set upon which the style characteristics are being analysed, there is less of a chance that the style characteristics will be evident when tested upon these adjusted returns relative to the unadjusted figures. Therefore, it can be construed that if certain factors are indeed of significant explanatory power they should be evident in a risk-adjusted setting. The risk-adjusted tests can be seen as somewhat of a robustness check on the pervasiveness of the identified factors.

5.4.6 Primary Adjustment to list of firm specific characteristics

The first step in analysing the full list of firm specific characteristics is that of ascertaining each of the tested factors statistical significance. From the monthly time series of cross sectional regressions run, associated average Student t-statistics are computed and assessed for significance.

Factors are tested at the five percent level of significance $\alpha = 0.05$ using the following procedure:

$$H_0: \beta_1 = 0$$

$$H_1: \beta_1 \neq 0$$

$$T \text{ stat} = \text{mean}(\gamma)/\text{se}(\gamma)$$

$$T\text{-critical: } t_{\alpha, n-1} = t_{0.05, 119} = \pm 1.65$$

The result of such testing serves to narrow down the list of characteristics run on the unadjusted returns from fifty to a final list of twenty eight statistically significant attributes.

As an aside, it is worth noting that the style factor ‘P/E’ was omitted from the list upon discovering flaws in the datasource.

5.4.7 Analysis of primary list of significant characteristics

The total list of firm specific characteristics was chosen in line with previous studies to be as comprehensive as possible whilst at the same time concerned with ensuring relevance. However in aiming to be sufficiently comprehensive it is inevitable that there will be factors that are similar and exhibit common variation. Such behavioural occurrences will serve to make the isolation and interpretation of each firm-specific effect troublesome, therefore some form of trimming procedure is necessary. The implementation of cluster and correlation analyses aims to mitigate the prevalence of such a problem through detailed examination of the monthly payoffs output.

The monthly payoffs of each of the factors form the subject of the suggested cluster and correlation analyses. The initial step in the procedure is the performance of the cluster analysis. By cluster analysing the characteristics identified as being significant, one is able to assess the degree of similarity between each factor and their relative ability in explaining return variation. However, clusters do not only form on account of there being like variation amongst factors. It may happen that certain factors group together with certain others on account of them being totally dissimilar to all those in the analysis. This phenomenon if

present may detract from the pervasiveness of the clusters and so therefore a detailed correlation analysis is performed to enhance the identification of co-moving factors.

The precise methodology employed for the aforementioned cluster analysis follows that as described in Ward (1963). This method is somewhat different from the alternatives such as Single and Complete Linkage as it considers the analysis of variance when establishing clusters. The procedure entails the computing of the total sum of the squared deviations from each observation from the mean of the cluster to which it belongs. At each and every stage of the analysis the combination of every possible cluster is considered and those unions that result in the minimum increase in the error sum of squares are combined into clusters. It is also generally found that such a clustering method serves to create narrow clusters as a result of the well defined clustering criterion.

The distance measure selected for such an analysis is additional important consideration. As the interest of this research is to ascertain the co-movement of such factors and their associated ability to explain share return variation, the Pearson Correlation Coefficient is selected as the appropriate distance measure for the cluster analysis. The coefficient takes the following form:

$$\rho_{x,y} = \frac{\sum_{t=1}^n (r_{x,t} - \bar{r}_x)(r_{y,t} - \bar{r}_y)}{n-1} \quad (5.10)$$

Where $\rho_{x,y}$ is the correlation coefficient between each of the time series of the monthly payoffs of each of the significant style characteristics.

$r_{x,y,t}$ is t th monthly characteristic payoff derived from the univariate testing procedure

$\bar{r}_{x,y}$ is the mean monthly characteristic payoff for the time series of returns derived from the same univariate testing procedure

n is the number of monthly payoffs in the time series

Once the above procedure is completed a sufficient number of clusters that map similar variation should be generated and form the foundation for further model building.

In performing a correlation analysis on the full set of monthly payoffs, the true relationships amongst the firm characteristics is forthcoming. A correlation matrix is generated for each of the identified clusters employing the use of the Pearson Correlation Coefficient the computation of which was discussed earlier in this chapter.

The correlation matrices output are then further scrutinised on statistical grounds. Factors that exhibit a high degree of co-movement with others are then compared based on their t-statistics output from the preceding cross sectional univariate style tests on the unadjusted returns. In the event of two factors exhibiting a high degree of correlation, only that factor with the higher t-statistic is included in the study. For the purposes of this section upon discussion with Van Rensburg, a high correlation is arbitrarily defined as any value in excess of 0.7 or less than -0.7.

Subsequently, the remaining factors are then analysed for any signs of co-movement. Once more the above procedure is followed to prune the list of significant characteristics to those whose impact on return variation can be sufficiently isolated.

Prior to any such trimming procedures being performed the Price Earnings firm specific factor was excluded from the analysis on account of its spurious negative data entries. Instead of this factor Earnings Yield is used a proxy to gauge the desired value effect.

5.4.8 Style Consistency

In order to gauge the potential for possible style modelling, the direction of the monthly payoffs to the refined list of significant firm specific characteristics is assessed.

5.4.8.1 Consistency in direction of monthly payoffs

This first method employed aims to attempt to ascertain the proportion of times that the payoff is either positive or negative.

The proportion of the number of times the monthly payoffs are positive or negative is found in the range between 0 and 100%. Those payoffs that have value closest to either one of the aforementioned bounds are considered to have a more consistent direction. In order to evaluate these ratios a non-parametric Sign Test is run with the null hypothesis that the payoffs are positive in 50% of the months and negative in the 50% of the months.

5.4.8.2 Tests for Randomness in the monthly payoffs

This second method aims to test for randomness in the payoffs by attempting to ascertain the frequency with which the actual directions of the payoffs change over the sample period. The null hypothesis for the test states that each of the sequence of monthly payoffs is random, with the alternative looking for non-randomness. The test statistic is usually defined as the number of runs (R) – the number of groups of payoffs exhibiting consistent direction, with the rejection region specified on the basis of the number of observations in differing categories, in this case the number being either positive or negative. However as the sample being analysed is of sufficient size the sampling distribution of R becomes approximately normal and so allows for more conventional data analysis.

5.5 Results

5.5.1 Univariate Testing: Unadjusted and Risk-Adjusted results

The results of the univariate cross sectional style tests on both the unadjusted and risk-adjusted returns are presented in the tables below. Each table contains the full list of fifty selected factors ranked in descending order of the absolute value of their t-statistic. Also presented for each factor is the average of the time series of slope coefficients generated over the full sample period. See Appendix B for a full output of slope coefficients and t-statistics.

Table 5.1 presents the full list of style factors tested on the unadjusted returns. Table 5.2 and 5.3 display the results of the same set of factors run for the risk-adjusted returns. Upon examination it becomes evident that a large number of these tested style characteristics are indeed significant. Furthermore, many of these factors remain significant post risk adjustment indicative of their pervasiveness in explaining emerging market return variation. However, there are a number of factors that diverge from the unadjusted results once risk adjustment has been completed, with the magnitude of their payoffs and direction of relationship substantially different.

Subsequently, the cluster analysis run on the factors found to be significant in univariate testing against unadjusted returns as presented in Figure 5.1. Thereafter the cluster analyses run on the both sets of risk adjusted return data are presented in for comparative purposes in Figures 5.2 and 5.3.

Significant and Insignificant Attributes:**Table 5.2 Significance of Attributes: Unadjusted Returns**

The table below contains the results of the Univariate Cross Sectional Regressions run on unadjusted returns data. The standardised firm specific characteristics are regressed against the total unadjusted firm return for that month and every month over the sample period spanning 1 January 1997 to the 31st December 2006. By unadjusted total returns it is meant that no form of risk adjustment to account for systematic risk based on any form of asset pricing model has been conducted. The mean slope coefficients and associated t-stats are represented below in order to communicate those attributes that are significant in explaining the variation in returns.

Attribute	T-Statistic	Beta Coefficient	Attribute	T-Statistic	Beta Coefficient
BTMV	6.4051	0.0091	Payout	-1.4241	-0.0008
SalestP	5.8429	0.0072	12_EPS	1.3157	0.0010
PTBV	-5.2197	-0.0069	EPS	-1.2607	-0.0011
PC	-5.1451	-0.0047	MOM_6M	0.9538	0.0031
MTBV	-4.5746	-0.0060	ROE	0.9410	0.0014
DY	3.9105	0.0039	6_EPS	0.9090	0.0007
LnP	-3.5023	-0.0061	VO	0.8391	0.0007
DtMVE	3.2749	0.0048	MOM_12M	0.7961	0.0020
LnMV	-3.1751	-0.0040	MOM_24M	-0.7427	-0.0016
P	-3.1722	-0.0056	Quick	-0.7396	-0.0005
MVTMV_3	2.7896	0.0023	Casheps	0.6970	0.0008
PE	2.6477	0.0301	24_EPS	0.6250	0.0005
VO_6	2.6171	0.0021	MVTMV_12	0.5208	0.0024
MVTrade	-2.4993	-0.0141	MOM_1M	0.5097	0.0014
EY	2.3199	0.0223	Diffdivtp6	-0.4734	-0.0002
A_Turn	2.2838	0.0025	MOM_18M	-0.4236	-0.0010
VO_3	2.2483	0.0018	TV	0.3338	0.0004
MVTMV_1	2.1360	0.0017	Diffdivtp12	0.2838	0.0002
ROCE	1.9757	0.0028	NS	0.2533	0.0003
MVTradeMV	1.6747	0.0400	Diffdivtp24	-0.1654	-0.0001
MVTMV_6	1.4878	0.0012	VO_12	-0.1071	-0.0001
CFtTD	1.4534	0.0010	TdtTA	0.0250	0.0000
VO_1	1.4500	0.0012	MOM_3M	0.0062	0.0000
ICBT	1.4489	0.0010			

Table 5.3 Significance of Attributes: CAPM Adjusted Returns (EMI)

The table below contains the results of the Univariate Cross Sectional Regressions run on CAPM adjusted returns data. The 90 day US Treasury Bill was used as the proxy for the riskless rate and the DataStream International Emerging Markets Index chosen as a good approximation of the market. The standardised firm specific characteristics at the beginning of the month are regressed against the total CAPM adjusted firm return for that month and every month over the sample period spanning 1 January 1997 to the 31st December 2006. Risk adjustment entails the removing of that component defined as systematic in order to gauge the pervasiveness of the identified style factors. The mean slope coefficients and associated t-stats are represented below in order to communicate those attributes that are significant in explaining the variation in returns.

Attribute	T-Statistic	Beta Coefficient	Attribute	T-Statistic	Beta Coefficient
BTMV	6.7684	0.0099	CFtTD	1.1690	0.0008
SalestP	5.1422	0.0072	MOM_12M	1.1266	0.0028
PTBV	-4.9239	-0.0066	12_EPS	1.1136	0.0009
MTBV	-4.8949	-0.0062	Payout	-0.9725	-0.0006
PC	-4.2412	-0.0042	MOM_6M	0.9366	0.0031
DY	4.1327	0.0043	Diffdivtp12	0.9250	0.0005
LnMV	-3.6980	-0.0048	Quick	-0.8555	-0.0007
LnP	-3.3111	-0.0059	VO	0.8432	0.0008
DtMVE	3.1051	0.0050	VO_12	-0.7936	-0.0010
MVTMV_3	3.0761	0.0027	ROE	0.7614	0.0011
VO_6	2.9630	0.0026	EPS	-0.7426	-0.0008
A_Turn	2.8519	0.0029	24_EPS	0.6858	0.0006
P	-2.7452	-0.0048	MOM_24M	-0.4105	-0.0008
MVTrade	-2.6450	-0.0164	Casheps	0.2800	0.0004
VO_3	2.5108	0.0022	MOM_3M	-0.2780	-0.0008
MVTMV_1	2.4909	0.0021	Diffdivtp6	-0.2442	-0.0001
ICBT	2.1035	0.0015	TDtTA	-0.2262	-0.0003
ROCE	2.0303	0.0028	MOM_1M	-0.2030	-0.0005
MVTradeMV	2.0058	0.0470	TV	-0.1552	-0.0002
PE	1.7241	0.0179	6_EPS	0.0915	0.0001
MVTMV_6	1.4649	0.0013	Diffdivtp24	0.0809	0.0001
EY	1.4563	0.0172	NS	0.0487	0.0001
VO_1	1.3453	0.0011	MOM_18M	-0.0368	-0.0001
MVTMV_12	-1.3120	-0.0077			

Table 5.4 Significance of Attributes: CAPM Adjusted Returns (WMI)

The table below contains the results of the Univariate Cross Sectional Regressions run on CAPM adjusted returns data. The 90 day US Treasury Bill was used as the proxy for the riskless rate and the DataStream International World Markets Index chosen as a good approximation of the market. The standardised firm specific characteristics at the beginning of the month are regressed against the total CAPM adjusted firm return for that month and every month over the sample period spanning 1 January 1997 to the 31st December 2006. Risk adjustment entails the removing of that component defined as systematic in order to gauge the pervasiveness of the identified style factors. The mean slope coefficients and associated t-stats are represented below in order to communicate those attributes that are significant in explaining the variation in returns.

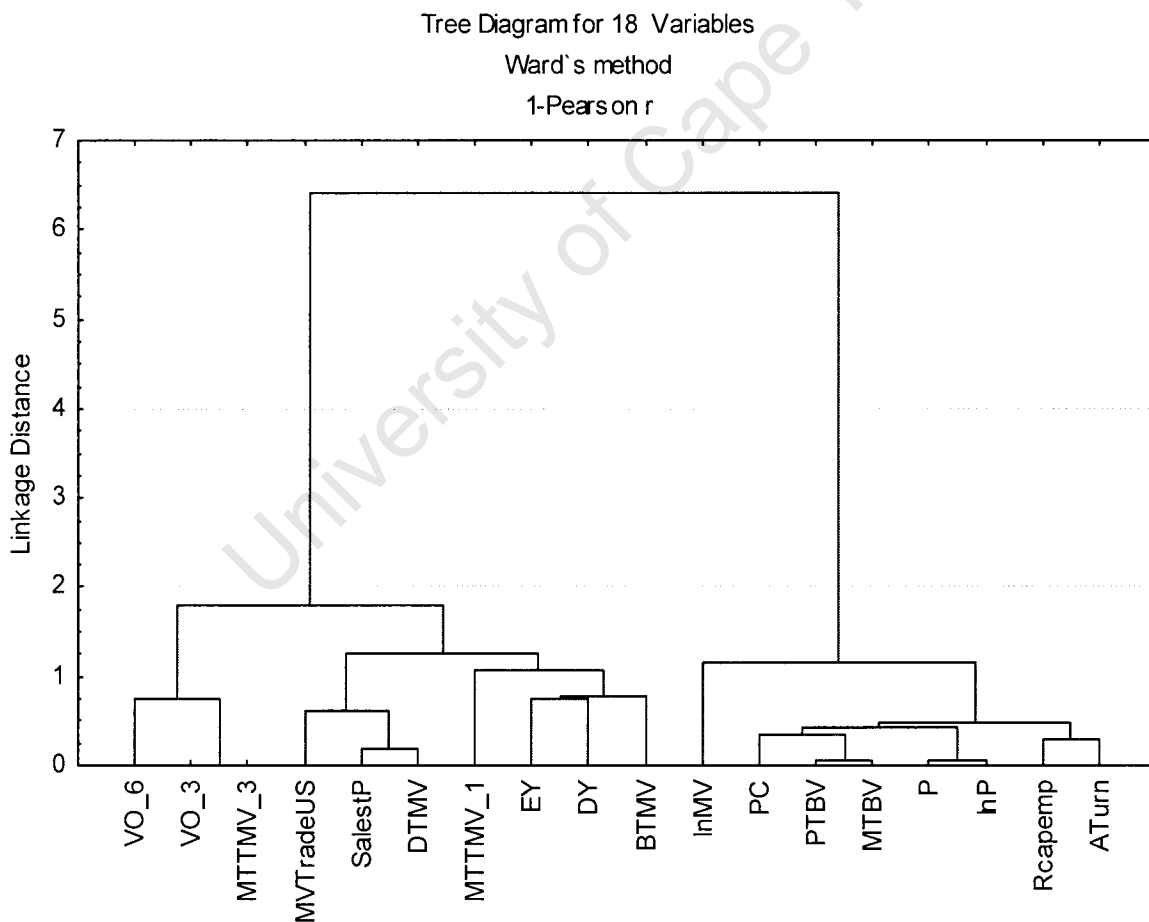
Attribute	T-Statistic	Beta Coefficient	Attribute	T-Statistic	Beta Coefficient
BTMV	5.6899	0.0106	Quick	-1.3351	-0.0011
MTBV	-5.2452	-0.0071	Diffdivtp12	1.3006	0.0008
PTBV	-5.1141	-0.0076	MOM_6M	1.2806	0.0043
SalestP	4.9531	0.0072	MVTMV_12	-1.2118	-0.0064
PC	-4.2464	-0.0046	MOM_12M	1.1364	0.0030
DY	3.5359	0.0041	VO_1	0.9292	0.0008
LnMV	-3.4823	-0.0050	24_EPS	0.9095	0.0008
LnP	-3.4298	-0.0064	EPS	-0.8196	-0.0009
DtMVE	2.9358	0.0052	CFtTD	0.6528	0.0005
MVTrade	-2.8670	-0.0175	Diffdivtp24	0.6455	0.0004
P	-2.7712	-0.0052	MVTMV_6	0.5569	0.0005
MVTMV_3	2.7128	0.0024	ROE	0.4568	0.0007
A_Turn	2.6530	0.0030	6_EPS	0.3889	0.0003
VO_6	2.5975	0.0023	TV	0.3849	0.0005
PE	2.2541	0.0236	Casheps	0.3725	0.0005
ICBT	2.0059	0.0014	VO_12	-0.3409	-0.0004
MVTMV_1	1.9782	0.0018	NS	0.2167	0.0003
VO_3	1.9501	0.0018	MOM_24M	-0.2056	-0.0004
12_EPS	1.8307	0.0016	Diffdivtp6	-0.1314	-0.0001
ROCE	1.7767	0.0025	MOM_18M	0.1257	0.0003
MVTradeMV	1.7383	0.0482	TDtTA	-0.1223	-0.0002
MOM_1M	-1.4952	-0.0044	MOM_3M	0.1147	0.0004
EY	1.4153	0.0178	VO	0.1004	0.0001
Payout	-1.3609	-0.0010			

Cluster Analyses:

Unadjusted Returns

Figure 5.1 Tree Diagram representing the Clusters of Monthly Payoffs: Unadjusted Returns

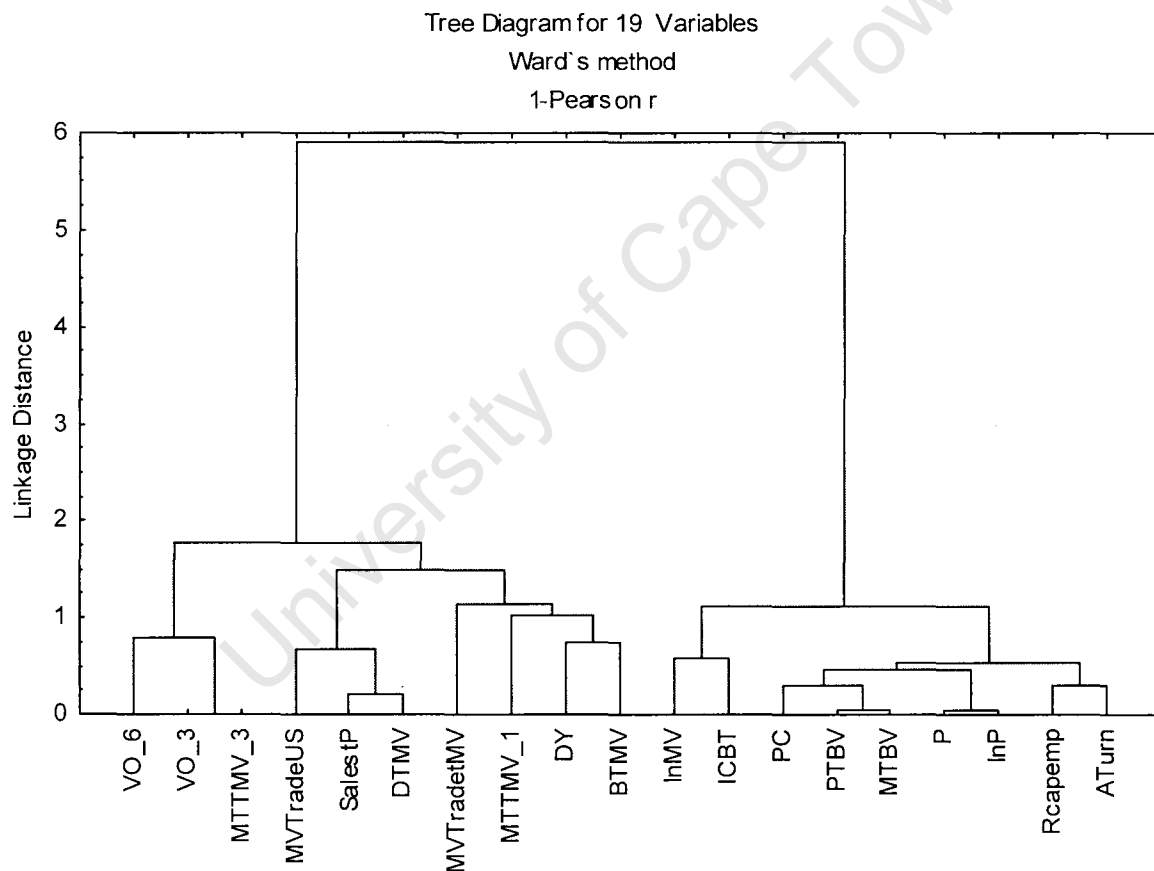
A Vertical Tree Diagram is depicted below showing the cluster analysis of the monthly payoffs to the standardised firm-specific attributes. The attributes presented are those found to be significant at a 5% level after the previous univariate testing procedure has been undertaken. Wards method is used with the Pearson clustering algorithm for sorting the attributes into their relevant clusters.



CAPM (Emerging Market Index) Adjusted Returns

Figure 5.2 Tree Diagram representing the Clusters of Monthly Payoffs: CAPM (EMI) Adjusted Returns

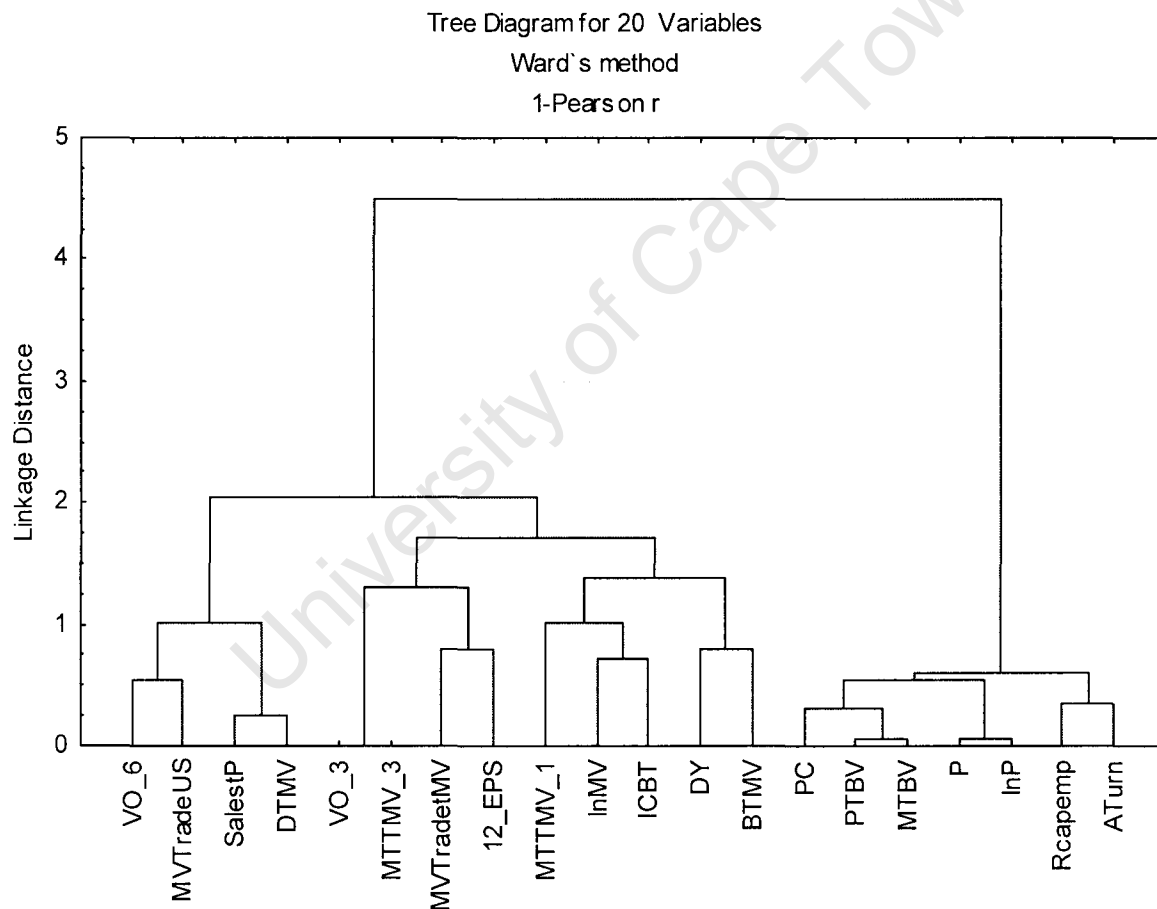
A Vertical Tree Diagram is depicted below showing the cluster analysis of the monthly payoffs to the standardised firm-specific attributes. The attributes presented are those found to be significant at a 5% level after the previous univariate testing procedure has been undertaken. Wards method is used with the Pearson clustering algorithm in sorting the attributes into their relevant clusters.



CAPM (World Market Index) Adjusted Returns

Figure 5.3 Tree Diagram representing the Clusters of Monthly Payoffs: CAPM (WMI) Adjusted Returns

A Vertical Tree Diagram is depicted below showing the cluster analysis of the monthly payoffs to the standardised firm-specific attributes. The attributes presented are those found to be significant at a 5% level after the previous univariate testing procedure has been undertaken. Wards method is used with the Pearson clustering algorithm in sorting the attributes into their relevant clusters.



5.5.2 Identification of significant clusters: Unadjusted Returns

The cluster analysis yielded few, well defined clusters worthy of scrutiny. Due to Ward's Method (1963) being very efficient in clustering it is documented that the groupings output may in fact be somewhat narrow and omit certain factors from an expected cluster. The classification of significant factors into the previously identified clusters is somewhat subjective with groupings defined whilst taking into account previous literary findings.

1. Size and Value Combination

Size

Logarithm of Market Value (lnMV), Price (P), Logarithm of Price (LnP)

Value

Price to Cash (PC), Price to Book Value (PTBV), Market to Book Value (MTBV), Return on Capital Employed (ROCE) and Asset Turnover (ATurn)

2. Value and Performance

Earnings Yield (EY), Dividend Yield (DY), Book to Market Value (BTMV), Market Value to Market Value Traded (MTTMV_1)

3. Liquidity

Six month change in Volume in Traded (VO_6), Market Value Traded to Market Value over Three months (MTTMV_3), Three month change in Traded Volume (VO_3)

4. Miscellaneous:

Sales to Price Ratio (SalestP), Debt to Market Value (DTMV) and Market Value Traded (MVTrade)

The additional cluster analyses run on the two differing sets of adjusted returns are used to gauge the respective robustness of the clusters identified from analysing unadjusted returns.

It is worth noting that certain factors fail to remain significant post risk adjustment, however more importantly the same general clusters are again identifiable.

5.5.3 Monthly Payoffs of Significant Factors

As a result of the clusters of significant characteristics being somewhat pervasive across unadjusted and risk-adjusted returns, the remainder of this chapter will focus on the unadjusted return factors and their associated dataset.

In order to simplify the list of firm specific characteristics, correlation matrices were generated for each of the clusters identified.

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Figure 5.4 Correlation Matrix of Significant Style Factors

Presented in the table below is a complete correlation matrix of Pearson coefficients of the final list of the monthly payoffs to the standardised firm-specific attributes found to be significant in the univariate testing procedure performed on the unadjusted return data. Those attributes exhibiting a correlation of greater than 0.9 or less than -0.9 are indicated in bold white text with a black background. Furthermore, those attributes exhibiting a correlation of 0.7 or greater, or -0.7 or less are reflected in white text with a grey background. The data analysed relates to the sample period 1st January 1997 to 31st December 2006. All data were sourced from the DataStream International

database,

Altum	BTW	DTW	EY	IMV	IMP	MTBV	MTW3	MVTradeUS	PC	P	PTBV	Recomp	SalesP	VO3	VO6
1.00	-0.10	-0.59	-0.33	-0.22	0.32	0.32	0.02	-0.46	0.57	0.59	0.62	0.70	0.88	0.00	0.01
0.24	1.00	0.35	0.17	1.00	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.35	0.35	1.00	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.24	0.24	0.35	1.00	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.17	0.17	0.35	0.17	1.00	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
-0.59	-0.59	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
-0.33	-0.33	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
-0.22	-0.22	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.32	0.32	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.02	0.02	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
-0.46	-0.46	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.57	0.57	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.62	0.62	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.70	0.70	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.88	0.88	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.00	0.00	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
-0.00	-0.00	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.07	0.07	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.22	0.22	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.39	0.39	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.56	0.56	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.73	0.73	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07
0.94	0.94	0.35	0.17	0.26	0.35	-0.25	-0.13	0.07	-0.20	-0.06	0.04	-0.21	-0.06	0.22	0.07

Figure 5.5 Correlation Matrix of Monthly Payoffs: Size

Presented below is a matrix of Pearson Correlation Coefficients between the monthly payoffs of the standardised firm-specific characteristics generated from the univariate cross-sectional regressions on the unadjusted returns data. All data is sourced from DataStream International and relates to the period January 1997 to December 2006. The attributes displayed below are those that clustered together using Ward's method and that were found to be significant at using the Student t-test at the 5% level of significance. Correlations in excess of 0.7 and -0.7 are highlighted accordingly.

	<i>LnMV</i>	<i>LnP</i>	<i>P</i>
<i>LnMV</i>	1.00	0.41	0.37
<i>LnP</i>	0.41	1.00	0.94
<i>P</i>	0.37	0.94	1.00

Figure 5.6 Correlation Matrix of Monthly Payoffs: Value (1)

Presented below is a matrix of Pearson Correlation Coefficients between the monthly payoffs of the standardised firm-specific characteristics generated from the univariate cross-sectional regressions on the unadjusted returns data. All data is sourced from DataStream International and relates to the period January 1997 to December 2006. The attributes displayed below are those that clustered together using Ward's method and that were found to be significant at using the Student t-test at the 5% level of significance. Correlations in excess of 0.7 and -0.7 are highlighted accordingly.

	<i>ATurn</i>	<i>MTBV</i>	<i>PC</i>	<i>PTBV</i>	<i>ROCE</i>
<i>ATurn</i>	1.00	0.66	0.57	0.68	0.70
<i>MTBV</i>	0.66	1.00	0.68	0.94	0.72
<i>PC</i>	0.57	0.68	1.00	0.76	0.64
<i>PTBV</i>	0.68	0.94	0.76	1.00	0.72
<i>ROCE</i>	0.70	0.72	0.64	0.72	1.00

Figure 5.7 Correlation Matrix of Monthly Payoffs: Value (2)

Presented below is a matrix of Pearson Correlation Coefficients between the monthly payoffs of the standardised firm-specific characteristics generated from the univariate cross-sectional regressions on the unadjusted returns data. All data is sourced from DataStream International and relates to the period January 1997 to December 2006. The attributes displayed below are those that clustered together using Ward's method and that were found to be significant at using the Student t-test at the 5% level of significance. Correlations in excess of 0.7 and -0.7 are highlighted accordingly.

	<i>BTMV</i>	<i>DY</i>	<i>EY</i>	<i>MTTMV_1</i>
<i>BTMV</i>	1.00	0.24	0.21	0.05
<i>DY</i>	0.24	1.00	0.26	0.05
<i>EY</i>	0.21	0.26	1.00	-0.00
<i>MTTMV_1</i>	0.05	0.05	-0.00	1.00

Figure 5.8 Correlation Matrix of Monthly Payoffs: Liquidity

Presented below is a matrix of Pearson Correlation Coefficients between the monthly payoffs of the standardised firm-specific characteristics generated from the univariate cross-sectional regressions on the unadjusted returns data. All data is sourced from DataStream International and relates to the period January 1997 to December 2006. The attributes displayed below are those that clustered together using Ward's method and that were found to be significant at using the Student t-test at the 5% level of significance. Correlations in excess of 0.7 and -0.7 are highlighted accordingly.

	<i>MTTMV_3</i>	<i>VO_3</i>	<i>VO_6</i>
<i>MTTMV_3</i>	1.00	0.99	0.43
<i>VO_3</i>	0.99	1.00	0.44
<i>VO_6</i>	0.43	0.44	1.00

Figure 5.9 Correlation Matrix of Monthly Payoffs: Miscellaneous

Presented below is a matrix of Pearson Correlation Coefficients between the monthly payoffs of the standardised firm-specific characteristics generated from the univariate cross-sectional regressions on the unadjusted returns data. All data is sourced from DataStream International and relates to the period January 1997 to December 2006. The attributes displayed below are those that clustered together using Ward's method and that were found to be significant at using the Student t-test at the 5% level of significance. Correlations in excess of 0.7 and -0.7 are highlighted accordingly.

	<i>DTMV</i>	<i>MVTraded</i>	<i>SalestP</i>
<i>DTMV</i>	1.00	0.45	0.80
<i>MVTraded</i>	0.45	1.00	0.52
<i>SalestP</i>	0.80	0.52	1.00

From the above figures it can be seen that many of the between factor correlations are low, however there are a number that have correlation figures in excess of the 0.7 bound imposed and so should be excluded to mitigate possible redundancies. Therefore the generation of the above matrices serves to aid in the simplification of the final characteristics list.

Final List of 14 Uncorrelated Attributes

Table 5.5 Displayed below is the finalised list of 14 significant firm-specific characteristics from the univariate cross sectional regressions run over the sample of monthly returns data spanning January 1997 to December 2006. The significant standardised firm specific attributes at the 5% level are reflected below with their associated monthly averaged coefficient and related t-statistic. All attributes are further classified according the nature of their behaviour as being either of the Size, Value, Liquidity, Momentum or Growth clusters as previously identified. Only included are those factors that exhibit insignificant degrees of correlation with those that were found in similar clusters.

Style Grouping	Characteristic	T-Statistic	Slope Coefficient
<i>SIZE</i>	LnMV	-3.1751	-0.0040
	LnP	-3.5023	-0.0061
<i>VALUE</i>	PTBV	-5.2197	-0.0069
	ROCE	1.9757	0.0028
	ATurn	2.2838	0.0025
	PC	-5.1451	-0.0047
	BTMV	6.4051	0.0091
	DY	3.9105	0.0039
	EY	2.3199	0.0223
	MTTMV_1	2.1360	0.0017
<i>LIQUIDITY</i>	VO_6	2.6171	0.0021
	MTTMV_3	2.7896	0.0023
<i>MISCELLANEOUS</i>	SalestP	5.8429	0.0072
	MVTrade	-2.4993	-0.0141

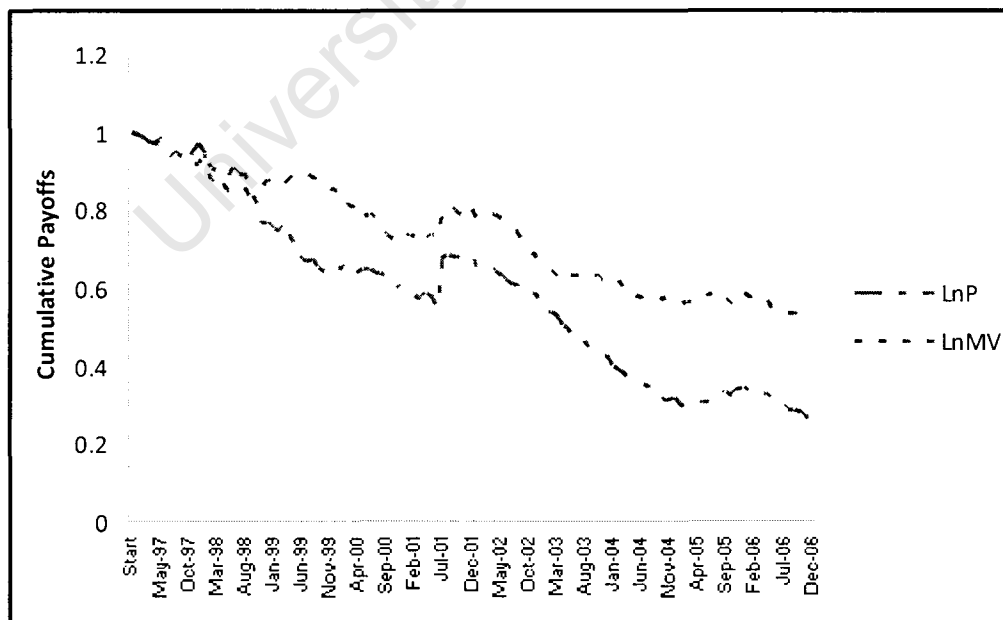
5.5.4 Analysis of Cumulative Monthly Payoffs

As can be seen from the above table, there are somewhat defined explanatory groupings into which the significant factors can be classified. These defined groupings namely Size, Value, Liquidity and a miscellaneous category have their own interpretations with respect to the prediction of return behaviour. The cumulative monthly payoffs of these collection of factors is presented below as an aid in determining the viability of including such characteristics in a multifactor predictive model.

5.5.4.1 Size

Figure 5.10: Cumulative Monthly Payoffs: Size

The Cumulative monthly payoffs of each of those uncorrelated, significant attributes evident from the univariate cross sectional regressions that can be categorized as Size related are presented graphically below. The monthly payoffs are obtained from the univariate analysis run on return data spanning the period January 1997 to December 2006. Only those attributes significant at the 5% level of significance are considered using the Student t test. All data were sourced from DataStream International with the graph below starting at 1.



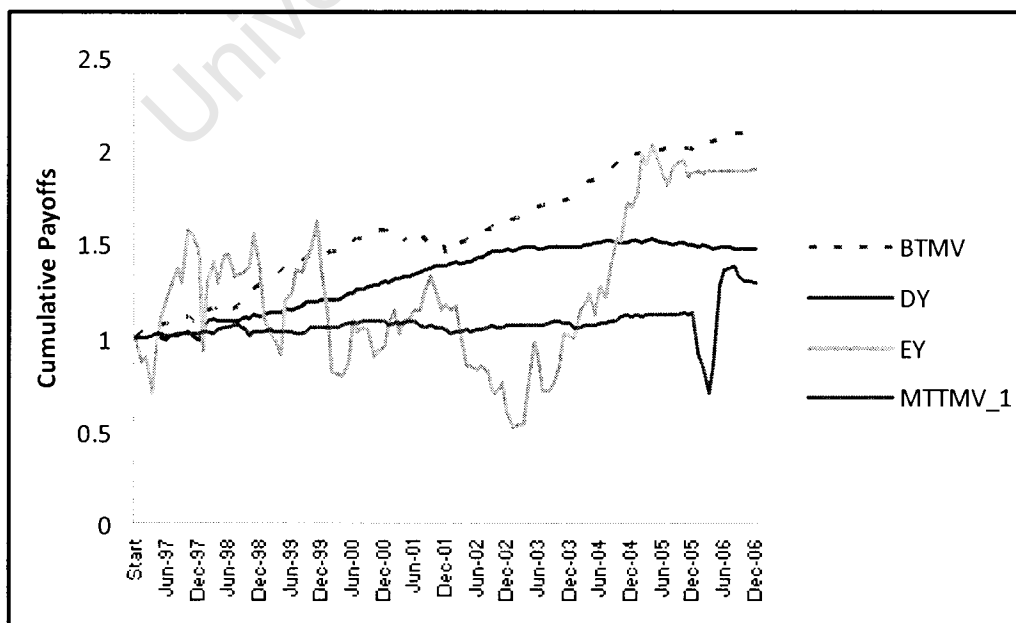
From the above graph it is evident that there exists a strong negative size effect across the sample of emerging nations studied. Both the significant characteristics identified namely

Both Return on Capital Employed (ROCE) and Asset Turnover (A-Turn) exhibit consistently positive cumulative monthly payoffs serving to endorse their value orientation. However, in many previous studies it is found that ROCE exhibits a significant negative relationship; the findings are to the contrary in this study. Interestingly there is no evidence in prior research to support the finding of Asset Turnover as a significant explanatory factor; therefore it may be the case that due to the sparseness of emerging market data such a factor has failed to be identified up until now. Further multivariate testing will serve to ascertain whether or not such a factor is robust in its explanation of the cross sectional variation of emerging market returns.

Price to Cash (PC) and Price to Book Value exhibit strong negative cumulative monthly payoffs.

Figure 5.12 Cumulative Monthly Payoffs: Value (2)

The Cumulative monthly payoffs of each of those uncorrelated, significant attributes evident from the univariate cross sectional regressions that can be categorized as Value related are presented graphically below. The monthly payoffs are obtained from the univariate analysis run on return data spanning the period January 1997 to December 2006. Only those attributes significant at the 5% level of significance are considered using the Student t test. All data were sourced from DataStream International with the graph below starting at 1.



Well defined positive value effects are exhibited by the majority of the factors in the above cluster.

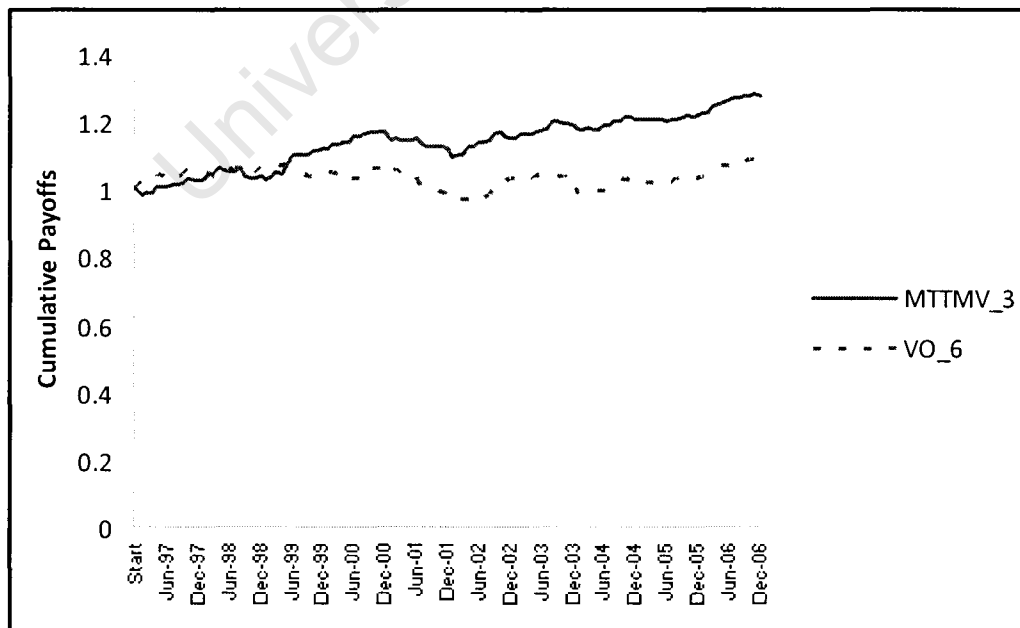
A mildly positive dividend yield effect is evident and comparable to developed market literature by Litzenberger and Ramaswamy (1979), Blume (1980) and Keim (1985).

Furthermore even stronger positive value effects are shown by the likes of Earnings Yield (EY) and Book-to-Market Value (BTMV) which cohere with the findings of Patel (1997), Rouwenhorst (1999) and Fama and French (1998).

5.5.4.3 Liquidity

Figure 5.13 Cumulative Monthly Payoffs: Liquidity

The Cumulative monthly payoffs of each of those uncorrelated, significant attributes evident from the univariate cross sectional regressions that can be categorized as Liquidity related are presented graphically below. The monthly payoffs are obtained from the univariate analysis run on return data spanning the period January 1997 to December 2006. Only those attributes significant at the 5% level of significance are considered using the Student t test. All data were sourced from DataStream International with the graph below starting at 1.



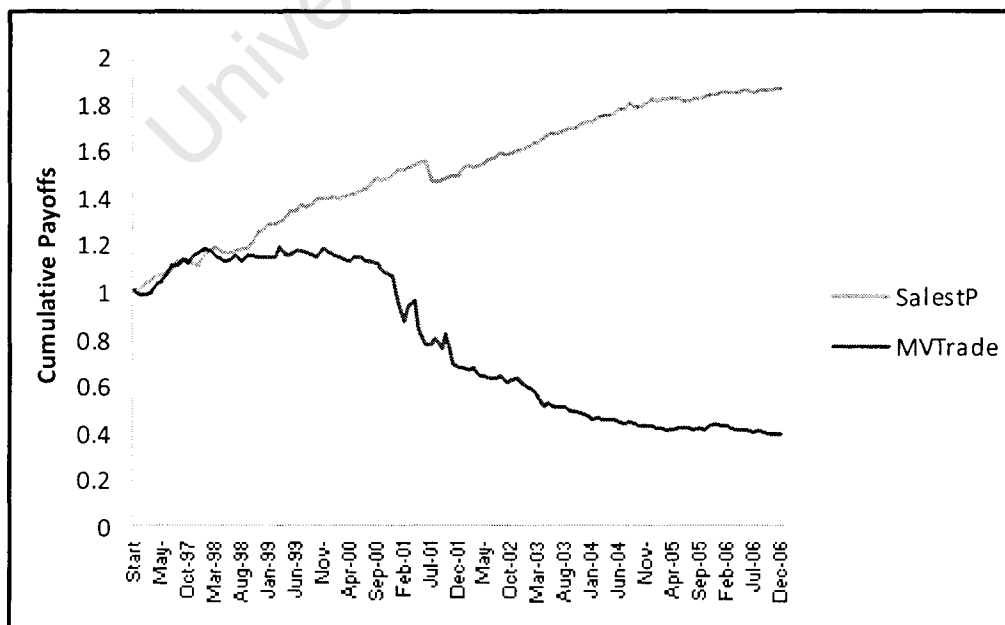
Earlier work by Claessens, Glen and Dasgupta (1998), Rouwenhorst (1999) endorse the above findings of a positive liquidity effect in emerging markets.

The above factors, namely MTTMV_3 and VO_6 communicate on aggregate, positive cumulative monthly payoffs across the ten year sample period. From the above it can be inferred that Short-Term Liquidity (MTTMV_3) demonstrates a better defined positive reward than the Medium-Term Liquidity Factor (VO_6) whose payoffs direction is somewhat less distinct and more volatile.

5.5.4.4 Miscellaneous

Figure 5.14 Cumulative Monthly Payoffs: Miscellaneous

The Cumulative monthly payoffs of each of those uncorrelated, significant attributes evident from the univariate cross sectional regressions that cannot be explicitly categorized are presented graphically below. The monthly payoffs are obtained from the univariate analysis run on return data spanning the period January 1997 to December 2006. Only those attributes significant at the 5% level of significance are considered using the Student t test. All data were sourced from DataStream International with the graph below starting at 1.



The above factors are found to be significant however their precise logical classification into any such style grouping is somewhat difficult. Sales to Price (SalestP) is by its very nature value orientated and with such a theoretical supposition in mind can be seen to exhibit an expected positive payoff over the chosen sample period. It is however rather strange that such a factor with its purported value orientation does not co-move more with those factors identified in the value clusters.

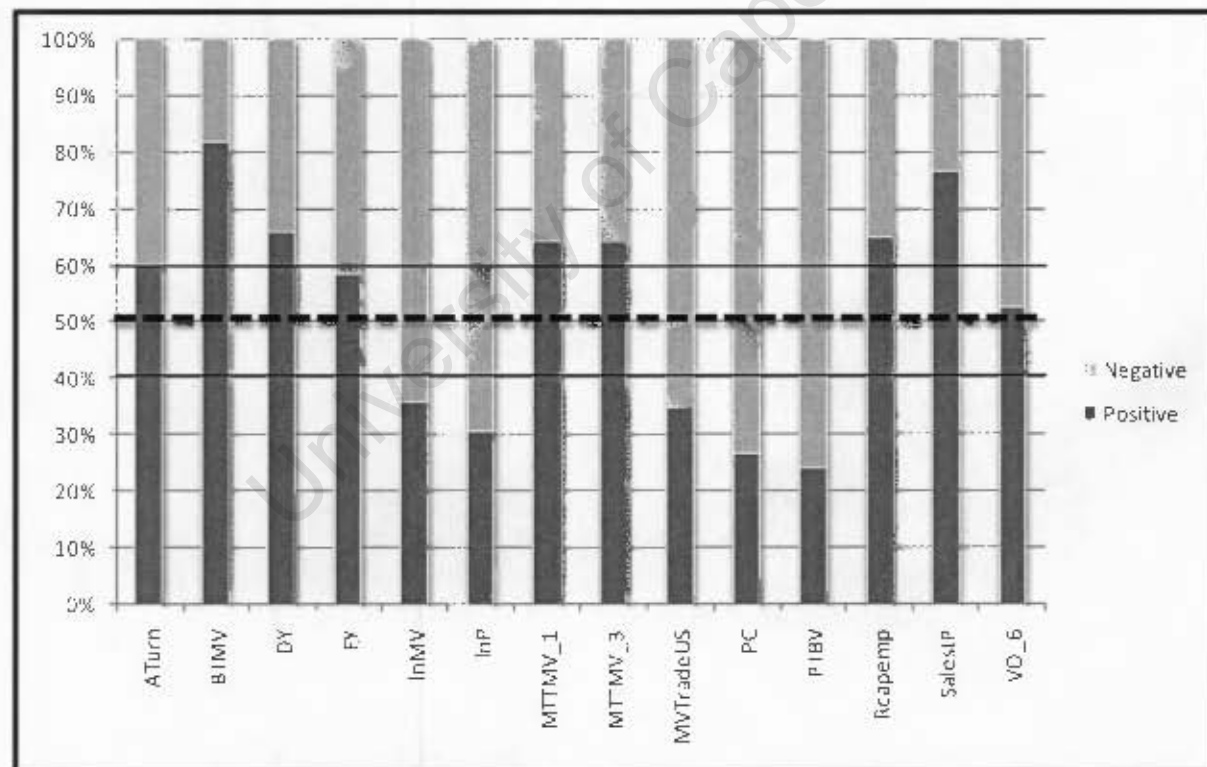
MVTrade can have a number of logical theoretical foundations. As it measures trading activity it can be considered to be somewhat of a gauge for liquidity in the market. However, as larger trades are generally associated with larger firms, MVTrade may also exhibit overtones of some form of size effect. From the above graphical depiction it appears to capture some of the effect of liquidity crises evident in emerging markets in the late nineties and early twenty first century with the same downward trend also cohering with a definite size effect already identified in an emerging market context.

5.6 Style Consistency

5.6.1 Sign Test

Figure 5.15 Consistency of Direction of Significant Attributes Monthly Payoffs

The diagram below represents the proportion of the number of times that each of the monthly factors payoffs were positive compared to when they are negative. As before the monthly payoffs are obtained from the cross sectional univariate regressions over the sample period spanning January 1997 to December 2006. All factors presented below are those found to statistically significant using the Student's *t* distribution. Those attributes that are found have values closer to the bounds; either 0% or 100% in either direction are considered to more consistent with respect to sign. A dashed line is displayed at the 50% level with solid lines indicating the 5% level of significance for the testing procedure. All data were extracted from DataStream International.



The above figure provides a helpful illustration of the consistency in direction of the monthly payoffs. A payoff with one direction closer to either 0% or 100% is considered to be of greater consistency than one which is located around the 50% mark. Eleven of the above characteristics are found to exhibit consistency ratios significant at the 5% level when tested using the binomial formulation of the non-parametric Sign Test.

Book-to-Market Value (BTMV) is the payoff that is found to be the most consistently positive payoff at 82%, with Sales-to-Price (SalestP) also exhibiting a strong positive tendency in its payoffs coming a close second with 77%.

Price-to-book Value (PTBV) is found to be the factor whose direction is the most consistently negative at 77%. Price to Cash (PC) is the factor with the second most regular direction with its payoffs negative 73% of the time.

The two most inconsistent factors based on their computed ratios being closest to 50% were Earnings Yield (EY) and Six month Volume Traded (VO_6). VO_6 was the most inconsistent with positive payoffs 52% of the time and negative payoffs prevalent 48% during the sampling period.

5.6.2 Tests for Randomness

Figure 5.16 Testing the Randomness of Monthly Payoffs

The output below is generated from a Runs Test for Randomness performed on the monthly payoffs of all identified significant factors from the cross-sectional univariate regressions. The table indicates the mean number of runs (R), the associated standard deviation, the computed test statistic assuming a normal sampling distribution (refer to 5.4.8.2) and the relevant p-value. Significance is tested at the 5% level of significance using the standard normal z-test. P-values in excess of 5% are statistically insignificant with null hypothesis of randomness unable to be rejected.

	μ_R	δ_R	Test Statistic	P-Value
ATurn	58.60	13.70	-0.48	0.32
BTMV	36.93	5.27	-0.94	0.18
DY	54.98	12.02	0.00	0.50
EY	59.33	14.05	-0.45	0.33
InMV	56.18	12.56	-0.33	0.37
InP	52.18	10.79	0.17	0.56
MTTMV_1	56.18	12.56	0.14	0.56
MTTMV_3	56.18	12.56	0.07	0.52
MVTradeUS	55.60	12.30	0.44	0.67
PC	47.93	9.06	-0.43	0.33
PTBV	44.98	7.94	-1.63	0.05
Rcapemp	55.60	12.30	0.03	0.51
SalestP	43.93	7.56	-0.78	0.22
VO_6	60.85	14.80	-0.26	0.40

From the above output it can be inferred that very few of the identified firm-specific characteristics exhibit a consistent unchanging direction. All of the generated p-values of the factors with the exception of the PTBV factor are in excess of 5% indicative of statistically significant randomness in the variation of the factors monthly payoffs. As mentioned only the PTBV factors had a p-value of approximately 5% meaning that the rejection of the null hypothesis is acceptable and so the factor is sufficiently consistent to doubt that it changes randomly. These findings are important as they provide some insight into the success of the formulation of style timing models later in this paper.

5.7 Summary and Conclusion

The aim of the first half of this chapter was to investigate the overall risk structure of the selected sample of emerging market nations for the period 1st January 1997 to 31 December 2006. The tests conducted found that to a certain extent the behaviour of stock returns in emerging nations exhibit a degree of commonality with a collective of such nations, namely the DataStream International Emerging Markets Index. Furthermore, co-movement on an international scale is also evident, more specifically with the DataStream International World Index.

Cluster Analysis and Principal Components methodologies were then posited as potential approaches for attempting to understand the variation inherent in emerging capital markets. Attempts to perform such analyses on the given dataset were deemed not feasible on account of its sheer magnitude as both testing procedures are most accurate when performed on a small scale. However, the results of previous studies such as Van Rensburg and Acres (2006) performed in a similar context shed some much needed light on the behaviour of emerging capital markets. Distinct clusters for emerging and developed markets were discovered which served as the basis for the selection of adequate proxies for the index-models later formulated. No defined sector behaviour was found to be evident in such a context, however emerging nations in close geographical proximity tended to have a significant degree of co-movement in their returns.

An explanation of the Time-Series variation in share returns is then attempted through the formulation of both Single and Multi-Index models. Considering the results of prior research in an emerging market context and the increasing trend in capital market integration, adequate proxies were chosen accordingly. First level tests found the Multi-Index model to have the greatest degree of explanatory power superior to either of the Single-Index models producing an average R^2 across the all the companies of 13.59% compared to 11.8% and 8.99% respectively. The number of significant regressions is also noteworthy - both the Single-Index models and Multi-Index models generate a healthy number of significant regressions (all in excess of 60% of the total run). The Second level tests regress the residuals against the rival model's independent variables; however they provide little additional evidence to further explain the nature of the underlying variation in stock returns. Adjusted R^2 that are close to or less than zero and the number of total regressions being significant not reaching above 5% in three of the four test run emphasize the futility of modelling.

On aggregate both the Single and Multi-Index models are relatively poor in their explanatory power and provide minimal insight into the explaining of the time series of share returns in emerging markets. One must consider the possibility that incorrect proxies were in fact employed in such a setting, however due to the data constraints that characterize emerging nations in particular, it is believed that the chosen proxies were the best available at the time of testing.

The next part of the chapter aims to investigate the ability of the firm-specific attributes to explain the cross sectional variation in share returns. In each month of the sample period the forward stock returns of each of the included companies are regressed in a univariate manner against the all 50 firm specific attributes. The averaged cross sectional regression coefficients that output are then assessed for significance using the Students t-test. This testing procedure serves to narrow the list down to only those characteristics that are most significant in explaining the variation in share returns. Less than twenty attributes remain after this procedure is conducted.

In order to assess the robustness of these factors, they are tested in the same manner against returns that are risk adjusted using the two market proxies mentioned earlier in the chapter.

Once more the Students t test is performed with the significant factors identified being very much similar to those evident from the test against the unadjusted returns.

A Cluster Analysis is then performed on the monthly payoffs of the factors identified to be significant from the tests run on the unadjusted returns and risk-adjusted returns. The clustering method used namely Ward's method is known to generate very narrow but significant clusters. This considered, it is fairly difficult to identify generalised factor groupings-however a number of logical classifications were identified. The factors could be found to group in the following clusters (1) Size and Value, (2) Value, (3) Liquidity and a Miscellaneous collection of factors.

In order to remove highly correlated factors that capture similar variation a correlation analysis was performed on all factors that fell into the well defined clusters mentioned above. If two factors were found to be excessively correlated, that factor having a lower t-statistic in the previous univariate cross-sectional regressions was excluded.

As a result of this pruning procedure a final list of 14 firm-specific characteristics was identified. The majority of these factors seem to cohere with the results of prior research; however the lack of significant momentum effects is somewhat unexpected. Significant Size, Value and Liquidity effects are however prevalent and comparable with previous studies in an emerging market context. Interestingly, Asset Turnover, a factor that is found to be considerably significant in this study has not been identified in previous research.

The monthly payoffs of each firm-specific attribute are then assessed for the consistency of their direction. The more consistent the payoff direction the more interpretable the factor becomes in terms of formulating a defined investment strategy based the results generated. A number of the factors are indeed found to be either significantly positive or negative, however there are many that have inconsistent direction which detracts from the potential of being able to time the direction of such payoffs and so exploit profit taking opportunities.

Further testing for the changeability of the direction of such payoffs is performed using a Runs test. It is found that the majority of the factors exhibit random behaviour with only a few exhibiting consistent predictable trends.

It is common knowledge that Univariate Testing is limited by the fact that only one independent variable is tested at a time against a chosen dependent variable. The problem with such a procedure is that the significance of the explanatory power of such factors may not in fact hold up when the number of independent variable exceeds one. Therefore in order to ascertain how pervasive these identified factors truly are testing in a multivariate setting will be forthcoming in chapters to follow.

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A Univariate Analysis of Macroeconomic influences on return behaviour in Emerging Markets

6.1 Introduction

The previous chapter identified numerous style characteristics found to have significant explanatory power over the cross sectional variation of returns of firms in so called emerging markets. Given these defined style anomalies that aid in our understanding of market behaviour, one is curious to determine whether or not there may be additional attributes or variables of a less firm-specific orientation that have some form of explanatory power. The aim of this chapter is to explore the impact of firm exposures to certain macroeconomic variables and changes therein in being able to further explain the cross section of returns.

6.2 Identification of Candidate Macroeconomic Variables

6.2.1 Prior Research

The majority of prior research into macroeconomic influences on the return pattern of shares has been considerably country-specific in its focus. The early developed market research by Chen, Roll and Ross (1986), Pearce and Roley (1988), Friedman (1988) and Chen (1991) place more emphasis on the local, endemic macroeconomic factors and their relative impact on domestic share returns. Variables such as inflation, industrial production, interest rates, money supply and unemployment are common factors cited to have potential explanatory power.

Research of such type is considerably more sparse in an emerging market context. Studies by Gjerde and Sættem (1999), Kwon (1997) and Sadorsky (1999) retain the localised focus that is characteristic of the majority of developed market studies. Gjerde and Sættem (1999), find that both changes in the real interest rate and oil price movements negatively related to stock market movement, partly endorsed by Sadorsky (1999) who communicates that shocks to the price of oil post 1986 do in fact have a significant impact on returns on the S&P 500. Kwon (1997) looks at the Korean market specifically and finds that factors such as the rate of foreign exchange, oil price and money supply exhibit significant relations which vary in sign in accordance to the type of sub-industry analysed but nevertheless provide additional support for macroeconomic influence on market movements.

However, research by Harvey (1995a) and the later work of Bilson, Brailsford, and Hooper (2001) focus on a broader sample of emerging nations and consider variables with a more global orientation than that of prior research. Bilson *et al* (2001) studies the influence of gold prices, exchange rates and money supply and find only moderate evidence to suggest any form of relation.

With this prior work in both developed and emerging nations in mind, an initial list was drawn up based on some of the hypotheses and conclusions previously asserted in the aforementioned papers. Notably this study aims to assess the impact of more globally orientated (mainly US) factors on the performance of emerging stock markets. This considered a preliminary list of factors was drawn up that encompass key sources of variation in the majority of economies across the globe

Table 6.1 Initial list of Candidate Macroeconomic Variables

The table below presents the full list of fifteen macroeconomic variables hypothesised to have potential in explaining the variation of share returns in emerging markets. They are presented with their respective code and a brief description of their nature. All data were sourced from DataStream International database.

Full Name and Description	Code
CRB Commodities Index	CRBINDEX
Gold Price \$US/ounce	GOLDPRICE
Oil Brent Crude \$US/Barrel	OILBRENTCR
Platinum Price \$US/ounce	PLATINUM
3-month US Bankers Acceptance rate	USBA3M

Rand(R) \$US exchange rate	RANDDOLLAR
US Export Index	USEXPIND
Yield on 10yr US Govt. Bond	USGLT10YR
US Money Supply (M1)	USMONSUPP
US Producer Price Index	USPPI
US Prime Rate	USPRIME
US Short Term Interest Rate	USSHTRM
Yield on 3-month US Treasury Bill	USTBILL3M
US Unemployment Rate	USUNEMP
Chinese Yuan \$US exchange rate	YUANDOLLAR

6.2.2 Explanation of Macroeconomic Factors

The list above combines the two pervading themes in the reviewed research and so has a strong term structure and commodity focus. The majority of the factors are easily recognised and understandable, being either commodity prices or interest rates. A number however are not common knowledge, namely the CRB Commodities Index, US Export Index and the US Short Term Interest Rate.

The CRB Commodities Index is a broad based commodities index also termed the NYFE Commodity Research Bureau Index. It is described as a three dimensional index as it averages prices across seventeen commodity futures whilst also incorporating the average commodity prices historically. The constituents of the index are as follows: Cattle (live), Cocoa, Coffee, Copper, Corn, Cotton, Crude Oil, Gold, Heating Oil, Hogs (live), Natural Gas, Orange Juice, Platinum, Silver, Soybeans, Sugar and Wheat.

The US export index is offered by the US Department of Labour and is a broad commodity based index comprised of a variety of goods. The index is has some exposure to agricultural products however its major focus is non-agricultural items such as industrial, capital and consumer products.

The US Short Term Interest Rate is the 3-month Eurodollar rate, i.e. the interest rate on United States Dollar three month deposits in London. It is sourced from the OECD, namely the Organisation for Economic Co-Operation and Development.

6.3 Adjustments to candidate variables prior to testing

Certain adjustments were carried out on the complete list of 15 macroeconomic variables prior to performing the Univariate analysis.

6.3.1 Stationarity

Each of the variables was tested for stationarity using the Augmented Dickey-Fuller (ADF) test. The aim of this test is to identify and mitigate the potential for spurious correlations that occurs when attempting to gauge the relationship between two data series that are non-stationary. The Augmented Dickey-Fuller (ADF) test differs from the simple Dickey Fuller unit root test as it considers correlation at higher order lags through a parametric correction that assumes the testable series follows an AR(p) process so adding (p) lagged difference terms to explanatory side of the regression equation.

Each series to be tested (y_t) using the ADF procedure is specified as follows in lagged form:

$$\Delta y_t = \alpha y_{t-1} + x_t' \delta + b_1 \Delta y_{t-1} + b_2 \Delta y_{t-2} + \dots + b_p \Delta y_{t-p} + \varepsilon_t \quad (6.1)$$

Where,

ρ and δ are parameters to be estimated, with $\alpha = \rho - 1$

x_t represents optional exogenous regressors, in this case a constant and trend term

In order for such a test to have true statistical significance the testing procedure must consider the nature or the manner that the data itself is generated. With regards to the current dataset of macroeconomic data, both a constant intercept and a term that proxies trend over time are included in the specification of the test procedure. The intercept term serves to model a random walk which is deemed suitable for all data that has a mean not equal to zero. The term capturing the trend over time is indicative of macroeconomic data which frequently contains an underlying pattern of increase or decrease over time.

Each of the series was tested against the null hypothesis of non-stationarity, with the Dickey Fuller test seeking subsequent rejection of the null to imply stationary series. Originally it

was found by Dickey and Fuller (1979) that the calculated test statistic does not in fact follow the conventional Student's t-distribution which served to restrict the applicability of the test. However, work by MacKinnon (1991, 1996) implements a larger set of simulations than those generated by the original authors. The outcome of this additional work results in calculation of Dickey-Fuller critical values and p-values for many differing sample sizes.

The testing procedure is conducted through the computation of the ADF test statistic for each respective series under scrutiny.

$$t = \bar{\alpha} / se(\alpha)$$

The test is run so that an increasing number of lagged difference terms are included until the distribution of the error term of the tested equation becomes random. The maximum number of lags is set at twelve with the Akaike Information Criterion used to determine which of the successively smaller lags are to be eliminated. The computed test statistic is then compared to the Dickey Fuller critical values at the 95% level of significance. Those factors that are not able to reject the null hypothesis are logarithmically transformed and subsequently retested. Any other factors still not found to be significant are first differenced and once again tested for significance. Factors still insignificant after the above transformations are omitted on the basis of non-stationarity and don't form part of the testing procedure.

6.3.2 Correlation amongst Stationary Macroeconomic Factors

In order to further assess the explanatory power of the reduced list of macroeconomic factors a correlation matrix of the thirteen considered stationary is generated. Factors that are highly correlated are considered to have a similar underlying pattern of variation and so the inclusion of such in further analysis of return predictability would be rendered somewhat fruitless.

In addition to the testing of correlation amongst the chosen factors, two broad market proxies were included as a robustness check. The decision of including both return indices, namely the DataStream Emerging Markets Index and DataStream International World Markets Index in the correlation matrix is to serve as a preliminary assessment of the relative explanatory power such factors have on a global scale. Macroeconomic variables that exhibit correlations

greater than 0.7 or less than -0.7 are considered highly correlated, an arbitrary level used consistently throughout this paper. If two candidate variables do in fact exhibit such co-movement they are considered to model similar variation and so if both were to be included the final list of factors would be prone to double counting. Therefore, variables are excluded if they are found to have a coefficient in excess of the proposed bounds.

6.3.3 Results:

Adjustments for Stationarity

Level Tests:

The results of the Augmented Dickey Fuller test served to identify that all the candidate variables exhibited a non-stationary trend and so were not fit for inclusion in the proposed analysis without sufficient adjustment.

Table 6.2 Results of Level Unit Root Tests

Presented in the table below is the output for the Augmented Dickey Fuller (ADF) test run on the fifteen candidate macroeconomic variables. ADF test statistics, their associated p-values and the number of lagged differences are included. All the variables were tested at the 95% significance level with rejection of the null hypothesis inferring a series that exhibits a constant mean and variance, namely the property termed 'stationarity'. All data were sourced from the DataStream International Database.

Variable	ADF Statistic	p-values	Lagged differences
CRBINDEX	0.16	0.9931	2
GOLDPRICE	-0.03	0.9954	6
OILBRENTCR	-2.66	0.2532	12
PLATINUM	-1.90	0.6474	0
RANDDOLLAR	-1.34	0.8766	0
USBA3M	-2.59	0.2849	7
USEXPIND	-0.81	0.9608	7
USGLT10YR	-2.45	0.3380	0
USMONSUPP	-2.06	0.5585	1
USPPI	-1.71	0.7427	3
USPRIME	0.97	0.9899	0
USSHTRM	-0.84	0.9605	0
USTBILL3M	-2.42	0.3673	8
USUNEMP	-2.01	0.5898	12

YUANDOLLAR	2.42	0.9999	0
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As is evident from the above output, no level macroeconomic variables exhibit stationarity and so are not suitable for testing without this trait being evident.

Logarithmic Transformations:

As none of the above level tests were able to find any of the potential macroeconomic variables stationary, each of the insignificant variables was re-tested subsequent to logarithmic transformation. See Appendix C.1 for results.

First Differenced Tests:

Each of the initial factors was then first differenced and the ADF statistics and associated critical values recomputed. Factors that weren't found to significant after first differencing were then logarithmically transformed and re-tested. The results are presented in the table below:

Table 6.3 Results of First Differenced Unit Root Tests

Presented in the table below is the output for the Augmented Dickey Fuller (ADF) test run on the fifteen candidate macroeconomic variables which have been first differenced. ADF test statistics, their associated p-values and the number of lagged differences are included. All the variables were tested at the 95% significance level with rejection of the null hypothesis inferring a series exhibit a constant mean and variance, namely the attribute termed 'stationarity'. All data were sourced from the DataStream International Database.

Variable	ADF Statistic	p-values	lags
DLCRBINDEX	-5.94	0.0000	2
DLGOLDPRICE	-6.09	0.0000	5
DLOILBRENTCR	-12.63	0.0000	0
DLPLATINUM	-10.67	0.0000	0
DLRANDDOLLAR	-10.38	0.0000	0
DLUSBA3M	-2.22	0.4728	7
DLUSEXPIND	-3.51	0.0410	6
DLUSGLT10YR	-9.66	0.0000	1
DLUSMONSUPP	-12.22	0.0000	0

DLUSPPI	-5.58	0.0000	2
DLUSPRIME	-8.98	0.0000	0
DLUSSHTRM	-10.89	0.0000	0
DLUSTBILL3M	-3.82	0.0187	2
DLUSUNEMP	-1.27	0.8884	12
DLYUANDOLLAR	-9.94	0.0000	0

After each series is first differenced it is evident that the vast majority of the selected variables now exhibit stationarity, however a number still fail to reject the null hypothesis at a 95% level of significance. These series could be differenced yet again and retested but would then lose simple economic interpretation. Thus, following the work of Van Rensburg (1999), those variables that continued to be characterised by non-stationarity were considered to be inadequate for progression into the testing procedure to follow. Both the 3-month US Bankers Acceptance rate and the US Rate of Unemployment could not reject the null hypothesis of non-stationarity and so were omitted from further testing.

Figure 6.1 Correlation Matrix of Final list of Stationary Macroeconomic factors

Presented in the table below is the correlation matrix generated between the final list of thirteen macroeconomic variables. The Pearson correlation measure is used to determine the relative similarity amongst the tested variables. Those variables that have correlation coefficients in excess of 0.7 are considered highly positively correlated and are represented in bold white text with a dark background. Alternatively those variables with correlation coefficients less the -0.7 are considered highly negatively correlated and are represented in bold white text with a dark background. Variables that exhibit a less significant correlation of greater than 0.4 or less than -0.4 are indicated on with bold white text on a light grey background. All data were sourced from DataStream International Database.

	DLCRINDEX	DLGOLDPRICE	DLNIBRENTCR	DLPLATINUM	DLRANDDOLLAR	DLUSBA3M	DLUSLXPIND	DLUSGLT10YR
DLCRINDEX	1.00							
DLGOLDPRICE	0.44	1.00						
DLNIBRENTCR	0.48	0.14	1.00					
DLPLATINUM	0.39	0.45	0.13	1.00				
DLRANDDOLLAR	-0.21	-0.30	0.07	-0.02	1.00			
DLUSBA3M	0.19	0.00	0.10	0.03	0.11	1.00		
DLUSLXPIND	0.25	0.06	0.13	0.14	-0.06	0.20	1.00	
DLUSGLT10YR	0.01	-0.05	-0.05	0.14	0.06	0.11	0.11	1.00
DLUSMUNSUPP	-0.09	0.20	0.06	0.08	0.01	0.21	0.00	0.30
DLUSPPI	0.18	0.06	0.22	-0.18	0.08	0.13	0.56	0.17
DLUSPRIME	0.24	0.11	0.16	0.10	-0.07	0.06	0.33	-0.10
DLUSSHRTRM	0.08	-0.06	-0.01	0.09	0.10	0.15	0.19	-0.01
DLUSTBILL3M	0.14	-0.01	0.05	0.06	-0.07	0.85	0.22	0.14
DLUSUNEMP	0.06	-0.08	0.07	0.00	0.04	-0.18	-0.10	0.08
DLYUANDOLLAR	0.10	0.04	0.06	0.01	0.04	0.08	-0.05	-0.12
EMINDEX	0.04	0.05	0.04	0.15	-0.01	0.04	0.29	0.26
WLDINDEX	-0.12	-0.04	-0.02	0.17	0.06	0.05	0.18	0.21

Figure 6.1 Correlation Matrix of Final list of Stationary Macroeconomic factors

Presented in the table below is the correlation matrix generated between the final list of thirteen macroeconomic variables. The Pearson correlation measure is used to determine the relative similarity amongst the tested variables. Those variables that have correlation coefficients in excess of 0.7 are considered highly positively correlated and are represented in bold white text with a dark background. Alternatively those variables with correlation coefficients less than -0.7 are considered highly negatively correlated and are represented in bold white text with a dark background. Variables that exhibit a less significant correlation of greater than 0.4 or less than -0.4 are indicated on with bold white text on a light grey background. All data were sourced from DataStream International Database.

	DLUSMOWSUPP	DLUSPI	DLUSPRIME	DLUSSHTRM4	DLUSTRLM4	DLUSINEM4P	DLVUANDOLLAR	FAMINDFX	WEDANDFX
DLUSMOWSUPP	1.00								
DLUSPI	0.01	1.00							
DLUSPRIME	-0.13	0.30	1.00						
DLUSSHTRM4	-0.15	-0.09	0.15	1.00					
DLUSTRLM4	0.24	0.10	0.56	0.20	1.00				
DLUSINEM4P	-0.03	0.03	-0.16	-0.10	-0.04	1.00			
DLVUANDOLLAR	0.17	-0.10	-0.18	-0.02	-0.13	-0.02	1.00		
FAMINDFX	0.19	0.06	0.05	0.06	0.13	0.01	0.02	1.00	
WEDANDFX	0.16	0.02	0.04	0.12	0.17	0.04	0.00	0.79	1.00

The correlation matrix generated served to endorse the exclusion of certain macroeconomic variables based on their inability to exhibit stationarity. When analysing the correlation of certain factors versus broad market indices such as the DataStream International Emerging Markets Index and the DataStream International World Markets Index it is found they exhibit little similarity. If a macroeconomic influence which is global in its nature is not able to affect such broad market indices there is little chance of such a factor being able to significantly influence the movement of individual stock returns. Therefore, the following factors were excluded from further analysis based on low correlations (less than 0.05) with the respective indices: US Three Month Bankers' Acceptance Rate, US Prime Rate, US Unemployment Rate and Chinese Yuan US\$ Exchange Rate.

It was decided to keep certain commodities in the final list of factors in hope of them having explanatory power due to firm-specific orientation. The final list of eleven factors is presented in Table 6.4 below:

Table 6.4 Final list of Macroeconomic factors

The table below presents the final list of macroeconomic factors eligible for testing in the univariate analysis to follow. Each factor is listed with its reference code and full name, there are a total of thirteen factors in total. All data were sourced from DataStream International database. Please note that in all factors are first differenced with a number undergoing logarithmic transformations in order to successfully be tested as stationary.

Code	Full Name and Description
DLCRBINDEX	CRB Commodities Index
DLGOLDPRICE	Gold Price \$US/ounce
DLOILBRENTCR	Oil Brent Crude \$US/Barrel
DLPLATINUM	Platinum Price \$US/ounce
DLRANDDOLLAR	Rand(R) \$US exchange rate
DLUSEXPIND	US Export Index
DLUSGLT10YR	Yield on 10yr US Govt. Bond
DLUSMONSUPP	US Money Supply (M1)
DLUSPPI	US Producer Price Index
DLUSSHTRM	US Short Term Interest Rate
DLUSTBILL3M	Yield on 3-month US Treasury Bill

6.4 Univariate Testing of Macroeconomic factors

The aim of this next section is to test all those significant macroeconomic factors identified in 6.3 and presented in Table 6.4. The analysis is similar to the testing procedure followed in testing the firm-specific attributes in Chapter 5 section 5.5 of this study with some methodological alteration. The analysis tests the significance of the macroeconomic factors over the entire sample period using a 'rolling' time-series cross-sectional regression procedure that serves to generate both the sensitivity and payoff of factor against two types of return data, unadjusted and risk adjusted return data.

6.4.1 Data and Methodology

The data employed for this analysis is as described in Chapter Four of this study. The monthly returns data were adjusted accordingly as alluded to Chapter Four and comprised of a total of 1273 listed stocks sourced from the DataStream International Emerging Markets Index for the sample period 1 January 1997 to 31 December 2006. A total of eleven candidate macroeconomic factors are compiled for testing. The list was compiled in section 6.2 of this Chapter, and consists of only those variables considered adequate for such statistical testing.

The macroeconomic variables are then tested against the returns on the sample of emerging market firms as mentioned in Chapter Four in a cross sectional setting. Each of the candidate variables are logarithmically transformed and first differenced as per the Augmented Dickey Fuller test in order to exhibit stationarity.

6.4.2 Tests of Unadjusted Returns

This section aims to test the significance of the macroeconomic factors listed in table 6.4 on returns that have undergone no adjustment for systematic risk. A version of the methodology of Fama and Macbeth (1973) is used to test for significance.

Using the list of pre-specified variables the following model is used to model individual stock returns.

$$r_{i,t+1} = \gamma_{0,t+1} + \gamma_{1,t+1} A_t + \varepsilon_{i,t+1} \quad (6.2)$$

Where,

$r_{i,t+1}$ = realized return on share i for year $t + 1$

$\gamma_{0,t+1}$ = constant intercept term

$\gamma_{1,t+1}$ = cross-sectional slope coefficient estimated from the regression

A_t = value of the variable at end of each year t

$\varepsilon_{i,t+1}$ = residual error

The version of Fama and Macbeth (1973) aims to generate individual sensitivities of each stock in the broad sample of emerging markets to the final list of candidate macroeconomic variables. In this paper the procedure is constrained to the emerging market stocks over the sample period at hand which spanned from the 1st January 1997 to 31st December 2006. The procedure begins by estimating the sensitivity (beta) of each of the emerging market stocks versus the final list of candidate macroeconomic variables over the first three years of the sample period, more specifically the period 1st January 1997 to 31st December 1999. This in-sample thirty six month period serves to provide the historical basis for the generation of monthly sensitivities of emerging market returns to each of the candidate factors for the remainder of the sample period.

The in-sample betas are then taken to be each stocks exposure to the respective macroeconomic factors over the remainder of the sample period spanning the 1st January 2000 to 31st December 2006, the out-sample period. The historical betas are then winsorised in order to remove the detrimental effect of outliers on the robustness of the testing procedures to follow. Univariate regressions of each factor versus stock returns in a cross sectional setting are then run to generate a set of monthly payoffs, or risk premia that represent the potential reward for each stocks exposure to a respective macroeconomic factor. These payoffs are then tested for statistical significance using the Student's T-test. This study is

subject to a degree of look-ahead bias by virtue of the method employed in out-sample beta estimation. It is understood that betas do in fact vary over time, however due to the nature of macroeconomic data and that each and every stock has some general exposure to such influences continuously it is deemed that such a bias will have little effect on the overall results produced and the assertions made thereupon.

Fama and Macbeth (1973) suggest that in order to control for the errors in variables problem that may arise from the above testing procedure the stocks should be grouped into portfolios. However this proposed adjustment fails to fully nullify the impact of estimation error on the generation of the regression slope coefficients. In this study no portfolio construction methodology is employed however flaws inherent to both the data and methodology are understood and considered when interpreting any results.

Furthermore, an important consideration to account for when testing any broad sweeping macroeconomic factors over a large sample period against share returns is trend. Nations develop and become more productive over time and experience varied levels of economic growth. This growth begins to manifest itself in both macroeconomic indicators and to some extent in the prosperity of certain business operations.

Therefore, over a period of time macroeconomic variables may become inflated whilst share returns exhibit similar increases in performance. From the perspective of the researcher it is essential to consider a nations general economic growth and the element of bias it may serve to introduce when attempting infer that certain macroeconomic variables have explanatory power over share price performance. Each of the aforementioned macroeconomic variables are depicted graphically over time compared to the returns of the selected stocks in the sample in order to assess the likelihood of any bias.

6.4.3 Results:

Univariate Testing of Unadjusted Factors:

A variation of Fama and Macbeth (1973) is used to generate a time series of emerging markets exposures to the predefined list of macroeconomic variables. These exposures are then tested against the returns of the previously used sample of emerging market stocks in order to assess the explanatory power of those influences not directly firm-specific.

The mean values of the resultant tests are presented in Table 6.5 below

Table 6.5 Significance of Candidate Macroeconomic Variables in return prediction

Presented in the table below are the results of a variant of the method posited by Fama and Macbeth (1973) that serves to test the significance of a number of general macroeconomic influences on emerging market share returns. The Student's T- test is employed to assess the significance of the mean slope of each of the preselected variables. A level of significance of 5% is employed to gauge statistical relevance. In addition the mean return of each factor across the eight year testing period is provided with the associated correlation between these returns and the factor exposures also being output. All data were sourced from DataStream International for the period 1st January 1999 to 31st December 2006.

Factor	Descriptive Statistics		Cross-Sectional Testing (Out-sample)		
	Mean	Std Dev	Slope	T-stat	p-value
DLCRBINDEX	0.0021	0.0126	0.00024	2.40	0.0162
DLGOLDPRICE	0.0022	0.0182	0.00065	3.24	0.0012
DLOILBRENTCR	0.0040	0.0484	0.00136	2.64	0.0081
DLPLATINUM	0.0044	0.0230	-0.00072	-2.88	0.0039
DLRANDDOLLAR	0.0014	0.0200	-0.00021	-1.52	0.1218
DLUSEXPIND	0.0002	0.0015	0.00001	1.41	0.1579
DLUSGLT10YR	-0.0014	0.0249	-0.00044	-2.59	0.0096
DLUSMONSUPP	0.0008	0.0031	-0.00003	-1.73	0.0834
DLUSPPI	0.0009	0.0041	0.00003	1.35	0.1760
DLUSSHRTRM	-0.0001	0.0545	-0.00007	-1.63	0.1011
DLUSTBILL3M	-0.0002	0.0307	-0.00010	-0.65	0.5149

From the above analysis it is apparent that a number of global macroeconomic factors do in fact exhibit some statistical power in explaining some portion of the variation in share returns. At the 5% level of significance it is evident that the vast majority of factors with a commodity focus are found to have some form of significant explanatory power.

The correlations provided serve to explain the strength of the predictive power that Fama and Macbeth's (1973) modified methodology has identified. The remainder of this chapter attempts to assess which variables are in fact the most noteworthy in a return based setting and with the aid of statistical and technical analyses goes on to suggest specific variables for potential inclusion in the multifactor predictive model to be discussed later in the chapter.

Graphical Depiction of Macroeconomic Variables:

The following graphs depict the relationship between changeable global macroeconomic factors and variation in the returns of the DataStream International Emerging Markets Index.

Certain commodities and changing interest rates are amongst the most highly significant of the list of candidate factors, refer to figures 6.7 and 6.8. Graphical representations of their movement over time are presented in the chapter with the remainder to be found in Appendix D.

Furthermore in order to more accurately assess whether or not such macroeconomic factors are in fact priced according to the degree of exposure experienced by emerging market firms, the mean monthly returns on each factor are regressed against the respective beta exposures. Those factors found to be most significant in section 6.4.1 are presented in graphs 6.9-6.15. Refer to appendix D for the remainder of the output.

Figure 6.2 Graph of Cumulative Returns on Macroeconomic Commodities versus Cumulative Returns on the DataStream International Emerging Market Index
 Below the cumulative returns over the testing period 1st January 1997 to 31st December 2006 are presented. All the factors depicted are found to be significantly related to returns using a variant of Fama and Macbeth (1973). Factors were tested at a 5% significance level and found to have some degree of explanatory power of returns in an Emerging Market context. All data were sourced from DataStream International for the period 1st January 1997 to 31st December 2006.



Figure 6.3 Graph of Cumulative Changes in US interest rates versus the Cumulative Returns upon the DataStream International Emerging Markets Index
 Presented below are the adjustments that the interest rates in the US have undergone over the period 1st January 1997 to the 31st December 2006. Some of the factors depicted are found to be significantly related to returns using a variant of Fama and Macbeth (1973). Factors were tested at a 5% significance level and found to have some degree of explanatory power of returns in an Emerging Market context. All data were sourced from DataStream International for the period 1st January 1997 to 31st December 2006.

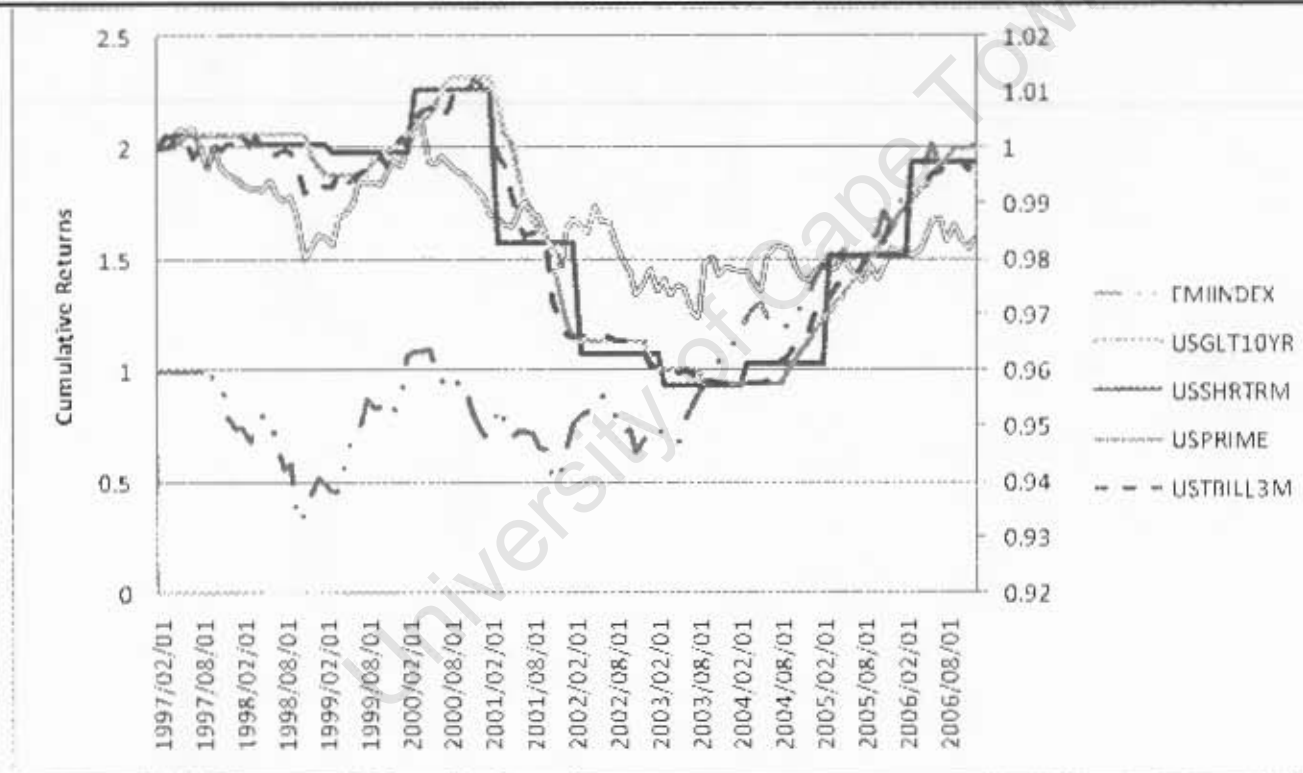


Figure 6.4 Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the CRBIndex

The figure below attempts to present the relationship between the returns on listed emerging market shares and their exposure to certain macroeconomic factors, in this case the CRBIndex. Fundamental to modern finance theory is that only systematic exposures to risk factors are rewarded with the commensurate return. The diagrammatic representation aims to assess whether or not increased exposure to such macroeconomic variables enables such factors to price risk, whereby increased exposure to such a factor is rewarded with improved return. The mean monthly share return on all 1273 emerging market stocks are plotted on the vertical axis against their respective monthly betas on the horizontal axis in order to discover any such risk: return relationship. The out-sample period spanning from the 1st of January 2000 to the 31st of December 2006 is analysed. All data were sourced from DataStream International Database.

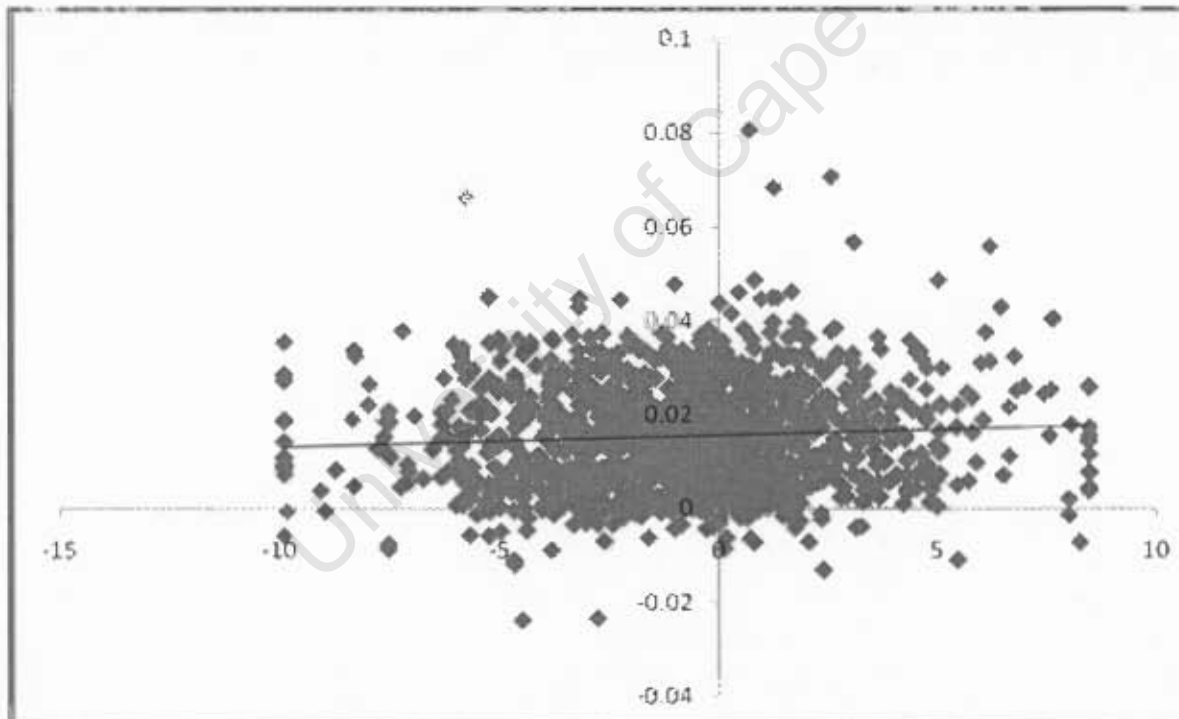


Figure 6.5 Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the Gold Price (\$US/ounce)

The figure below attempts to present the relationship between the returns on listed emerging market shares and their exposure to certain macroeconomic factors, in this case the Gold Price (\$US/ounce). Fundamental to modern finance theory is that only systematic exposures are risk factors is rewarded with the commensurate return. The diagrammatic representation aims to assess whether or not increased exposure to such macroeconomic variables enables such factors to price risk, whereby increased exposure to such a factor is rewarded with improved return. The mean monthly share return on all 1273 emerging market stocks are plotted on the vertical axis against their respective monthly betas on the horizontal axis in order to discover any such risk: return relationship. The out-sample period spanning from the 1st of January 2000 to the 31st of December 2006 is analysed. All data were sourced from DataStream International Database.

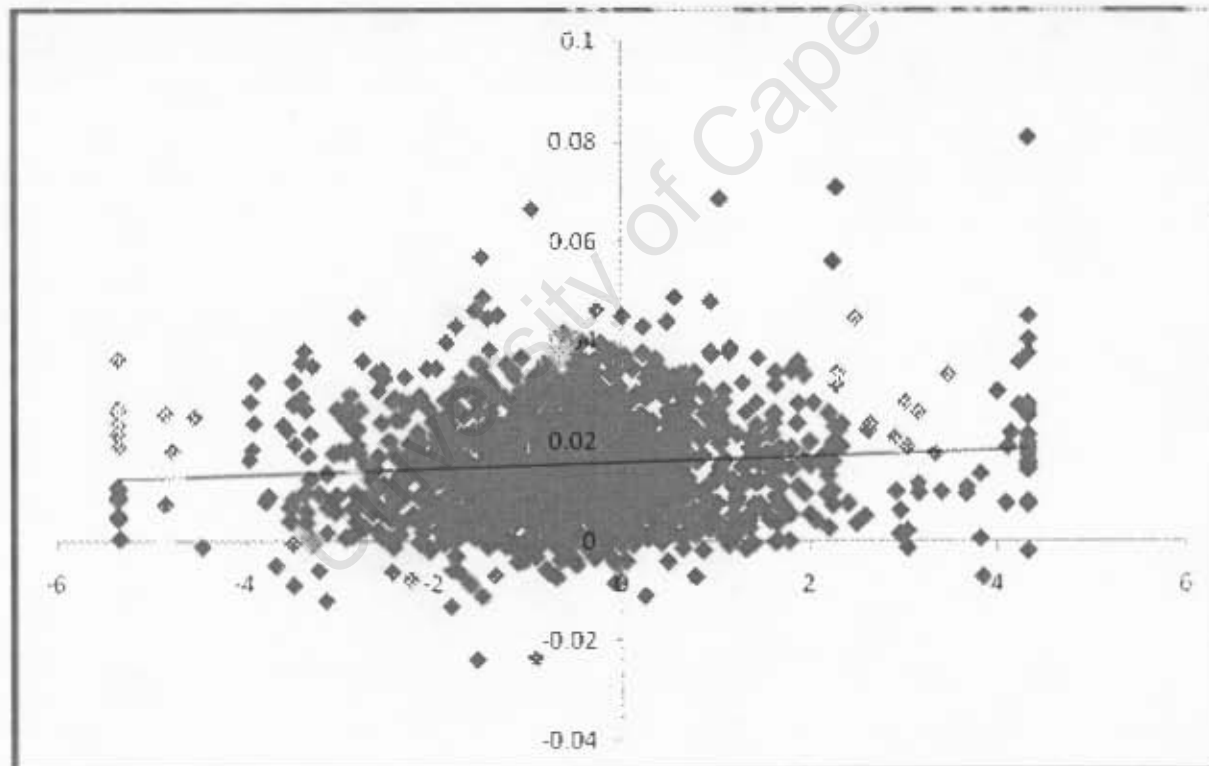


Figure 6.6 Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the Brent Crude Oil Price (\$US/barrel)

The figure below attempts to present the relationship between the returns on listed emerging market shares and their exposure to certain macroeconomic factors, in this case the Brent Crude Oil Price (\$US/barrel). Fundamental to modern finance theory is that only systematic exposures to risk factors are rewarded with the commensurate return. The diagrammatic representation aims to assess whether or not increased exposure to such macroeconomic variables enables such factors to price risk, whereby increased exposure to such a factor is rewarded with improved return. The mean monthly share return on all 1273 emerging market stocks are plotted on the vertical axis against their respective monthly betas on the horizontal axis in order to discover any such risk: return relationship. The out-sample period spanning from the 1st of January 2000 to the 31st of December 2006 is analysed. All data were sourced from DataStream International Database.

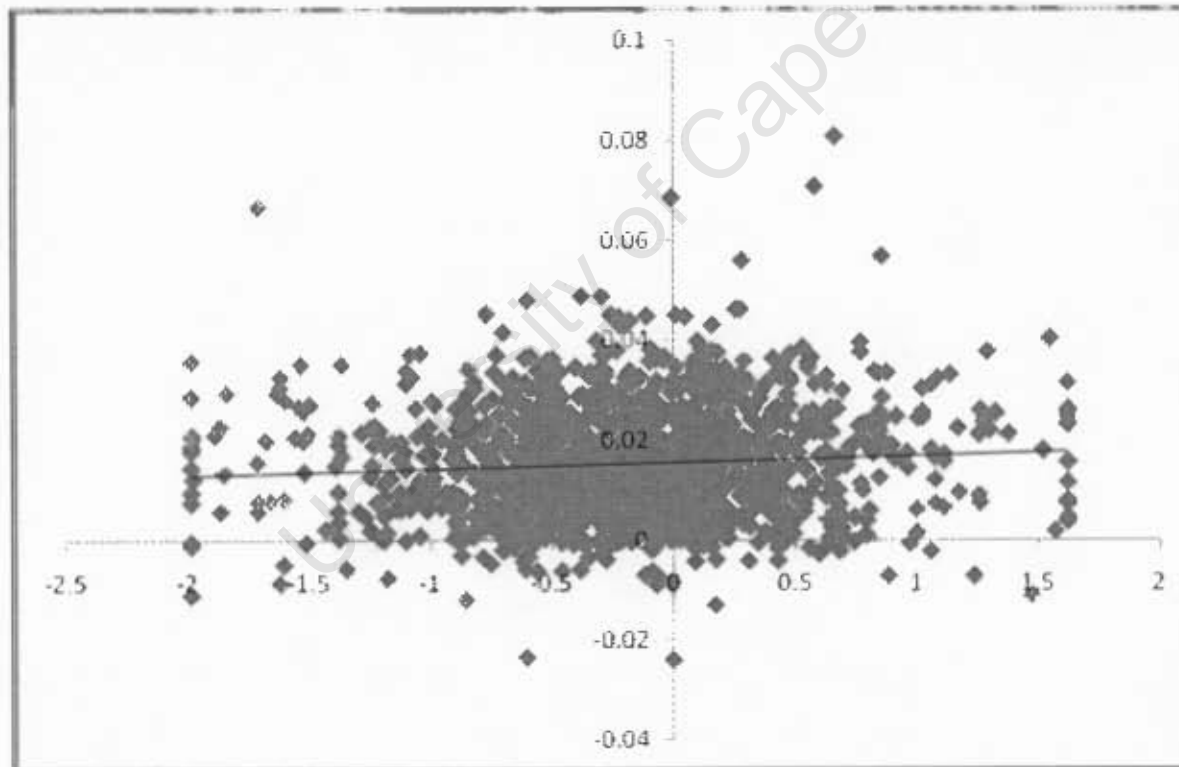


Figure 6.7 Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the Platinum Price (\$US/ounce)

The figure below attempts to present the relationship between the returns on listed emerging market shares and their exposure to certain macroeconomic factors, in this case the Platinum Price (\$US/ounce). Fundamental to modern finance theory is that only systematic exposures to risk factors are rewarded with the commensurate return. The diagrammatic representation aims to assess whether or not increased exposure to such macroeconomic variables enables such factors to price risk, whereby increased exposure to such a factor is rewarded with improved return. The mean monthly share return on all 1273 emerging market stocks are plotted on the vertical axis against their respective monthly betas on the horizontal axis in order to discover any such risk: return relationship. The out-sample period spanning from the 1st of January 2000 to the 31st of December 2006 is analysed. All data were sourced from DataStream International Database.

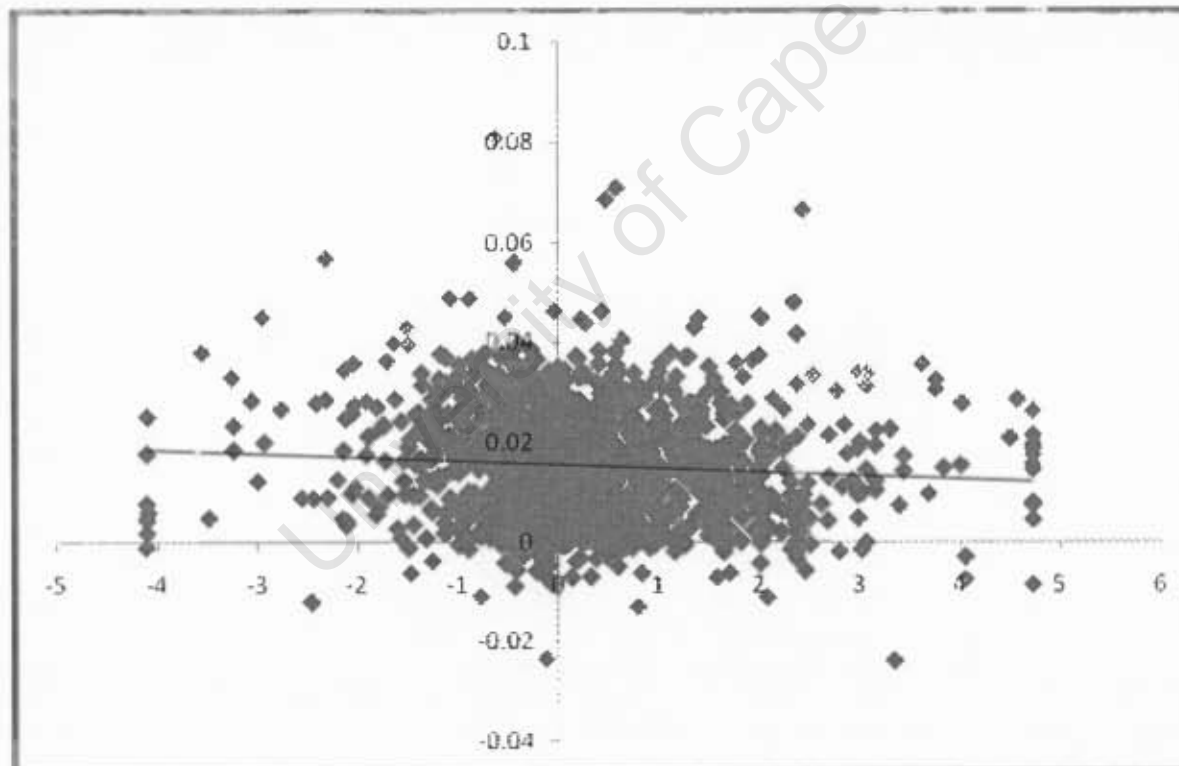
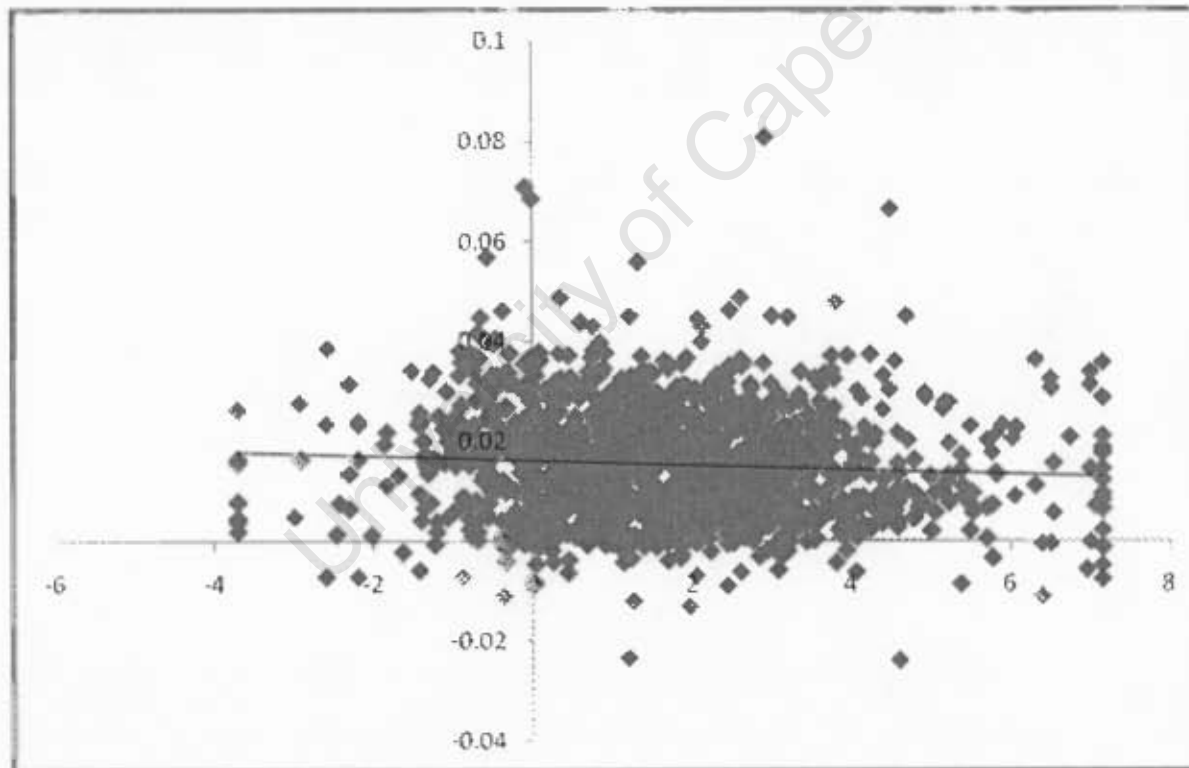


Figure 6.8 Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the US 10 year Gilt

The figure below attempts to present the relationship between the returns on listed emerging market shares and their exposure to certain macroeconomic factors, in this case the US 10 year Gilt. Fundamental to modern finance theory is that only systematic exposures to risk factors are rewarded with the commensurate return. The diagrammatic representation aims to assess whether or not increased exposure to such macroeconomic variables enables such factors to price risk, whereby increased exposure to such a factor is rewarded with improved return. The mean monthly share return on all 1273 emerging market stocks are plotted on the vertical axis against their respective monthly betas on the horizontal axis in order to discover any such risk: return relationship. The out-sample period spanning from the 1st of January 2000 to the 31st of December 2006 is analysed. All data were sourced from DataStream International Database.



6.5 Further Analysis:

6.5.1 Preliminary Commentary

As is evident from both the statistical and technical analyses performed, there is sufficient evidence to believe that there are indeed more global, less company specific factors that have the ability to explain the cross-sectional variation in emerging market share returns.

The returns on precious commodities such as gold, platinum, oil and the like are found in regression to be significantly correlated with emerging market returns. Student t statistics of 2.40 for the CRB index (a broad based commodities index), 3.24 for the Gold Price (\$US/ounce), 2.64 for Brent Crude (\$US/barrel) and -2.88 for Platinum (\$US/ounce) provide a sound basis for inferring a definitive relation between independent and dependent variables. More technically, post 1997-1999 (Asian Crisis), commodities and their associated appreciations and depreciations in value have seemed to track closely with emerging firm performance, refer to figure 6.8 above.

US interest rates, the drivers of economic activity on the continent are found to be far less significant in their statistical relation with the performance of emerging market firms. The yield of the US Government Bond (-2.59) is the sole US interest rate that exhibits some form of relation to emerging market returns. Figure 6.9 serves to reinforce the inadequacy of such factors being return predictors.

6.5.2 Macroeconomic Factors as priced risk factors

In order for such statistical relationships to possess some worth, the relative exposure of emerging market firms to changes in the values of the selected macroeconomic factors need to be priced. The greater the exposure that an emerging market firm has to a candidate macroeconomic variable the greater the anticipated return as a result of the increased risk burden. This relationship should hold in the event of the factor being a suitable proxy for pricing risk, however upon closer examination it is evident that these factors do not in fact exhibit this hypothesised relation.

Figures 6.10 through to 6.19 track the systematic risk of the candidate macroeconomic factors in relation to their returns on an monthly basis over the seven year period spanning 1st January 2000 to the 31st December 2006.

The graphical depictions serve to communicate that such macroeconomic influences do not per se reward an investor for increased exposure to their subsequent variation. The candidate variables follow distinctive trends, for which their sensitivities are quite closely correlated. However changes in the value of these factors are not picked up by the sensitivity measure that communicates the risk exposure to the investor. Therefore such macroeconomic influences are merely periodic influences on return behaviour and not consistently price-able risk factors that are able to predict returns.

In light of these above relations the next goal would be to harness this knowledge of similar behaviour and use this as a basis for constructing a model that is able to forecast share returns in upcoming time horizons. However, as it is presumed that these factors lack predictive power the construction of such models should serve to endorse the views expressed in this chapter based on results generated thus far.

6.6 Summary and Conclusion

The aim of this chapter was to supplement the risk analysis of the previous section which identified numerous priced firm specific risk factors through the consideration of more global influences on return behaviour, namely adjustments in the macro economy. A similar sample period was used spanning from the 1st January 1997 to 31st December 2006.

Previous work in developed markets endorsed the ability of such macroeconomic influences being more than adequate in explaining a degree of the variation in listed stock's returns. Work by Chen, Roll and Ross (1986), Pearce and Roley (1988) et al has found a semblance of significance in analysing shocks to the macro economy and their associated impact on share performance.

As is the case with much research in the context of emerging markets, there is little or none available. Therefore, such a section is somewhat groundbreaking in terms of attempting to gauge the likelihood of global factors having an impact on the behaviour developing market performance. With the aid of prior developed market research a shortlist of 15 macro-economic variables was selected for testing in emerging markets.

The variables were first tested for Stationarity using the Augmented Dickey-Fuller Test. The level tests run found that none of the chosen variables were in fact stationary and contrary to

the requirements of linear regression had a variable mean and variance so making any immediate analysis futile. As performed by Van Rensburg and Slaney (1997) the variables are then logarithmically transformed in order to remove trends inherent to the data and to create coefficients that are interpretable as percentage changes. The factors are then first-differenced and then re-tested. Of the initial list of fifteen factors two were omitted on account of them exhibiting non-stationarity.

The final list of factors is then correlated together to detect for similar factors with similar variation and so remove any repetition or double counting. Once this is completed a final list of eleven candidate macroeconomic variables is available for testing.

The factors are tested for significance using a variant of the methodology employed in Fama and Macbeth (1973). A three year in-sample regression period (1st January 1997 to 31 December 1999) is used to obtain historical estimates of each stock's sensitivity to the final list of macroeconomic variables. These sensitivities or betas are then tested over the out-sample period spanning the 1st of January 2000 to the 31st December 2006 in order to assess their ability as priced risk factors.. The betas are regressed against the forward returns of the same emerging market sample in order assess predictive power. A time series of cross sectional estimates of each factors associated risk premium is then tested using a t-test for mean to ascertain whether or not there is significant difference from zero. Factors found to exhibit distinct positive relation include the Gold Price (\$US per ounce), CRB Commodities Index and the Brent Crude Oil Price (\$US per barrel), with the negative relations shown by the price of Platinum (\$US per ounce) and the 10 year US Gilt. As is evident of the factors tested those more closely aligned with commodities and term structure were found to be of most interest.

However, the viability of the significant factors identified is less than satisfactory when seeking an explanation for risk based on the computed exposures. The majority of factors fail to be identified as priced risk factors, whereby the increased exposure of emerging firms to such variables lack the associated rewards in terms of additional returns. The factors themselves seem to experience peaks and troughs over time that are somewhat independent of the relative returns and performance of emerging market firms. Therefore, the suitability of such factors to be included in a multifactor model for the purposes of return prediction must be questioned.

The next chapter will incorporate aspects from both this and previous chapters in building a multifactor model that considers both firm-specific and macroeconomic influence in attempting to explain and extrapolate future share returns. Cognisance of the findings of this chapter will be taken and recalled when interpreting the proposed models that are to follow.

University of Cape Town

Multivariate Style Analysis incorporating Macroeconomic Influences and Expected Return Models

7.1 Introduction

The previous chapters of this thesis have aimed to test the influence of certain company specific and broader macroeconomic variables on emerging market share returns. Chapter Five which focused on firm-specific variables found a number of value orientated clusters able to explain share returns in developing countries. Chapter Six expanded the analysis to a more global scale and found that a number of macroeconomic factors, especially changes in the prices of certain commodities are in fact able to provide a certain amount of insight as to the behaviour of stock returns.

The analyses in the Chapters above however provide limited usefulness as they are presented largely in isolation. Univariate studies do indeed provide valuable information as to which independent variables have a major influence in explaining the variation of the dependent variable, however the construction of forecasting models based on such isolated influences would be excessively narrow in both their scope and accuracy for the purposes of prediction. Furthermore, to constrain modelling to either firm specific or macroeconomic influences in separation may also serve to negate possible combinations of explanatory variables that could lend themselves to the better crafting of a predictive model.

Therefore the first aim of this Chapter is to construct a multifactor model from the final list of 14 firm specific factors identified previously. In such a model one seeks to have the maximum number of explanatory factors whilst still maintaining the statistical significance of the multivariate analysis. A range of timing models are then employed in order to find an optimal predictive formulation for a multifactor expected return model by applying the methodology of Haugen and Baker (1996) in a stepwise fashion.

Second, the 10 candidate macroeconomic variables identified in Chapter Six are also tested in a multifactor setting. The exposures of each share to each macroeconomic influence in sample are first computed using a variant of the methodology of Fama and Macbeth (1973) over a specified out-sample period. A similar set of timing models is then employed in the creation of multifactor expected return models in order to gauge the share return forecasting ability of the selected factors.

Finally, all firm specific and macroeconomic variables are combined in one testing procedure in order to find an optimum model that employs both firm specific and broader market influences in the prediction of share returns. Once more similar timing models are used to formulate the desired expected return models in adherence with the variant of the methodology of Haugen and Baker (1996). Firm specific attributes and macroeconomic variables with t-statistics greater than 1.00 from the univariate tests on unadjusted returns are included in the analysis. All regressions performed are Ordinary Least Squares (OLS) regressions.

Such a multivariate testing procedure incorporates the influence of a vast array of independent influences in a few statistical tests. According to Michaud (1999) there exists a distinct trade-off in such a modelling procedure. He explains that whilst the analyst may in fact increase the in-sample explanatory power through the inclusion of more than a one independent variable, excessive inclusion may also serve to have a detrimental effect on the out-sample forecast power. Therefore, one must be wary of developing models of too large a size if one seeks to employ such models in forecasting future undertakings.

The remainder of the Chapter is set out as follows: Section 7.2 defines the data and methodology for the multivariate cross-sectional regressions with the results following, Section 7.3 – 7.4 presents the multifactor expected return models and Section 7.5 summarises and concludes.

7.2 Multivariate cross-sectional regressions

7.2.1 Introduction

The section aims to test the unadjusted monthly return data against all those firm-specific characteristics identified as significant as identified in Chapter Five. In doing so it is the ambition of this testing procedure to create a multifactor predictive model. Once more the distribution of each firm-specific attribute is standardised to a mean of zero and standard deviation of one in order to enable comparability amongst the magnitudes of slopes generated. As before all data is sourced from DataStream International and modified accordingly as described in Chapter Four.

7.2.2 Methodology

In order to create the desired multifactor model a defined stepwise procedure is followed. To begin the most significant characteristic evident in the univariate tests run in Chapter Five is cross-sectionally regressed against the forward monthly returns. Thereafter the second most significant characteristic is added and a two-factor cross-sectional regression is run with the monthly regression specified as follows:

$$r_{i,t+1} = \gamma_{0,t+1} + \gamma_{1,t+1}A_t + \gamma_{2,t+1}B_t + \varepsilon_{i,t+1} \quad (7.1)$$

Where,

$r_{i,t+1}$ is the realised return on share i in month $t+1$

$\gamma_{0,t+1}$ is the constant intercept term

A_t and B_t are the selected standardised factors

$\gamma_{1,t+1}$ and $\gamma_{2,t+1}$ are the respective cross-sectional coefficients

$\varepsilon_{i,t+1}$ represents the residual error term

$\gamma_{1,t+1}$ and $\gamma_{2,t+1}$ the respective cross-sectional coefficients are then tested for statistical significance. Their mean values are tested using a Student t-test in order to assess whether or not they are in fact significantly different from zero and so have an impact on the dependent variable. If the results of the test find both characteristics to be significant then the next most significant attribute is regressed in combination with these first two. Once more the time-series of monthly slopes is assessed for significance. If again the mean values of the slopes of the attributes are found to be significant the process continues as before.

However, if at any time during the testing procedure the attribute with the lowest t-statistic is found to be insignificant when $\alpha = 0.05$ this characteristic is to be removed from the regression. The regression is then run again with the variable omitted, with any additional variables that are insignificant removed until such time as all variables are found to be of sufficient significance. The procedure follows on in this manner until all of the final 18 variables have been tested in such a multiple setting.

7.2.3 Results:

The monthly multivariate regressions yielded several significant factors stemming from the final list of significant firm-specific attributes. The stepwise procedure results in a multifactor model being formulated that contains more than 50% on the final list of significant factors. Of the final 14 factors 9 are found to have sufficient explanatory power in a multiple setting. See the table below which serves to indicate their name, style grouping, average slope and related t-statistic. The directions of all the nine characteristics are much the same as found in the univariate analysis.

Table 7.1 Results of the Multivariate Cross-Sectional Regressions

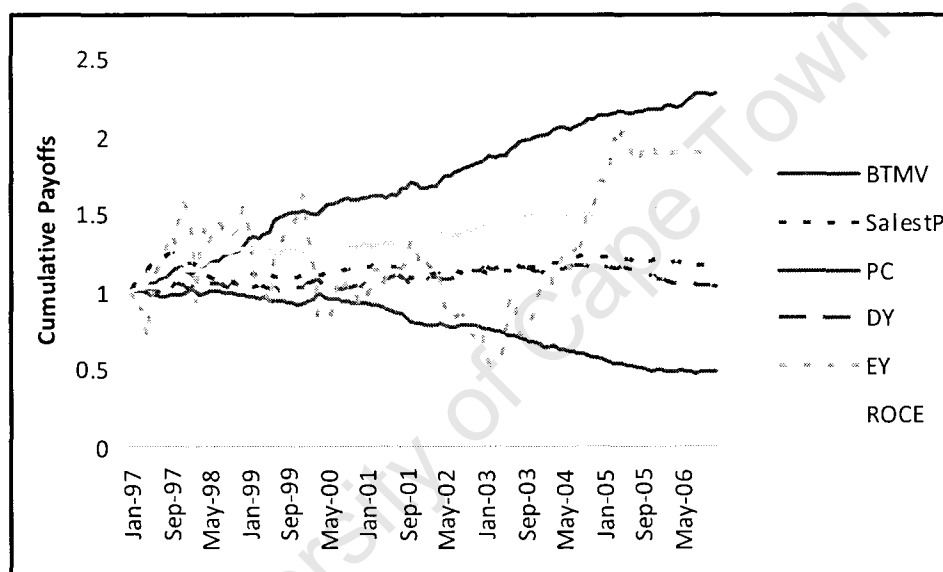
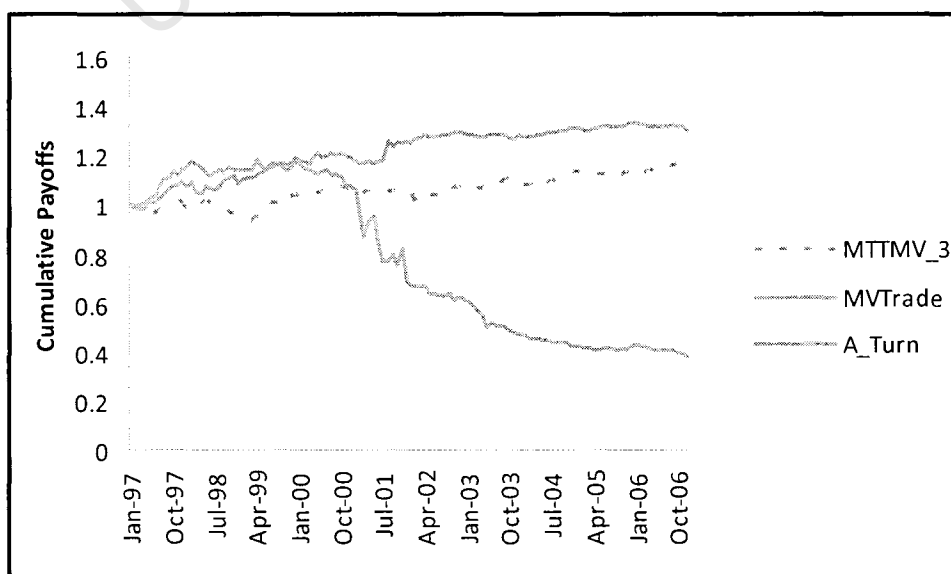
Below the final results of the multivariate cross-sectional regressions of the univariately significant standardised firm-specific attributes on monthly unadjusted returns data are tabulated. All tests are run over the sample period spanning the period January 1997 to December 2006. The regressions follow the stepwise procedure that serves to omit those variables that don't stand up to consistent rounds of Student t-tests that assess each factor's mean value being significantly different from zero. The procedure results in a multifactor model in which all the characteristics are univariately and multivariately significant.

Firm-Specific Attribute	Style Grouping	Mean Slope	Mean T-Statistic
BTMV	Value	0.0078	9.519
SalestP	Miscellaneous	0.0028	3.612
PC	Value	-0.0045	-6.207
DY	Value	0.0015	2.391
MTTMV_3	Liquidity	0.0024	3.933
MVTrade	Size	-0.0021	-3.537
EY	Value	0.0054	8.679
A_Turn	Value	0.0022	3.285
RCapmp	Value	0.0045	6.032

Figure 8.1 presents a graphical depiction of the cumulative monthly payoffs of each of the nine characteristics as calculated from the multivariate monthly payoffs.

Figure 7.1: Cumulative Monthly Payoffs to Multivariately Significant Factors

The figure below depicts the multivariate cumulative monthly payoffs of the final list of firm-specific attributes. The firm specific attributes are standardised and then regressed against the unadjusted return data from which the controlled payoffs are then derived. All tests were run over the sample period spanning the 1st of January 1997 to the 31st of December 2006. All data were sourced from the DataStream International Database with each graph starting at a minimum value of one to serve as a common reference point. The graphical displays are broken down into value-based characteristics and non-value based characteristics.

(A) Value Based Characteristics**(B) Other Style Characteristics**

7.3 Multifactor Expected Return Models

In order to assess the true explanatory power of those factors said to both firm specific and more general in their nature, a series of expected return models are generated that aim to test the return forecast accuracy.

7.3.1 Data and Methodology

Similar monthly returns, firm specific attribute and macroeconomic data to that used in the previous chapters are employed here in model construction. However, in this section unstandardised, winsorised firm specific data is used as no comparisons between each and every univariate factor is necessary.

Firstly, to obtain a history of payoffs to the candidate factors multivariate cross sectional regressions are run that include all factors simultaneously. The analysis takes the following form:

$$r_{i,t+1} = \gamma_{0,t+1} + \sum_{k=1}^K \gamma_{k,t+1} F_{i,k,t} + \varepsilon_{i,t+1} \quad (7.2)$$

Where,

$r_{i,t+1}$ = return to stock i in month $t+1$,

$\gamma_{k,t+1}$ = estimated regression coefficient of factor k in month $t+1$

$F_{i,k,t}$ = exposure to factor k for stock i at the end of month t

The historical payoffs to each factor form the basis for the generating of out-of-sample predictions in future time horizons. Haugen and Baker (1996) make use of the 12 months prior payoffs as a means of producing a forecasted return for the current month (month t).

In addition to trailing twelve-month moving average model employed by Haugen and Baker (1996), this paper analyses four additional timing models. The first of the timing models (1M) employs the previous month's payoff to provide an estimate of the current month's payoff. The second of the timing models (3M) uses the past three month's payoffs and a means of predicting the current month's payoff, with the third (6M) timing model using the

previous six months historical payoffs and the fourth (18M) using eighteen months prior payoffs to ascertain the payoff in the current month. This estimation procedure can be considered the second step in the three step process.

In the final step the monthly payoffs generated previously for month $(t+1)$ are combined with the specified values of each attribute for each share i at the end of month t in order to generate a forecast return for share i in each and every month:

$$E(r_{i,t+1}) = \gamma_{0,t+1} + \sum_{k=1}^K E(\gamma_{k,t+1}) F_{i,k,t} \quad (7.3)$$

Where,

$E(r_{i,t+1})$ = forecast return to share i in month $t+1$

$E(\gamma_{k,t+1})$ = estimated payoff to attribute k in month $t+1$

A model is only effective if it servers to adequately perform the function it was designed to carry out, in this case accurately forecast share returns. The effectiveness with which the constructed expected return models are able to predict returns is assessed using the Information Coefficient or IC as mentioned by Grinold (1989). The IC is a measure of similarity, more specifically a monthly cross-sectional correlation between the forecast and actual returns.

$$IC = \frac{\sum_{t=1}^h (\hat{y}_t - \sum_{t=1}^h \hat{y}_t / h)(y_t - \bar{y})}{\sqrt{\sum_{t=1}^h (\hat{y}_t - \sum_{t=1}^h \hat{y}_t / h)^2 \sum_{t=1}^h (y_t - \bar{y})^2}} \quad (7.4)$$

Where,

$\hat{y}_t$ and y_t are the forecast and realised returns for the shares for month t ,

h is the number of forecasts in month t and,

$\sum_{t=1}^h \hat{y}_t / h$ and $\bar{y}$ are the respective means of the forecast and realised returns.

According to Grinold and Kahn (1995) the IC measure is considered to be a measure that is able to gauge the level of the manager's skill in being able to generate a model that can accurately forecast returns. An IC measure close to or in excess of 0.1 is considered high and serves to indicate that such a model may in fact have exploitable ability in using such pre-specified factors to predict returns of stocks into the future.

An additional measure is used in this chapter to assess the suitability of the expected return models generated. The Information Ratio or IR also from the work Grinold and Kahn (1995) serves to test the robustness of the IC result by incorporating the inherent variation present in the IC measure into the analysis.

$$IR = \frac{\overline{IC}}{\delta_{IC}}$$

The above expresses the mean monthly IC over the standard deviation of the monthly IC. It serves to take into account the volatility for each of the monthly IC statistics in order to ensure that the computed and ranked IC's are in fact truly significant.

7.3.1.1 Problems with Haugen and Baker (1996)

As is apparent from the methodology outlined above, a multifactor model is created by simply including all the testable variables in the expected return model. This process fails to determine the optimal forecasting model since it fails to scrutinize the incremental explanatory effect of adding a greater number of independent variables into the regression equation. In order to create a more accurate model, the original methodology of Haugen and Baker (1996) is tweaked somewhat in order to assess the impact on explanatory power of each and every variable as it is included in the model.

7.3.1.2 Haugen & Baker (1996) – a revised methodology

As in Van Rensburg and Janari (2005), a stepwise variant of Haugen and Baker (1996) is applied. The list of candidate factors eligible for testing was compiled from the original list of univariate tests run in Chapter Five. All factors present in the univariate tests that had a t-

statistic of in excess of 1.00 were considered for the analysis to follow so as to allow the for the chance an insignificant variable tested univariately may hold some explanatory power in a multifactor setting. As previously the value of each specific attribute is considered a measure of the stock's exposure to the factor.

The procedure commences using each of the timing models considered, namely 12M, 6M, 3M, 1M and 18M. The process is characterised by two distinct phases. Phase One follows a univariate testing methodology much the same as those in previous chapters whereby the tested factors are used to predict slopes. Phase Two expands the analysis to a multivariate form whereby a set of controlled slopes is then estimated.

At each step S , the aim is to create an optimal model that exhibits the best average monthly IC using the full range of independent variables V_1 to V_{s-1} in combination with an added independent variable N .

Step 1 aims to establish a univariate expected return model through the running of the same univariate cross sectional regressions performed in Chapter Five of this paper. The distinct difference here is that the data set is non-standardised. Furthermore, the dataset is scrutinized once again for outliers and winsorised sufficiently to reduce the influence of extreme observations. The testing procedure is as follows:

$$r_{i,t+1} = \gamma_{0,t+1} + \gamma_{N,t+1}N_{i,t} + \varepsilon_{i,t+1} \quad (7.5)$$

Where,

$N_{i,t}$ represents the value of the attribute of share i at end of each month t ,

$\gamma_{N,t+1}$ is the cross-sectional coefficient,

$r_{i,t+1}$, $\gamma_{0,t+1}$, and $\varepsilon_{i,t+1}$ are the same as in the univariate regressions and represent the realised return on share i for month $(t+1)$, the constant intercept term, and the residual error respectively.

From the above regressions, a set of monthly payoffs for each of the attributes is calculated. These derived monthly payoffs are then used to form the basis of prediction for each of the attributes' monthly slopes with respect to the model employed.

Specified as:

$$E(r_{i,t+1}) = \gamma_{0,t+1} + E(\gamma_{N,t+1})N_{i,t} \quad (7.6)$$

Where,

$E(r_{i,t+1})$ = forecast return to share i in month $t + 1$

$E(\gamma_{N,t+1})$ = predicted payoff to attribute N in month $t + 1$

Upon establishing a forecast of each share's return based on its predictive payoff to the attributes concerned, the accuracy of the forecast is assessed through comparison with the realised return. An IC ratio is computed to quantify the predictive accuracy of each of the tested attributes. The tested attribute that exhibits the largest average IC across all months in the sample period assumes the place of V_1 and is the first attribute to remain in the model.

Step 2, follows a similar procedure however here the setting is no longer univariate. Multivariate cross-sectional regressions are run with two independent variables, S_1 being that independent variable chosen to remain in the model from Step 1 and each of the remaining attributes to be included as the second independent variable (N). The most next most significant attribute according to its average cumulative IC value is then included and takes the place of V_2 .

Specified as follows:

$$r_{i,t+1} = \gamma_{0,t+1} + \gamma_{V_1,t+1}V_{1,i,t} + \gamma_{N,t+1}N_{i,t} + \varepsilon_{i,t+1} \quad (7.7)$$

At step 2, V_1 is omitted from the list of remaining attributes to be tested in order to find the next best characteristic.

The cross-sectional regression run as expected give rise to a set of controlled monthly slopes for the tested independent variables ($\gamma_{i,t+1}$). As more variables are included, the set of controlled slopes for V_1 adjusts. The timing model employed is then used to predict the monthly controlled slopes for each of V_1 and N .

The forecast of the monthly return on share i at the end of month t considering the predicted monthly payoffs to the attributes for month $(t + 1)$ can be indicated as follows:

$$E(r_{i,t+1}) = \gamma_{0,t+1} + \sum_{k=1}^{K-1} E(\gamma_{i,k,t+1})V_{k,t} + E(\gamma_{N,t+1})N_{i,t} \quad (7.8)$$

The same procedure is repeated until the cumulative average IC across the selected sample period is at a maximum, with the procedure ending when the next included variable causes a reduction in the average IC value. If such a decline in the IC occurs, that variable which caused the decrease is removed from the model and that which remains constitutes the optimal model formulation. Therefore, the model could at minimum include just V_1 as an independent variable based on the next computed IC value due the inclusion of N , or could have V_n independent variables where V_n represent that last added variable that did not reduce the average IC value.

7.4 Expected Return Model Construction

In previous chapters in this study both firm specific effects and broader macroeconomic influences were tested for their significance in explaining the variation in emerging market stock returns. In order to test both influences forecasting power, a number of expected return models are specified.

7.4.1 Firm Specific Models:

The first rounds of models constructed contain only those firm-specific factors mentioned in Chapters Four and Five of this paper. They are tested using all the predefined timing models, namely 1M, 3M, 6M, 12M and 18M over both the entire and restricted sample periods. Such sample restrictions were imposed due to emerging market data being somewhat sporadic in its distribution, with only the most recent data being of a desired level of completion. The sample is restricted to the seven year period (1st January 2000 to 31st December 2006). This analysis is performed to act as both a check on the robustness of the full-sample results and to possibly identify trends that have only of late become exploitable.

7.4.2 Macro Economic Models:

The second round of test aim to test the macroeconomic factors identified in Chapter 6 of this paper for their ability to forecast emerging market share returns. As alluded to in the previous Chapter, it is doubtful that these factors will in fact prove to be significant in their relation to returns however they are tested nevertheless in order to provide further evidence to justify previous findings.

Methodology:

In testing the predictive power of these variables, another variant of the methodology posited by Fama and Macbeth (1973) is employed.

Using the list of pre-specified variables the following model is used to model individual stock returns.

$$r_{i,t+1} = \gamma_{0,t+1} + \gamma_{1,t+1} A_t + \varepsilon_{i,t+1} \quad (7.9)$$

Where,

$r_{i,t+1}$ = realized return on share i for year $t + 1$

$\gamma_{0,t+1}$ = constant intercept term

$\gamma_{1,t+1}$ = cross-sectional slope coefficient estimated from the regression

A_t = value of the variable at end of each year t

$\varepsilon_{i,t+1}$ = residual error

The version of Fama and Macbeth (1973) employed can be defined as a ‘rolling’ beta regression methodology. In this paper the procedure is constrained to the emerging market stocks over the sample period at hand which spanned from the 1st January 1997 to 31st December 2006. The procedure begins by estimating the sensitivity (beta) of each of the emerging market stocks versus the final list of candidate macroeconomic variables over the first three years of the sample period, more specifically the period 1st January 1997 to 31st December 1999. This rolling thirty six month period serves to provide the historical data in order to generate monthly sensitivities of emerging market returns to each of the candidate factors for the remainder of the sample period.

Thereafter the regression ‘rolls’ forward whereby the range of the second to the thirty seventh month is regressed and the updated beta estimates per stock are generated. The procedure is repeated until a set of updated beta estimates are generated for the out-sample period spanning the 1st of January 2000 to the 31st of December 2006. These exposures are then collectively used for further testing for predictive significance in the methodology of Haugen

and Baker (1996). Once more a range of timing models are employed in order to measure both the short and long term predictive capability of these macroeconomic exposures to emerging market stock returns.

7.4.3 Combined Models:

Finally, the influence of both firm-specific and macroeconomic variables are jointly tested in order to assess whether through their combination a more effective expected return modelling formation is able to developed. Such a combination is tested with similar timing models over the jointly applicable sample period. In this instance the out sample testing period running from the 1st of January 2000 to the 31st of December 2006 is used as it is common in both firm specific and macroeconomic datasets.

7.4.4 Results

Results of stepwise Haugen & Baker (1996) – Style

Table 7.2 Constructed Expected Return Models: Style (Full Sample)

The methodology of Haugen and Baker (1996) is followed in a stepwise procedure in order to formulate a series of expected return models the aim of which is to forecast emerging market share returns. The first step of the process begins by using only one non-standardised explanatory variable. Unlike Haugen and Baker (1996), an array of timing models are used in order to attempt to construct the optimum model. Eighteen, Twelve, Six, Three and previous month moving average models are used in order to estimate the controlled slopes for the attributes under consideration. The forecasting ability of each model is gauged through the use of the IC or Information Coefficient of Grinold (1989). That attribute that displays the highest average IC over the tested sample period remains in the model and is then tested once more with all the other candidate factors. The second attribute to remain in the model is that which has the highest average IC when tested alongside that factor that remained in the first step. This stepwise procedure continues until the multifactor expected return model derived at a stage displays a lower cumulative average IC than that of the previous stage. The Information Ratio is that of Qian and Hua (2004) which is calculated as the mean monthly IC divided by the standard deviation of the IC over the sample period. The mean IC and IR generated for each step are displayed for each of the timing models below. The data were extracted from DataStream International.

Full Sample (1st January 1997 to 31st December 2006): Style Characteristics

Timing Model	Mean Monthly IC	IR (Qian and Hua, 2004)	Variables
1M	0.0408	0.8852	LN MV DY MOM_6M PTBV VO_3 ROCE BTMV VO_6 PC
3M	0.0463	1.0390	BTMV ROCE DY MOM_6M PC LN MV MVTRADE EPS VO_6 A_TURN PTBV
6M	0.0444	1.1740	LN MV MVTRADE BTMV PTBV PC EPS DY MVTRADE MV
12M	0.0456	1.2113	BTMV MVTRADE MOM_6M PC ICBT MTBV DY
18M	0.0468	1.2551	BTMV MVTRADE DY MOM_6M ICBT

From the above table it is evident that five timing models used provide a number of different forecasting models with a range of explanatory factors. Expected Return models fitted to the full sample period failed to return statistically significant results. For such tests a mean IC of 0.1 is considered good, with such a model having a degree of explanatory power and so being

somewhat exploitable in a market based environment. All five models fail to generate a mean IC remotely close to the desired threshold, with the 18M model achieving the highest value of 0.0468. Models ranged in size from as small as five factors to a maximum of eleven independent variables.

There are a number of considerations that may in fact lend themselves to explaining the insignificance of such models in explaining emerging market share returns. The sheer magnitude and variety of the tested sample, 19 countries from six continents a total of 1290 firms makes finding an accurate general forecasting model a somewhat onerous task. Furthermore, both data availability and the integrity thereof has been a cause for concern in many emerging market based study as in this one. Data pre-dating the year 2000 is sparse and sporadic in its nature and so fails to lend itself to the subject of detailed financial research, refer to Appendix A.2. Furthermore, the inclusion of certain anomalous countries such as Venezuela, Pakistan et al about which little is known and wherein financial and governmental regulation is rife serves to further exacerbate the problem of identifying a general and reliable forecasting model.

In order account for some of the pitfalls mentioned above, an out-sample period running from the 1st of January 2000 to the 31st of December 2006 was specified and the above style characteristics retested.

Table 7.3 Constructed Expected Return Models: Style (Restricted Sample)

The methodology of Haugen and Baker (1996) is followed in a stepwise procedure in order to formulate a series of expected return models the aim of which is to forecast emerging market share returns. The first step of the process begins by using only one non-standardised explanatory variable. Unlike Haugen and Baker (1996), an array of timing models are used in order to attempt to construct the optimum model. Eighteen, Twelve, Six, Three and previous month moving average models are used in order to estimate the controlled slopes for the attributes under consideration. The forecasting ability of each model is gauged through the use of the IC or Information Coefficient of Grinold (1989). That attribute that displays the highest average IC over the tested sample period remains in the model and is then tested once more with all the other candidate factors. The second attribute to remain in the model is that which has the highest average IC when tested alongside that factor that remained in the first step. This stepwise procedure continues until the multifactor expected return model derived at a stage displays a lower cumulative average IC than that of the previous stage. The Information Ratio is that of Qian and Hua (2004) which is calculated as the mean monthly IC divided by the standard deviation of the IC over the sample period. The mean IC and IR generated for each step are displayed for each of the timing models below. The data were extracted from DataStream International.

Restricted Sample (1st January 2000 to 31st December 2006): Style Characteristics

Timing Model	Mean Monthly IC	IR (Qian and Hua, 2004)	Variables
1M	0.0634	1.8538	BTMV MTBV ROCE MOM_6M PTBV CTTD
3M	0.0708	2.1366	BTMV ROCE LNP 12_EPS
6M	0.0767	1.7943	BTMV MVTRADE MOM_6M MVTRADEMV MTBV PC LNMV
12M	0.0846	1.7444	BTMV ROCE MOM_6M MVTRADEMV PC EPS LNP VO_3 P
18M	0.0833	2.3279	BTMV ROCE MOM_6M A_TURN 12_EPS DTMV ICBT P PC

It is evident from the results presented above in table 7.11 that such sample restriction did indeed have a profound effect on the significance of the forecasting models generated. Of the five timing models retested over the sample period 1st of January 2000 to 31st of December 2006, the lowest mean IC is that of the 1M model (0.0634) which is superior to all models specified for the full sample. The 18M model has the highest mean IC of 0.0833 with a total of nine factors.

Such sample modification serve to endorse the hypothesis that emerging market data in the late twentieth century lacked completeness and so made the search for predictable relationships an onerous one. Whilst the above models are an improvement in terms of their explanatory power they still fail to be of sufficient exploitable significance in a market environment with their mean IC's still below the accepted benchmark of 0.1.

In order to supplement this analysis, those macroeconomic factors thought to be of significance when the explanation of firm returns is concerned as studied in Chapter Six of this paper are retested as additional explanatory factors in a similar Haugen and Baker (1996) stepwise routine.

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Results of stepwise Haugen and Baker (1996) – Macroeconomic Variables

Table 7.4 Constructed Expected Return Models: Macroeconomic Variables

The methodology of Haugen and Baker (1996) is followed in a stepwise procedure in order to formulate a series of expected return models the aim of which is to forecast emerging market share returns. The first step of the process begins by using only one non-standardised explanatory variable. Unlike Haugen and Baker (1996), an array of timing models are used in order to attempt to construct the optimum model. Eighteen, Twelve, Six, Three and previous month moving average models are used in order to estimate the controlled slopes for the attributes under consideration. The forecasting ability of each model is gauged through the use of the IC or Information Coefficient of Grinold (1989). That attribute that displays the highest average IC over the tested sample period remains in the model and is then tested once more with all the other candidate factors. The second attribute to remain in the model is that which has the highest average IC when tested alongside that factor that remained in the first step. This stepwise procedure continues until the multifactor expected return model derived at a stage displays a lower cumulative average IC than that of the previous stage. The Information Ratio is that of Qian and Hua (2004) which is calculated as the mean monthly IC divided by the standard deviation of the IC over the sample period. The mean IC and IR generated for each step are displayed for each of the timing models below. A variation of Fama and Macbeth (1973) was used to estimate updating monthly sensitivities of the emerging market stocks to the candidate list of macroeconomic variables. The method used a thirty six month rolling period to generate the sensitivities out-sample, such a procedure serves to present estimates for a eighty four month out-sample testing period. The data were extracted from DataStream International.

Sample (1st January 2000 to 31st December 2006): Macroeconomic Factors

Timing Model	Mean Monthly IC	IR (Qian and Hua, 2004)	Variables
1M	0.0201	0.5257	OILBRENTCR USMONSUPP RANDDOLLAR USHRTRM USGLT10YR
3M	0.0199	0.6813	CRBINDEX
6M	0.0183	0.3802	GOLDPRICE RANDDOLLAR
12M	0.0352	0.6473	RANDDOLLAR CRBINDEX USEXPIND GOLDPRICE USMONSUPP PLATINUM USGLT10YR
18M	0.0316	0.6415	USGLT10YR GOLDPRICE USEXPIND USMONSUPP

As displayed in table 7.11, attempts at creating a multivariate model capable of predicting emerging market stock returns based solely on their exposure to macroeconomic variables is somewhat optimistic. The five macroeconomic timing models employed range in size from as little as three factors to a maximum of seven. As was the case with the style based models previously tested, all timing formulations fail to provide sound forecasting ability with all mean IC's below the accepted threshold of 0.1, the largest being the 12M model which generated a value of 0.0352. However this model's IR is less significant being the only the second highest out of the five models tested. This discrepancy may be a direct result of the sparseness of the dataset examined, with earlier data being less complete resulting in tested models providing less robust results when run thereupon.

Once more the relative sparseness and incomplete nature of emerging market data coupled with the inclusion of a number of either overly or poorly regulated country indices in sample are cited as potential explanations for the fitted models inconclusive performance. In this instance the reduced size of the out-sample period employed for testing is a further factor that may in fact hamper any potential predictive powers any tested factors could exhibit.

However, as the previously tested style factors were found to be significant in explaining emerging market share returns over the out-sample period it is queried whether or not the inclusion of the above candidate macroeconomic factors will in fact add to the explanatory power of the model specified. Therefore, the methodology of Haugen and Baker (1996) is implemented once more over a combination of style and macroeconomic factor in order to attain a model of best fit.

Results of stepwise Haugen and Baker (1996) – Style and Macroeconomic Variables

Table 7.5 Constructed Expected Return Models: Style and Macroeconomic Variables

The methodology of Haugen and Baker (1996) is followed in a stepwise procedure in order to formulate a series of expected return models the aim of which is to forecast emerging market share returns. The first step of the process begins by using only one non-standardised explanatory variable. Unlike Haugen and Baker (1996), an array of timing models are used in order to attempt to construct the optimum model. Eighteen, Twelve, Six, Three and previous month moving average models are used in order to estimate the controlled slopes for the attributes under consideration. The forecasting ability of each model is gauged through the use of the IC or Information Coefficient of Grinold (1989). That attribute that displays the highest average IC over the tested sample period remains in the model and is then tested once more with all the other candidate factors. The second attribute to remain in the model is that which has the highest average IC when tested alongside that factor that remained in the first step. This stepwise procedure continues until the multifactor expected return model derived at a stage displays a lower cumulative average IC than that of the previous stage. The Information Ratio is that of Qian and Hua (2004) which is calculated as the mean monthly IC divided by the standard deviation of the IC over the sample period. The mean IC and IR generated for each step are displayed for each of the timing models below. A variation of Fama and Macbeth (1973) was used to estimate updating monthly sensitivities of the emerging market stocks to the candidate list of macroeconomic variables. The method used to make testable the macroeconomic variables is characterised by a thirty six month rolling period that generates the sensitivities out-sample, such a procedure serves to present estimates for a eighty four month out-sample testing period. The data were extracted from DataStream International.

Sample (1st January 2000 to 31st December 2006): Style and Macroeconomic Factors

Timing Model	Mean Monthly IC	IR (Qian and Hua, 2004)	Variables
1M	0.0781	1.7429	BTMV MTBV ROCE USMONSUPP PTBV MOM_6M CTTD PLATINUM 12_EPS CRBINDEX
3M	0.0714	1.9668	BTMV ROCE LNP USMONSUPP
6M	0.0767	1.7943	BTMV MVTRADE MOM_6M MVTRADEMV MTBV PC LNMV
12M	0.0861	1.7742	BTMV ROCE MOM_6M MVTRADEMV PC EPS LNP VO_3 P GODLPRICE USGLT10YR
18M	0.0947	1.8669	BTMV ROCE MOM_6M A_TURN 12_EPS USPPI OILBRENTCR DTMV PC MTBV GOLDPRICE DY VO_3 LNP RANDDOLLAR P USGLT10YR CTTD

Table 7.12 communicates the results of the combined Style and Macroeconomic specification following the refined methodology first employed in its original form by Haugen and Baker (1996).

It is most notable that this joint specification over the reduced sample period spanning the 1st of January 2000 to the 31st December 2006 shows models with improved return predictability. The five timing models range between four and eighteen factors, with all five having below par statistical power in prediction. However, one model specification in particular, the 18M timing model produces a mean IC very similar to 0.1, 0.0947 to be precise. Coupled with it having the top ranked IR equalling 1.8699 it can be inferred that this model shows potential having a semblance of predictive power over a broad range of emerging market nations and stocks respectively.

One should however also take heed in considering the model a truly accurate predictive formulation. Consideration must be taken of the constrained testing period evident in the above scenario. Timing models of significant historical depth will generate very few observations over the reduced out sample period and so may serve to exaggerate forecasting ability. A seven year out-sample period and the results generated there from may contain significant bias, with certain sample specific factors exhibiting predictive power over that distinct period but being less robust as time passes.

7.5 Summary and Conclusion

As mentioned this chapter aims to continue on from work done in Chapters Five and Six and construct a number of multifactor models. Firstly, a multifactor style characteristic model derived from the final list of candidate style factors determined in Chapter Five is constructed. In order to create a robust model with more than a single independent variable, a defined testing procedure is followed. It would not be sufficient to just include all style factors as in such specifications the model may indeed provide a greater overall explanatory power, but attempts to isolate the true explanatory sources is onerous and clouded by the excessive number of factors in regression.

To begin a multifactor regression is run on the final list of standardised characteristics by regressing the most significant characteristic (in the previous univariate tests) against the forward returns in a cross sectional setting. Variables are included in the model one by one if they are able to add to the overall significance of the model. Once a variable is added and either that same variable or another becomes the least significant and fails to hold up to the Student t-test for mean significance the procedure of adding variables is halted and that variable is removed from the regression. The process of adding variables then restarts until final characteristic is considered for inclusion in the regression. Thereafter those variables that remain are the multifactor specification.

The procedure in this instance results in a model with a total of nine style characteristics. They are Book to Market Value (Value), Sales to Price (Value), Price to Cash (Value), Dividend Yield (Value), 3-month Market Value Traded to Market Value (Liquidity), Market Value Traded (Size), Earnings Yield (Value), Asset Turnover (Size) and Return on Capital Employed (Value). The above formulation has a strong value orientation with Book to Market Value, Earnings Yield and Return on Capital Employed collectively having the largest and most significant positive monthly payoffs.

The methodology of Haugen and Baker (1996) is then applied in order to assess the return predictability of such factors through the construction of a number of expected return models. A variant of the above methodology is applied in order to increase the robustness of the generated results as in Van Rensburg & Janari (2005). The stepwise procedure implemented employs five differing timing models and so forms the basis for the formulation of five

differing expected return models. Only previously tested style attributes that have an univariate t-statistic in excess of 1.00 are considered for this procedure. The expected return models generated over the full sample period are found to be somewhat insignificant as their mean IC's fail to achieve the predictability threshold of 0.1. As emerging market data is somewhat sparse in the late nineties the sample was restricted accordingly so as to include only that data deemed to be more complete and testable. The sample was reduced to seven years with such manipulations able to significantly improve the relevance of the candidate style characteristics in explaining emerging market stock returns.

Secondly, the macroeconomic variables tested in Chapter Six of this paper were considered for inclusion in a multifactor predictive model. In order to make such variables testable, a variant of the methodology of Fama and Macbeth (1973) was employed that computed changing monthly stock exposures to such factors through the use of a thirty six month rolling period regression. This procedure generated a seven year out-sample period from the 1st of January 2000 to the 31st of December 2006.

The methodology of Haugen and Baker (1996) is once again applied in testing the predictive capability of such macroeconomic sensitivities. Besides the twelve month trailing moving average used by the original authors, the additional timing models used to gauge the significance of the style characteristics are once again employed. None of the models provide statistically significant results that lend themselves to being forecasting models of some practical ability.

Finally, a joint test is performed whereby both style characteristics and macroeconomic variables are combined to generate a hybrid multifactor model. Such an analysis aims to ascertain whether or not the combination of local firm specific factors and broader more global macroeconomic data is able to better explain the variation in emerging market stock returns.

The stepwise variant of the methodology of Haugen and Baker (1996) using the five different timing models is employed to test the forecasting ability of the combination. As the macroeconomic exposures are constrained to the out-sample period for which they were computed, the combination is run over the same period, namely-1st of January 2000 to 31st of December 2006. The timing models aid in generating expected return models that range from five to fourteen factors. Of the five models only one is found to have a mean IC

comparable to 0.1 and therefore a semblance of return predictability. The best model includes the following factors: (1) Book-to-Market Value, (2) Return on Capital Employed, (3) Prior six month momentum, (4) Asset Turnover, (5) Prior twelve month change in earnings per share, (6) US Producer Price Index, (7) Price of Oil (Brent Crude in \$US/barrel), (8) Debt to Market Value of Equity, (9) Price to Cash Ratio, (10) Gold Price (\$US per ounce), (11) Dividend Yield, (12) Prior three months change in traded volume, (13) The logarithm of Price, (14) Rand/Dollar exchange rate, (15) The Price per share, (16) The Yield on the 10 year US Gilt and (17) Cash to Total Debt Ratio. Inference based on such a hybrid model should be made with considerable caution due to the disputable data integrity of emerging market firms, a constrained out-sample testing period and unreliability of constituent countries and firm's regulations and reporting procedures.

This section has aimed to provide evidence that both style and macroeconomic influences are able to explain the variation of share returns in a broad emerging market context. Unlike developed market research, little evidence is found that supports these hypotheses. Certain influences, be they firm specific or macroeconomic show some predictive power, however the true meaning and explanation behind these effects is still to be understood.

Summary, Conclusion and Areas for further research

8.1 Introduction

The chief aim of this thesis is the detailed investigation of asset pricing in emerging markets, i.e. to identify both the firm-specific and broader macroeconomic factors which significantly influence the cross-sectional variation of listed stock returns. The significant question to follow from this ambition – are emerging markets efficient and do they price assets correctly? If this is not the case, then the next question would ask if the reasons for share mis-pricings are in fact identifiable, or more specifically attributable to certain characteristics that certain firms or markets exude? Finally, the most onerous of queries relates to whether these identifiable attributes are able to be exploited by investors.

More specifically, these questions can be narrowed down into the three main objectives of this paper, (1) to determine whether style factors are in fact better able to explain the variation in share returns compared to conventional asset pricing models, (2) to assess the likelihood of broader macroeconomic influences on stock markets and to establish their predictive power upon returns; and (3) to form multifactor predictive style, macroeconomic and hybrid models that are able to forecast share returns based on historical payoffs to the most significant factors.

The chapter is comprised of two sections: Section 8.2 summarises and concludes the main findings in light of the objectives above, and Section 8.3 concludes the thesis and mentions possible areas of refinement and suggests areas for further research.

8.2 Summary and Conclusion

This study employs the use of the DataStream Emerging Markets Index for the extracting of various firm specific and return data.² As of the 1st of April 2007, the index had listed a total of 1538 companies from 26 emerging nations across the globe. Certain countries and their associated companies are excluded from this study on the basis of excessive trade regulations hampering the exploitation of any potential investment opportunities, insufficient or incomplete data, too few listed shares over the sample period and insufficient representation in terms of overall market capitalisation. The problem of thin trading was analysed and found not to be of significant threat to the integrity of the outcomes of analyses to follow. After such sample refinements the total number of countries was reduced to twenty which comprised 1273 listed shares having a cumulative market capitalisation of \$US 3,299 billion with the top 100 firms accounting for approximately 50% of this total capitalisation.

All return data and the forty six style characteristics are either constructed from or downloaded from the DataStream International database over the sample period 1st of January 1997 to the 31st of December 2006. The study is free from look-ahead bias on account of DataStream only updating information once it is publicly available. Furthermore, there is no element of data-snooping bias present in-study as an analysis of such rigour is yet to be performed on such an emerging market sample. The study is however subject to survivorship bias.

Risk based explanations for the variations of share returns in emerging markets were then sought. Single and Multi-Index Models are constructed in order to attempt to explain the time-series variation of returns. Firstly, the DataStream International Emerging Markets Index was used as the market proxy for the single index model with the DataStream World Market Index next to be tested in a single index setting. Subsequently, the aforementioned indices were then combined for the multi-index model formulation. The computed R^2 and adjusted R^2 across the respective models indicates that the multi-index model is marginally superior in explaining the variation in returns, however with only 69% of regressions

² The use of this dataset was endorsed through correspondence with Professor Geert Rouwenhorst whose paper entitled "Local Return Factors in Emerging Markets" employed the use of data from the same database albeit over a differing sample period.

significant compared to 72% of the single index model which serves to somewhat blur the distinction as to which model is ultimately superior in describing the structural influences of a broad sample of emerging market shares. The residual variation unexplained by each model is cross-tested in a similar manner between both index model formulations with either model's explanatory power over the other's unclassified variation found to be statistically insignificant.

Following the above risk-adjustment, testing of the sourced firm-specific attributes begins. All forty-six style factors are standardised for comparative purposes and then regressed in a cross-sectional format against emerging market share returns. The regressions are run on unadjusted, CAPM adjusted and APT adjusted returns in order to gauge the ability of the attributes to explain the cross sectional variation of share returns and as a test of robustness check on identified explanatory factors. The significance of the payoffs of the tested variables is assessed using the Student-t test. Cluster Analyses of the significant factor payoffs are then performed for unadjusted and risk-adjusted testing procedure outputs in order to detect groups of factors with similar explanatory power. Furthermore, to remove double counting and the prevalence of repetition, a correlation matrix is generated on the tests of unadjusted returns to aid in pruning out factors of excessive likeness.

The testing procedures run over the both the unadjusted and adjusted returns served to yield very similar statistically significant factors indicating their robustness in explaining return variation. Following the correlation analysis a final list of 14 significant style factors is generated. A strong value and size influence is evident as indicated by factors such as the logarithm of Price (Size), the logarithm of Market Value (Size), Book-to-Market Value (Value), Price-to-Cash (Value) and Price-to-Book Value (Value) being amongst the most statistically significant.

Such influences cohere with the vast majority of both developed and developing literature concerning market efficiency with the emerging market studies of Patel (1997), Rouwenhorst (1999), Fama and French (1998) and Serra (2000), who all find strong a strong prevalence of a negative size and positive value effect, however few find as many varied forms of these effects as evident in this study. Short Term Liquidity is also found to be relevant in predicting emerging market return movements; however data concerns and lower statistical significance are cause for concern when attempting to exploit such anomalies. The factors can be classified into the following broad groups or clusters: (1) Size, (2) Value, (3) Liquidity

and (4) Miscellaneous. The consistency and direction of the calculated payoffs is then assessed in order to establish the integrity of the inferred relationship. From the analysis undertaken it is apparent that few of the so called significant factors are consistent in the direction of their payoff which may result in the interpretation of timing models constructed on the basis of these anomalous factors to be somewhat less than ideal in terms of forecast accuracy. However, from the univariate testing procedure employed it is evident that there are indeed a number of identifiable firm-specific factors that are able to aid in explaining the variation in emerging share returns.

Having identified a number of firm-specific factors as having some explanatory power, the analysis then moves to consider a list of macroeconomic variables and their potential influence on emerging stock market returns in a similar setting. The variables chosen are dominated by commodity prices and numerous short and long term interest rates in line with similar work by Gjerde and Sættem (1999), Sadorsky (1999) and Bilson, Brailsford, and Hooper (2001) who test and find similar factors to be significant. Augmented Dickey Fuller tests as performed in Van Rensburg and Slaney (1997) are performed on logarithmically transformed first differenced variables in order to establish the stationarity of the chosen factors. A correlation analysis followed to aid in pruning those variables that show little influence on broad emerging and global indices resulting in a final list of eleven macroeconomic factors to be considered for testing.

In testing such macroeconomic factors, a version of the methodology used in Fama and Macbeth (1973) was employed over an in-sample period spanning the 1st of January 1997 to 31st December 1999 in order to estimate the sensitivity of each emerging market stock to the respective macroeconomic variable on a monthly basis. The in-sample betas were then regressed out-sample over the period 1st of January 2000 to the 31st of December 2006 in a cross sectional univariate setting and their explanatory power over the cross section of emerging market returns assessed using the Student-t test. Of the final list of eleven factors tested only the monthly payoffs or risk premia of five are found to be of notable significance. Fluctuation in the price of Gold and Platinum in dollars per ounce, the CRB Index and they yields on certain US government bonds issues are factors identified as having a measure of explanatory power over the cross sectional variation of emerging market stock returns. Through graphical depiction and with some further consideration it is quite plausible that such macroeconomic factors are not per se priced risk factors, i.e. a greater exposure to such

a factor will not necessarily provide greater reward – the factors performance may in fact be to a degree somewhat independent of attempts at increased investment exposure. However as a number are statistically significant one must in fact consider that such broader market influences may indeed have some forecasting ability.

Ultimately the real assessment of such identifiable factors that purport to explain mispricing in so called efficient markets is in the establishment and scrutiny of predictive models that attempt to forecast share returns on the basis of these related factors.

To begin a multivariate analysis of the aforementioned style factors was run in order to assess whether those factors identified previously in univariate testing were in fact robust in their explanatory power. The procedure begins by including the most significant variable evident from the previous univariate tests. Variables are included one at a time in a multifactor regression versus forward returns until the inclusion of an additional variable causes the least significant variable to show an insignificant mean of the time series of its controlled slope. Upon this outcome that variable is removed and the testing procedure continued until all such factors are tested in such a manner. The analysis yielded a multifactor model with a total of nine factors, namely; (1) Book-to-Market Value (2) Sales-to-Price, (3) Price-to-Cash, (4) Dividend Yield, (5) Three month change in Market Value to Market Value Traded, (6) Market Value Traded, (7) Earnings Yield, (8) Asset Turnover and (9) Return on Capital Employed. As evident from the univariate analyses the Book-to-Market Value factor is of greatest significance with the highest cumulative monthly payoff of all the factors present in the model.

Finally, expected return models are constructed using a stepwise variant of the methodology employed by Haugen and Baker (1996). The expected return models are constructed using three models, (i) Style factors only, (ii) Macroeconomic factors only, and (iii) A Hybrid formulation combining both Style and Macroeconomic factors in an effort to improve explanatory power of the generated forecasting model. Firstly, non-standardised firm-specific factors having a t-statistic of greater than 1.00 are examined over the full sample period spanning the 1st of January 1997 to the 31st of December 2006 using not only the twelve-month trailing moving average of attribute payoffs employed by Haugen and Baker (1996) but further one, three, six and eighteen month trailing averages. The model's forecasting power is assessed using the Information Coefficient (IC) and the Information Ratio (IR). The five timing models give rise to expected return models of between five and

eleven factors, however none are found to be of significant forecasting ability with mean IC's well below the desired threshold of 0.1.

The integrity of emerging market data in the late nineties may be considered poor (refer Appendix A) and therefore cited as a potential cause for the apparent insignificance in explanatory power of models tested over the specified time period. Such a data anomaly in part justifies that the timing models be re-tested over a restricted sample running from the 1st of January 2000 to the 31st of December 2006. The results generated are considerably more promising with mean IC value of all expected return models rising, the highest value being the twelve month model with a mean IC of 0.0846. However, even with such a considerable improvement such models are still statistically inadequate to be regarded as exploitable in a real-world investment setting. Therefore, the macroeconomic variables previously considered in univariate analysis are tested for their ability firstly to provide independent forecasting power over emerging market return, and then subsequently they are added in analysis to the style factors in an attempt to create a more optimal hybrid expected return model.

To test the macroeconomic variables using the appropriate timing models previously employed the updated monthly payoff of each share to each macroeconomic variable needed to be computed. Once more a variation of Fama and Macbeth (1973) was used whereby a rolling thirty six month in-sample period beginning the 1st of January 1997 to the 31st of December 2006, would in cross sectional regression serve to establish such updated exposures over an out-sample period 1st of January 2000 to the 31st of December 2006. These exposures were then entered into the stepwise variant of Haugen and Baker (1996) in order to ascertain their return forecasting ability. The variables however lacked any considerable forecasting ability with the largest mean IC value of 0.352 well below 0.1. Such variables held little value independently, but perhaps combining them to form combined style and macroeconomic expected return models would yield better results.

The inclusion of such macroeconomic variables into a combined analysis resulted in a testing procedure that considered a total of 36 variables of both specific and broad influence. Such an amalgamation of factors did indeed provide a marginal improvement in the forecasting ability of the specified expected return models. The mean IC of the original eighteen month trailing average model improved from 0.0833 to 0.0947 indicating a somewhat slight but nevertheless significant improvement in forecasting ability. This model proved to have the

highest mean IC and contained the following factors; (1) Book-to-Market Value, (2) Return on Capital Employed, (3) Prior six month momentum, (4) Asset Turnover, (5) Prior twelve month change in earnings per share, (6) US Producer Price Index, (7) Price of Oil (Brent Crude in \$US/barrel), (8) Debt to Market Value of Equity, (9) Price to Cash Ratio, (10) Gold Price (\$US per ounce), (11) Dividend Yield, (12) Prior three months change in traded volume, (13) The logarithm of Price, (14) Rand/Dollar exchange rate, (15) The Price per share, (16) The Yield on the 10 year US Gilt and (17) Cash to Total Debt Ratio.

While such hybrid formulations were in fact able to improve the forecasting ability of the constructed expected return models, they still fail in statistical significance with investment based thereupon lacking any exploitable ability.

8.3 Final Conclusion and Areas for Further research

Emerging equity markets are associated with a certain degree of mystery and fear of the unknown. Professionals will often advocate the combination of various emerging market offerings in portfolio with more developed market holding on the basis of diversification, however such inclusion is often done blindfolded and considered somewhat of a gamble. This paper aims to assist and shed a little more light on some hypothesised return drivers of a broad sample of emerging market nations.

This thesis aimed to identify both firm-specific characteristics and more general macroeconomic influences that have some form of relationship and explanatory power of the cross section of emerging market share returns. A number of firm-specific and macroeconomic variables were identified as anomalies that have their monthly payoffs significant in both a univariate and multivariate setting. To ascertain their true worth, both sets of characteristic's ability to forecast share returns were tested at first independently and then in a hybrid combination through the construction of a number of expected return models. Unfortunately, such models fail to provide conclusive evidence that indicates their ability to accurately forecast emerging market share returns.

There has been considerable evidence in both developed and developing markets of the existence of these anomalous effects, both firm-specific and macroeconomic. However, no definitive account exists that accurately explains their existence. Previously accepted asset

pricing model theories such as the CAPM which make use of a sole market proxy as an explanation for the risk: return trade-off are one again disproved with this study indicating the presence of additional price risk factors over and above that a seemingly sufficient market proxy. However, although such results are found that do cohere with previous literature, one must not get carried away without considering the potential biases to which a form of data analysis is prone.

The emerging market dataset employed is cause for concern from the outset. Data manipulations to remove outliers, erroneous data entries, incomplete information and account for the presence for biases such as thin trading were necessary. A broad analysis of the data availability for the chosen sample does raise cause for concern when noticing the somewhat obvious trend of the decreasing sparseness of data overtime as the sample is viewed from start to end. An additional concern would be reflected in the selected data source and it's method of backfilling data. Such a procedure leaves the analysis vulnerable to survivorship bias, a prejudice that has conflicting perceptions on its impact on the robustness of generated results. Data-mining or the over analysis of a specified sample of data may lend itself to generating anomalous results not by virtue of the fact that they are actually present but in part due to the researcher wanting them to exist. Although such biases may hamper the production of superbly accurate results, every possible measure is taken that the final outcomes generated are in fact considered in light of the aforementioned concerns.

This study has indeed produce a number of expected but also unexpected results, partly due to the extensiveness of analyses performed and partly due to the fact that minimal previous work in such a context has been undertaken. In order to better assess the robustness of the generated outcomes application of the proposed predictive methods needs to be extended to further time horizons that are not only unknown but also more detailed in the rigour and completeness of their recorded data. The testing for instance of the formulated expected return models in a range of different sample periods and the subsequent comparison of such results would indeed to serve to communicate whether or not the study of such anomalous factors has any benefit.

From a practical perspective, a study of this nature aside from making an attempt at shedding much needed light on markets not studied in rigour to those termed developed should in fact

be able to have some industry application. As previously asserted the realms of portfolio management, equity analysis and investment performance appraisal cited similarly in work by Fama and French (1993) would be the ideal context in which such research should be value adding. However, it is in the area of real-world application that this study had further potential.

Two main pitfalls hamper the ability of such an analysis to bear fruit in a real world context. Barriers to trade are first and foremost the most considerable obstacle worth mentioning. Numerous countries included in the tested sample were included for the sake of completeness and due to the fact they have well recorded historical datasets. However, many Asian and Latin American nations have considerable barriers to foreigners trading on their markets. Such restricted accessibility severely hampers the potential for such a predictive modelling procedure to bear fruit in industry. However, as markets become less regulated and the arrival of the global village becomes part and parcel of every nations policy, perhaps such broad based trading will in the end be able to generate some form of competitive reward.

The second consideration not accounted for in this study is the issue of trading costs. This thesis omits the presence of trading costs which form a substantial portion of any investor's outflows when managing his or her portfolio. The characteristics of a portfolio in terms of its style and macroeconomic exposure change over time in response to overall market movements, therefore for an investor to actively pursue a defined style based strategy frequent re-balancing of stocks held needs to occur in order for the portfolio to remain focused. Such portfolio adjustment is brought about through trading in and out of positions which will result in exposure to substantial transaction costs, the magnitude of which will be directly dependent on the frequency of the rebalancing. In addition, due to the fact of the tested model incorporating 1273 firms from many different nations across the globe, consistent trading in such a wide range of markets may present the investors with trading costs more substantial than the potential benefit from pursuing the strategies investigated herein.

Ultimately, this thesis has provided insight into some of the potential factors that may serve to influence the decisions of investors who have a keen interest in emerging equity markets. Although not all results have been statistically significant, nevertheless they have postulated potential economic relationships and aided in providing some clarity as to their existence. Future studies with the aid of more up to date information, analytical techniques and perhaps

some changes in the stance of certain nations to becoming so called 'team players' in the game of global integration may serve to provide further insight into those markets termed emerging.

University of Cape Town

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List of Appendices

Appendix A	1
<i>A.1. Cumulative Size of firms listed on the DataStream Emerging Markets Index as a Percentage of Total Market Capitalisation on the 31st of December 2006.....</i>	<i>2</i>
<i>A.2. Attribute Availability for the Last Month of Each Twelve-month Period from the 1st of January 1997 to the 31st of December 2006.....</i>	<i>3</i>
<i>A.3. Complete list of Firm of Specific Attributes.....</i>	<i>4</i>
<i>A.4 Grouping of Firm Specific Attributes.....</i>	<i>6</i>
<i>A.5. Construction and Classification of Firm Specific Measures.....</i>	<i>8</i>
<i>A.6. List of Countries comprising the DataStream International Emerging Markets Index.....</i>	<i>11</i>
<i>A.7. List of Sample Constituents.....</i>	<i>13</i>
<i>A.8. Descriptive Statistics of Firm Specific Attributes.....</i>	<i>26</i>
<i>A.9. Definitions of DataStream International Items.....</i>	<i>28</i>
Appendix B	1
<i>B.1. Significance of Attributes: CAPM Adjusted Returns (EMI).....</i>	<i>1</i>
<i>B.2. Significance of Attributes: CAPM Adjusted Returns (WMI).....</i>	<i>2</i>
<i>B.3. Cluster Analysis: CAPM (Emerging Market Index) Adjusted Returns.....</i>	<i>3</i>
<i>B.4. Cluster Analysis: CAPM (World Market Index) Adjusted Returns.....</i>	<i>4</i>
<i>B.5. Significance of Attributes: APT Adjusted Returns (EMI and WMI).....</i>	<i>5</i>
<i>B.6. Correlation Matrix of Significant Style Factors.....</i>	<i>6</i>
Appendix C	1
<i>C.1. Augmented Dickey Fuller Tests.....</i>	<i>1</i>
<i>C.2 ScatterPlot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to US Export Index.....</i>	<i>2</i>
<i>C.3 ScatterPlot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to Rand/US Dollar Exchange Rate.....</i>	<i>3</i>
<i>C.4 ScatterPlot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to alterations to US Money Supply (M1).....</i>	<i>4</i>
<i>C.5 ScatterPlot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to US Producer Price Inflation.....</i>	<i>5</i>
<i>C.6 ScatterPlot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to US Short Term Interest Rates.....</i>	<i>6</i>
<i>C.7 ScatterPlot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to US Three Month Treasury Bill.....</i>	<i>7</i>

Appendix D	1
<i>D.1. Expected Return Model Constructed from a 1-Month Moving Average Timing Model-Style (Full Sample).....</i>	<i>1</i>
<i>D.2. Expected Return Model Constructed from a 3-Month Moving Average Timing Model-Style (Full Sample).....</i>	<i>2</i>
<i>D.3. Expected Return Model Constructed from a 6-Month Moving Average Timing Model-Style (Full Sample).....</i>	<i>3</i>
<i>D.4. Expected Return Model Constructed from a 12-Month Moving Average Timing Model-Style (Full Sample).....</i>	<i>4</i>
<i>D.5. Expected Return Model Constructed from a 18-Month Moving Average Timing Model-Style (Full Sample).....</i>	<i>5</i>
<i>D.6. Expected Return Model Constructed from a 1-Month Moving Average Timing Model-Style (Restricted Sample)</i>	<i>6</i>
<i>D.7. Expected Return Model Constructed from a 3-Month Moving Average Timing Model-Style (Restricted Sample)</i>	<i>7</i>
<i>D.8. Expected Return Model Constructed from a 6-Month Moving Average Timing Model-Style (Restricted Sample)</i>	<i>8</i>
<i>D.9. Expected Return Model Constructed from a 12-Month Moving Average Timing Model-Style (Restricted Sample)</i>	<i>9</i>
<i>D.10.Expected Return Model Constructed from a 18-Month Moving Average Timing Model-Style(Restricted Sample).....</i>	<i>10</i>
<i>D.11. Expected Return Model Constructed from a 1-Month Moving Average Timing Model-Macroeconomic Variables.....</i>	<i>11</i>
<i>D.12. Expected Return Model Constructed from a 3-Month Moving Average Timing Model-Macroeconomic Variables.....</i>	<i>12</i>
<i>D.13. Expected Return Model Constructed from a 6-Month Moving Average Timing Model-Macroeconomic Variables.....</i>	<i>13</i>
<i>D.14. Expected Return Model Constructed from a 12-Month Moving Average Timing Model-Macroeconomic Variables.....</i>	<i>14</i>
<i>D.15. Expected Return Model Constructed from a 18-Month Moving Average Timing Model-Macroeconomic Variables.....</i>	<i>15</i>
<i>D.16. Expected Return Model Constructed from a 1-Month Moving Average Timing Model-Style and Macroeconomic Variables.....</i>	<i>16</i>
<i>D.17. Expected Return Model Constructed from a 3-Month Moving Average Timing Model-Style and Macroeconomic Variables.....</i>	<i>17</i>
<i>D.18. Expected Return Model Constructed from a 6-Month Moving Average Timing Model-Style and Macroeconomic Variables.....</i>	<i>18</i>
<i>D.19. Expected Return Model Constructed from a 12-Month Moving Average Timing Model-Style and Macroeconomic Variables.....</i>	<i>20</i>
<i>D.20. Expected Return Model Constructed from a 18-Month Moving Average Timing Model-Style and Macroeconomic Variables.....</i>	<i>22</i>

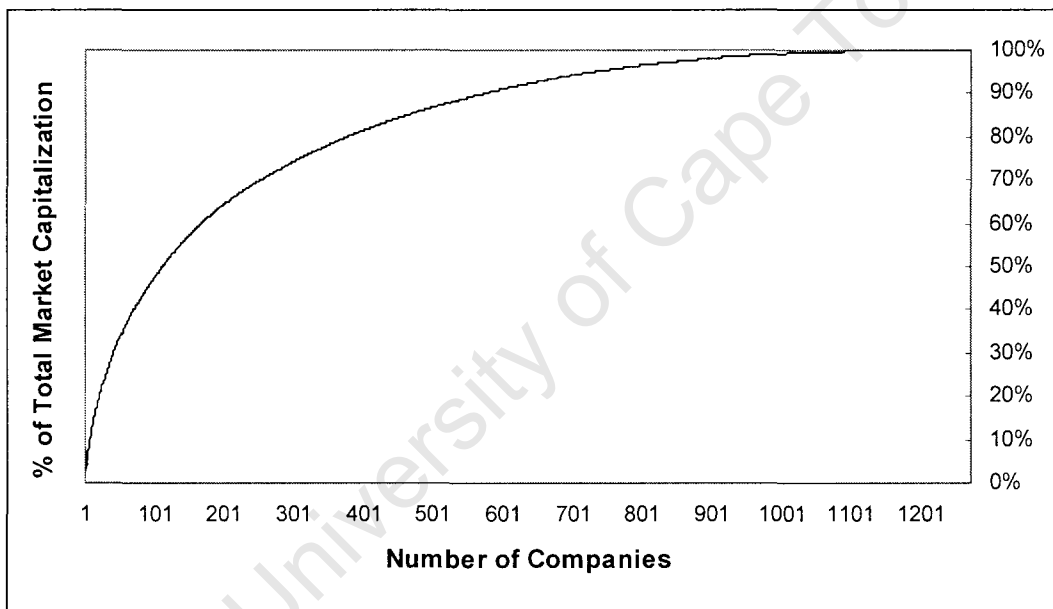
Appendix A

University of Cape Town

Appendix A.1

Cumulative Size of firms listed on the DataStream Emerging Markets Index as a Percentage of Total Market Capitalization on 31st of December 2006

The graph below shows the cumulative market capitalization of the constituents of the DataStream International Emerging Market Index included in the sample for this study. A total of seventeen firms of the chosen sample are excluded on account of insufficient data for the one month period analyzed. The total market capitalization of the firms comprising the altered index amounts to approximately US\$ 3299 billion.



Attribute Availability for the Last Month of Each Twelve-month Period from 1st of January 1997 to the 31st of December 2006

This table displays the number of observations for all associated stock returns data and firm specific attribute included in the sample period January 1997 to December 2006. The data pertains to the constituent shares of the DataStream Emerging Markets Index as at the 31 May 2006.

	Dec-97	Dec-98	Dec-99	Dec-00	Dec-01	Dec-02	Dec-03	Dec-04	Dec-05	Dec-06
eMOM_1 month	862	928	975	1028	1076	1110	1136	1172	1223	1266
eMOM_3 month	855	915	966	1020	1073	1107	1127	1164	1213	1259
eMOM_6 month	839	900	959	1005	890	1100	1120	1150	1201	1244
eMOM_12 month	812	870	932	978	1033	1076	1112	1138	1180	1226
eMOM_18 month	780	839	900	957	1005	1058	1100	1120	1150	1201
eMOM_24 month	753	812	932	930	978	1032	1076	1112	1138	1180
12-month diff in EPS/P	742	787	849	935	976	1013	1058	1080	1128	1170
24-month diff in EPS/P	695	740	789	849	935	975	1013	1058	1080	1128
6-month diff in EPS/P	768	830	911	955	998	1045	1070	1090	1152	1205
DY	848	902	957	1020	1060	1102	1132	1176	1223	1270
EPS	789	849	935	976	1014	1058	1080	1128	1170	1233
PTBV	692	766	844	924	966	1011	1039	1081	1120	1129
PC	688	764	841	921	965	1008	1040	1080	1119	1127
QAssRatio	527	581	628	707	766	786	816	854	865	862
Rcapmp	584	673	751	807	896	977	1003	1051	1094	1106
ROE	584	669	732	795	884	963	990	1039	1087	1103
Casheps	632	709	773	858	918	961	997	1037	1074	1097
TdTA	675	756	810	910	978	1013	1059	1104	1124	1120
InMV	870	932	980	1035	1079	1112	1138	1180	1226	1273
A_Turn	668	751	811	906	978	1011	1058	1103	1124	1119
VO	665	732	785	803	699	869	843	1007	1044	1118
MTBV	679	754	831	911	957	1004	1038	1075	1114	1133
ICBT	690	755	844	938	992	1032	1079	1115	1120	1127
Price(US)	870	932	980	1035	1079	1112	1138	1180	1226	1273
MVTrade(US)m	665	731	784	802	957	868	843	1006	1044	1117
BTMV	678	754	830	911	698	1002	1036	1075	1114	1133
MVtradeMV	665	731	784	802	1079	868	843	1006	1044	1117
PE	678	657	740	784	800	843	899	991	1062	1273
EY	678	657	740	784	800	843	899	991	1062	1118
MTTMV-1	518	670	710	717	637	782	795	944	920	1118
MTTMV-3	561	570	637	654	544	768	778	837	891	1070
MTTMV-6	591	588	621	698	632	796	778	845	956	959
MTTMV-12	495	561	667	704	604	634	752	814	954	866
VO-1	518	671	711	718	638	783	795	945	920	1011
VO-3	561	571	638	655	545	769	778	837	891	1070
VO-6	591	589	622	699	633	797	778	846	957	960
VO-12	557	561	668	705	605	635	752	814	955	867
NS	870	932	980	1035	1079	1112	1138	1180	1226	1011
Return	842	901	953	1016	1059	1100	1130	1168	1220	1264
CtTD	634	714	759	842	898	948	990	1032	1046	1057
SalestP	619	703	770	851	915	955	995	1028	1067	1090</

Appendix A.3

Complete list of Firm-specific Attributes

The table below shows the complete list of 50 firm-specific attributes to be tested and their respective codenames used in this thesis. The data were extracted from DataStream International.

CODE USED	STYLE CHARACTERISTIC
A_Turn	Asset Turnover
BTMV	Book to Market Value
CFtP	Cashflow to Price
CFtTD	Cashflow to Total Debt
DY	Dividend Yield
DtMVE	Total Debt to Market Value of Equity
Divtp6m	6 month difference in Dividend to Price
Divtp12m	12 month difference in Dividend to Price
Divtp24m	24 month difference in Dividend to Price
EPS	Earnings per Share
12_EPS	12 month difference in EPS
24_EPS	24 month difference in EPS
6_EPS	6 month difference in EPS
EY	Earnings Yield
ICBT	Interest Cover Before Tax
LnMV	Ln of Market Value
LnP	Ln of Price
MOM_12M	12-month Momentum in Returns
MOM_18M	18-month Momentum in Returns
MOM_1M	1-month Momentum in Returns

MOM_24M	24-month Momentum in Returns
MOM_3M	3-month Momentum in Returns
MOM_6M	6-month Momentum in Returns
MTBV	Market Value to Book Value
MVTrade	Market Value Traded
MVTradeMV	Market Value Traded to Market Value
MVTMV_1	1-month growth in Market Value Traded to Market Value
MVTMV_3	3-month growth in Market Value Traded to Market Value
MVTMV_6	6-month growth in Market Value Traded to Market Value
MVTMV_12	12-month growth in Market Value Traded to Market Value
NS	Number of Shares in Issue
P	Price
Payout	Payout Ratio
PC	Price to Cash
PE	Price Earnings Ratio
Quick	Quick Assets Ratio
ROCE	Return on Capital Employed
ROE	Return on Equity (published)
SalestP	Sales-to-Price ratio
TDtTA	Total Debt to Total Assets
TLtTA	Total Loan Capital to Total Assets
TV	Trading Volume Ratio
VO	Absolute Trading Volume
VO_1	1-month growth in Trading Volume
VO_3	3-month growth in Trading Volume
VO_6	6-month growth in Trading Volume
VO_12	12-month growth in Trading Volume

Appendix A.4

Grouping of Firm Specific Attributes

The table below shows the corresponding groups into which all the listed firm specific attributes from Table 4.1(a) have been sorted. Each group models a certain behavioural aspect regarding the nature and overall description of the firm.

STYLE GROUP	CODE USED	STYLE CHARACTERISTIC
<i>MOMENTUM</i>	MOM_12M	12-month Momentum in Returns
	MOM_18M	18-month Momentum in Returns
	MOM_1M	1-month Momentum in Returns
	MOM_24M	24-month Momentum in Returns
	MOM_3M	3-month Momentum in Returns
	MOM_6M	6-month Momentum in Returns
<i>LIQUIDITY</i>	MVTMV_1	1-month growth in Market Value Traded to Market Value
	MVTMV_3	3-month growth in Market Value Traded to Market Value
	MVTMV_6	6-month growth in Market Value Traded to Market Value
	MVTMV_12	12-month growth in Market Value Traded to Market Value
	VO_1	1-month growth in Trading Volume
	VO_3	3-month growth in Trading Volume
	VO_6	6-month growth in Trading Volume
	VO_12	12-month growth in Trading Volume
	TV	Trading Volume Ratio
<i>SIZE</i>	LnMV	Ln of Market Value
	ICBT	Interest Cover Before Tax
	MVTrade	Market Value Traded
	MVTradeMV	Market Value Traded to Market Value
	VO	Absolute Trading Volume
	NS	Number of Shares in Issue

VALUE	BTMV	Book to Market Value
	CFtP	Cashflow to Price
	CFtTD	Cashflow to Total Debt
	DY	Dividend Yield
	DtMVE	Total Debt to Market Value of Equity
	EPS	Earnings per Share
	EY	Earnings Yield
	PC	Price to Cash
	P	Price
	Payout	Payout Ratio
	PE	Price Earnings Ratio
	Quick	Quick Assets Ratio
	SalestP	Sales-to-Price ratio
	TDtTA	Total Debt to Total Assets
	TLtTA	Total Loan Capital to Total Assets
GROWTH	12_EPS	12 month difference in EPS
	24_EPS	24 month difference in EPS
	6_EPS	6 month difference in EPS
	ROCE	Return on Capital Employed
	Divtp6m	6 month difference in Dividend to Price
	Divtp12m	12 month difference in Dividend to Price
	Divtp24m	24 month difference in Dividend to Price
	ROE	Return on Equity (published)
	A_Turn	Asset Turnover

Appendix A.5

Construction and Classification of Return and Firm Specific Measures

The table below represents the full list of 50 firm specific attributes and the respective manner in which each of the measures was constructed if not satisfactorily quoted by the DataStream International Database.

Code	Name of Measure	Formula
A_Turn	Asset Turnover	$[\text{Total Sales} / \text{Total Assets}]$
BTMV	Book to Market Value	$1 / [\text{Market to Book Value}]$
CFtP	Cashflow to Price	$[\text{Cashflow} : \text{Price}]$
CFtTD	Cashflow to Total Debt	$[\text{Cashflow} : \text{Total Debt}]$
DY	Dividend Yield	$[\text{Dividend Yield}]$
DtMVE	Total Debt to Market Value of Equity	$[\text{Total Debt} / \text{Market Value of Equity}]$
Divtp6m	6 month difference in Dividend to Price	$[\text{Div}(t) - \text{Div}(t-6)] / \text{PI}(t)$
Divtp12m	12 month difference in Dividend to Price	$[\text{Div}(t) - \text{Div}(t-12)] / \text{PI}(t)$
Divtp24m	24 month difference in Dividend to Price	$[\text{Div}(t) - \text{Div}(t-24)] / \text{P}(t)$
EPS	Earnings per Share	$[\text{Earnings per Share}]$
12_EPS	12 month difference in EPS	$[\text{E}(t) - \text{E}(t-12)] / \text{PI}(t)$

24_EPS	24 month difference in EPS	$[E(t)-E(t-24)] / PI(t)$
6_EPS	6 month difference in EPS	$[E(t)-E(t-6)] / P(t)$
EY	Earnings Yield	$1 / PE$
ICBT	Interest Cover Before Tax	[Interest Cover Before Tax]
LnMV	Ln of Market Value	$LN[MV]$
LnP	Ln of Price	$LN[P]$
MOM_12M	12-month Momentum in Returns	$[RI(t)-RI(t-12)] / RI(t-12)$
MOM_18M	18-month Momentum in Returns	$[RI(t)-RI(t-18)] / RI(t-18)$
MOM_1M	1-month Momentum in Returns	$[RI(t)-RI(t-1)] / RI(t-1)$
MOM_24M	24-month Momentum in Returns	$[RI(t)-RI(t-24)] / RI(t-24)$
MOM_3M	3-month Momentum in Returns	$[RI(t)-RI(t-3)] / RI(t-3)$
MOM_6M	6-month Momentum in Returns	$[RI(t)-RI(t-6)] / RI(t-6)$
MTBV	Market Value to Book Value	[Market to Book Value]
MVTrade	Market Value Traded	$[VO*P]$

MVTradeMV	Market Value Traded to Market Value	$[VO*P]/[MV*1000]$
MVTMV_1	1-month growth in Market Value Traded to Market Value	$[MVTMV(t)-MVTMV(t-1)] / MVTMV(t-1)$
MVTMV_3	3-month growth in Market Value Traded to Market Value	$[MVTMV(t)-MVTMV(t-3)] / MVTMV(t-3)$
MVTMV_6	6-month growth in Market Value Traded to Market Value	$[MVTMV(t)-MVTMV(t-6)] / MVTMV(t-6)$
MVTMV_12	12-month growth in Market Value Traded to Market Value	$[MVTMV(t)-MVTMV(t-12)] / MVTMV(t-12)$
NS	Number of Shares in Issue	[Number of Ordinary Shares in Issue]
P	Price	[Price]
Payout	Payout Ratio	[Dividend paid/Price]
PC	Price to Cash	[Price/Cash]
PE	Price Earnings Ratio	[Price per Share/Earnings per Share]
Quick	Quick Assets Ratio	[Quick Assets Ratio]
ROCE	Return on Capital Employed	[Return on Capital Employed]
ROE	Return on Equity	[Return on Equity]

SalestP	Sales-to-Price ratio	[Sales per Share/Price per Share]
TDtTA	Total Debt to Total Assets	[Total Debt]/[Total Assets]
TLtTA	Total Loan Capital to Total Assets	[Total Loan Capital]/[Total Assets]
TV	Trading Volume Ratio	$[(\text{Turnover by Volume})_t / (\text{Number of Shares})_{t-1}]$
VO	Absolute Trading Volume	[Turnover by Volume]
VO_1	1-month growth in Trading Volume	$[VO(t) - VO(t-1)] / VO(t-1)$
VO_3	3-month growth in Trading Volume	$[VO(t) - VO(t-3)] / VO(t-3)$
VO_6	6-month growth in Trading Volume	$[VO(t) - VO(t-6)] / VO(t-6)$
VO_12	12-month growth in Trading Volume	$[VO(t) - VO(t-12)] / VO(t-12)$

Appendix A.6

List of Countries comprising the DataStream International Emerging Markets Index

Below is a complete list of all countries comprising the DataStream International Emerging Markets Index. Their relative contribution to the overall market capitalization of the index is provided with the number of listed stocks selected for inclusion as at the 31 December 2006 available on the 31 May 2007. A number of countries were excluded from the index on account of insufficient information and/or significant trade restrictions that prevent free and frequent trade by foreigners. The countries to be excluded are China, Cyprus, Romania, Russia and Turkey.

Name of Country	Proportion of Market Capitalization	Number of Stocks listed on index as at 31 December 2006
Argentina	0.71%	50
Brazil	14.36%	99
Colombia	1.01%	50
China	-	50
Chile	3.53%	50
Cyprus	-	50
Sri Lanka	0.16%	50
Czech Republic	1.25%	29
Hungary	0.94%	42
Indonesia	2.87%	101
India	15.16%	50
Israel	2.80%	50
Korea	16.65%	100
Mexico	7.42%	88
Malaysia	4.49%	90
Peru	0.84%	49
Philippines	1.41%	50
Pakistan	1.01%	50
Poland	3.21%	50
Romania	-	50

Russia	-	50
South Africa	7.93%	70
Taiwan	10.94%	70
Thailand	3.00%	50
Turkey	-	50
Venezuela	0.29%	50

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Appendix A.7

List of Sample Constituents

The table below list all the constituents of the DataStream International Emerging Markets Index. The full, unadjusted sample includes a total of 1290 companies from 26 companies. All data were sourced from DataStream International.

ARGENTINA	BRAZIL	
ACINDAR 'B'	AES TIETE ON 1000	LOCALIZA ON
AGROMETAL 'B'	AES TIETE PN 1000	LOJAS AMERIC ON 1000
ALPARGATAS	ALL AMER LAT ON	LOJAS AMERIC PN 1000
ALTO PALERMO 'B'	ALL AMER LAT PN	LOJAS RENNER ON
ALUAR 'B'	AMBEV ON 1000	M DIASBRANCO ON
AUTOPISTAS DEL SOL	AMBEV PN 1000	METALURGICA GERDAU PN
BANCO GALICIA 'B'	AMPRA ENERG ON 1000	MMX MINER ON
BANCO MACRO 'B'	ARACRUZ ON	NATURA ON
BANCO RIO 'B'	ARACRUZ PNB	NET PN
BBVA BANCO FRANCES 'B'	ARCELOR BRASIL ON	NOSSA CAIXA ON
BOLDT 'B'	BANCO BRASIL ON	PARMALAT ON
CAMUZZI GAS PAMPEANA 'B'	BANCO ITAU.HLDG.FINCA.ON	PARMALAT PN
CAPEX 'A'	BANCO ITAU.HLDG.FINCA.PN	PERDIGAO ON
CAPUTO 'B'	BRADESCO ON	PETROBRAS ON
CARBOCLOR 'B'	BRADESCO PN	PETROBRAS PN
CARLOS CASADO 'B'	BRADESPAR ON	PORTO SEGURO ON
CELULOSA 'B'	BRADESPAR PN	SABESP ON 1000
CENTRAL PUERTO 'B'	BRASCAN RES ON	SADIA PN
COMERCIAL DEL PLATA 'B'	BRASIL TELCOM PARTP.ON 1000	SIDER.NACIONAL ON
CRESUD 'B'	BRASIL TELCOM PARTP.PN 1000	SOUZA CRUZ ON
DISB.DE GAS CUYANA 'B'	BRASIL TELECOM ON 1000	SUBMARINO ON
DYCASA 'B'	BRASIL TELECOM PN 1000	SUL AM.NAC.SEG.ON
ENDESA COSTANERA 'B'	BRASKEM PNA	SUZANO PAPEL PNA
FERRUM 'B'	CCR RODOVIAS ON	TAM ON
GAS NATURAL 'B'	CEMIG ON 1000	TAM PN
GPO.CONCIO.DEL OESTE 'B'	CEMIG PN 1000	TELE NRLES.PARTP.ON
GRUPO FINCO.GALICIA 'B'	CESP PNB 1000	TELE NRLES.PARTP.PN
HIPOTECARIO 'D'	COMGAS ON 1000	TELEMAR NRLES.ON
IMPORT&EXPORT PATAG 'B'	CMPH.BRASL.DISTB.ON 1000	TELEMAR NRLES.PNA
INDUPA 'B'	CMPH.BRASL.DISTB.PN 1000	TELESP ON
IRSA 'B'	COPASA ON	TELESP PN
LEDESMA 'B'	COPEL ON 1000	TIM PART ON 1000
MASSUH 'B'	COPEL PNB 1000	TIM PART PN 1000
METROGAS 'B'	COPESUL ON	TRACTEBEL ON
MINETTI(J) 'B'	COSAN ON	UNIBANCO HOLDING ON
MIRGOR 'C'	CPFL ENERGIA ON	UNIBANCO ON
MOLINOS RIO PLATA 'B'	CYRELA REALT ON	UNIBANCO PN
PAMPA HOLDING	ELEKTRO ON 1000	USIMINAS ON
PETROBRAS ENGA.PRTPN.'B'	ELETROBRAS ON 1000	USIMINAS PNA
QUES 'B'	ELETROBRAS PNB 1000	VALE DO RIO DOCE ON
QUICKFOOD 'B'	EMBRAER ON	VALE DO RIO DOCE PNA

RIGOLLEAU 'B'	EMBRATEL PAR ON 1000	VCP PN
SAN LORENZO 'B'	EMBRATEL PAR PN 1000	VIVO ON
SAN MIGUEL 'B'	ENERGIAS BR ON	VIVO PN
SIDERAR 'A'	GERDAU ON	WEG ON
SOCOTHERM	GERDAU PN	WEG PN
TELECOM ARGN.'B'	GOL PN	
TELEFONICA DE ARGN.'B'	GUARARAPES ON	
TRANSENER 'B'	GUARARAPES PN	
TSPA.GAS DEL SUR 'B'	ITAUSA ON	
	ITAUSA PN	
	KLABIN NEW PN	
	LIGHT ON 1000	

COLOMBIA	CHINA	CHILE
AIRES	AIR CHINA 'H'	AES GENER
BBVACOL	ALUMINUM CORP.OF CHINA 'H'	AGUAS 'A'
BCOLOMBIA	ANGANG STEEL 'H'	ALMENDRAL
BOGOTA	ANHUI CONCH CEMENT 'H'	ANDINA 'A'
CARBOCAR	BANK OF CHINA 'H'	ANDINA 'B'
CARTON	BANK OF COMMS.'H'	ANTARCHILE
CARULLA	BEIJING CAP.INTL.ARPT. 'H'	BANMEDICA
CEMARGOS	BYD 'H'	BBVACL
CHOCOLATES	CHINA BLUE CHEMICAL 'H'	BCI
CINECO	CHINA COAL ENERGY 'H'	BICECORP
CLICOLSANI	CHINA COMMS.CON.'H'	BSANTANDER
COLINVERS	CHINA CON.BANK 'H'	CAP
COLSANITAS	CHINA COSCO HDG.'H'	CAPITALES
COLTEJER	CHINA INTL.MARINE 'B'	CCT
COMPUDEC	CHINA LIFE INSURANCE 'H'	CEMENTOS
CORFICOLCF	CHINA MERCHANTS BANK 'H'	CENCOSUD
EDATEL	CHINA MERCHANTS PR.DEV. 'B'	CERVEZAS
ETB	CHINA OILFIELD SVS. 'H'	CGE
EVERFIT	CHINA SHENHUA EN.CO.'H'	CGEDISTRO
EXITO	CHINA SHIP.CTNR.LINES 'H'	CHILE
FABRICATO	CHINA SHIPPING DEV. 'H'	CMPC
GASNATURAL	CHINA TELECOM 'H'	COLBUN
GRUPOAVAL	CHINA VANKE 'B'	CONCHATORO
IMUSA	DATANG INTL.PWR.GNRTN. 'H'	COPEC
INCASTILLA	DONGFENG MOTOR GP.CO.'H'	CORPBANCA
INTERBOLSA	GUANGSHEN RAILWAY 'H'	CRISTALES
INVERARGOS	GUANGZHOU R&F PROPS.'H'	CTC 'A'
ISA	HARBIN POWER EQUIT. 'H'	D & S
MARLY	HUANENG POWER INTL. 'H'	ENDESA
MINEROS	HUNAN NONFR.METALS 'H'	ENERSIS
OCCIDENTE	INDL.& COML.BK.OF CHINA 'H'	ENTEL
ODINSA	JIANGSU EXPRESSWAY 'H'	FALABELLA
PAZRIO	JIANGXI COPPER 'H'	GASCO
PFBBVACOL	MAANSHAN IRON & STL.'H'	IAM

PFBCELOM	PETROCHINA 'H'	INVERCAP
PFCORFICOL	PICC PROPERTY & CLTY.'H'	LA POLAR
PFVILLAS	PING AN INSURANCE 'H'	LAN
POPULAR	SHANGHAI ELEC.GP.CO.'H'	MASISA
PROMIGAS	SHANGHAI JIN JIANG INTL. HTLS.'H'	MINERA
SANTANDER	SHAI.ZHENHUA PORT MCH. 'B'	MOLYMET
SDCORFICOL	SINOPEC 'H'	PASUR
SDPFCORFIC	SINOPEC SHAI.PETROCHEM. 'H'	PEHUENCHE
SETAS	SINOTRANS 'H'	QUINENCO
SURAMINV	THE CHINA COMMS.SVS.'H'	RIPLEY
TABLEMAC	TSINGTAO BREWERY 'H'	SANTANGRUP
TERPELSUR	YANTAI CHANGYU PION.WINE 'B'	SM-CHILE 'B'
TRASMETANO	YANZHOU COAL MINING 'H'	SONDA
VALOREM	ZHEJIANG EXPRESSWAY 'H'	SQM 'A'
VALSIMESA	ZIJIN MINING GROUP 'H'	SQM 'B'
VILLAS	ZTE 'H'	VAPORES

CYPRUS	SRI LANKA	CZECH REP.
A & P ENTERPRISES	ACL CABLES	CENTRAL EUR.MEDIA (PRA)
A TSOKKOS HOTELS	AITKEN SPENCE	CESKA ZBROJOVKA
A ZORPAS & SONS	AITKEN SPENCE HTL.	CEZ
ALLIANCE INTL.REIN.	AMANA TAKAFUL	CS NAMORNI PLAVBA
APOLLO INVESTMENT FUND PUBLIC	ASIAN HOTELS AND PROPS.	ECM REAL ESTATE
AQUA SOL HOTELS	ASIRI	JC PAPIRNY VETRNI
ARISTO DEVELOPERS	ASSOCIATED MOTORWAYS	JC PLYNARENSKA
ASPI HDG.PUB.CO.LTD.	CALTEX LUBRICANTS	JM PLYNARENSKA
ATHINA CYPRUS INV.	CAPITAL DEV.INV.	K-T-V INVEST
ATLANTIC INSURANCES	CARGILLS	KOMERCNI BANKA
BANK OF CYPRUS	CARSONS CUMBERBATCH	LAZNE TEPLICE
BLUE ISLAND	CENTRAL FINANCE	PARAMO
CAC PAPANTONIOU	CEYLON COLD STORES	PEGAS NONWOVENS
CHRISTIS DAIRIES	CEYLON TEA	PHILIP MORRIS
CLR CAPITAL	CEYLON THEATRE	PRAZSKA ENERGETIKA
CLR INV.FUND	CEYLON TOBACCO	PRAZSKE SLUZBY
CONSTANTINOUS BROS HTLS. PUBLIC	COLOMBO DOCKYARD	RM S HOLDING
CYPRUS AIRWAYS	COMMERCIAL BK.OF CEYLON	SC PLYNARENSKA
CYPRUS CEMENT	CTC EAGLE INSURANCE	SETUZA
CYPRUS TRADING CORP.	DFCC BANK	SLEZAN FRYDEK-MIS
CYTRUSTEES INVESTMENTS	DIALOG TELEKOM	SM PLYNARENSKA
DEMETRA INVS.	DIPPED PRODUCTS	SPOLANA
DIMCO	DISTILLERIES	SPOLEK CHUO HAUTE VYR
DODONI PRTF.INVS.PCL.	HATTON NATIONAL BK.	SSZ
DOVE INVESTMENTS	HAYLEYS	TELEFONICA O2 CR
ELMA HOLDINGS PCL.	HAYLEYS MGT KNITTING	TOMA
FROU FROU BISCUITS	HOTEL DEVELOPERS	UNIPETROL
HELLENIC BANK	HOTEL SERVICES	ZC PLYNARENSKA
INTERFUND INVESTMENT	JAMES FINLAY	ZENTIVA
KEO	JOHN KEELLS HOLDINGS	
LAIKI INVESTMENTS	LANKA IOC	

LANITIS DEVELOPMENT PUBLIC	LANKA ORIX LEASING	
LEPTOS CALYPSO HTLS.	MILLERS	
LOGICOM	NATIONAL DEV.BANK	
LOUIS	NATIONS TRUST BANK	
MALLOUPAS & PAPAS PCL.	NESTLE LANKA	
MARFIN POPULAR BANK	PELWATTE SUGAR INDS.	
MINERVA INSURANCE CO.	PROPERTY DEV.	
MUSCITA ALUMINIUM INDS.	RICHARD PIERIS	
OPTIONS CASSOULIDES	SAMPATH BANK	
ORFANIDES PUBLIC COMPANY	SEYLAN BANK	
PANDORA INVS.	SHALIMAR ESTATES	
PETROLINA HOLDINGS	SINGER SRI LANKA	
SFS GROUP	SRI LANKA TELECOM	
SUPHIRE HOLDINGS PUBLIC	THE LANKA HOSPITAL	
UNIVERSAL BANK	THE LION BREWERY CEYLON	
VASSILIKO CEMENT	TOKYO CEMENT	
VISION INTL.PEOPLE GROUP	TOUCHWOOD INVESTMENTS	
WHITE KNIGHT HOLDINGS	TRANS ASIA HOTEL	
WOOLWORTH(CYPRUS) PROPS.	UNITED MOTORS	
HUNGARY	INDIA	
AGRIMPEX 'N'	ABB (INDIA)	LANCO INFRATECH
ALLAMI NYOMDA	ACC	LARSEN & TOUBRO
BIF	ADITYA BIRLA NUVO	MAHANAGAR TEL.NIGAM
BOOKLINE	ASHOK LEYLAND	MAHINDRA & MAHINDRA
BORSODCHEM	ASIAN PAINTS	MNGL.REF.& PETROCHEM.
CSEPEL HOLDING	BAJAJ AUTO	MARUTI UDYOG
DANUBIUS HOTEL & SPA	BANK OF BARODA	MOTOR INDUSTRIES
ECONET HU	BANK OF INDIA	NATIONAL ALUMINIUM
EGIS	BF UTILITIES	NESTLE INDIA
ELMU	BHARAT ELECTRONICS	NEYVELL LIGNITE
EMASZ	BHARAT FORGE	NICHOLAS PIRAMAL INDIA
EXBUS	BHARAT HEAVY ELS.	NTPC
FHB	BHARAT PETROLEUM	OIL & NATURAL GAS
FIRST HUNG.EN.PRTF.	BHARTI AIRTEL	ORIENTAL BK.OF COMMERCE
FORRAS FORRAS/OE	CAIRN INDIA	PANTALOO RET.(INDIA)
FORRAS FORRAS/T	CANARA BANK	PARSVNATH DEVELOPERS
FOTEX	CENTURY TEXTILE & INDS.	PATNI COMPUTER SYSTEMS
FREESOFT	CIPLA	PUNJAB NATIONAL BANK
GARDENIA	CONTAINER CORP.OF INDIA	RANBAXY LABS.
GRAPHISOFT	CROMPTON GREAVES	RELIANCE CAPITAL
GRAPHISOFT PARK	DABUR INDIA	RELIANCE COMMUNICATIONS
HUMET	DR.REDDY'S LABORATORIES	RELIANCE ENERGY
INTER-EUROPA BANK	ESSAR OIL	RELIANCE INDUSTRIES
KARTONPACK	FINANCIAL TECH.(INDIA)	RELIANCE PETROLEUM
KONZUM	GAIL (INDIA)	SATYAM COMPUTER SERVICES
LINAMAR HUNGARY	GLAXOSMITHKLINE PHARMS.	SESA GOA
MAGYAR TKOM.TELECOM.PLC	GLENMARK PHARMACEUTICALS	SIEMENS
MOL MAGYAR OLAJ-ES GAZIPARI	GMR INFRASTRUCTURE	STATE BANK OF INDIA
GENESIS	GRASIM INDUSTRIES	STEEL AUTHORITY OF INDIA
OTP BANK	GUJARAT AMBUJA CEMENTS	STERLITE INDS.(INDIA)

PANNON VALTO	HCL TECHNOLOGIES	SUN PHARMACEUTICALS
PANNONFLAX	HDFC BANK	SUN TV
PANNONPLAST	HERO HONDA MOTORS	SUZLON ENERGY
PHYLAXIA PHARMA	HINDALCO INDUSTRIES	TATA CONSULTANCY SVS.
QUESTOR	HINDUSTAN COPPER	TATA MOTORS
RABA	HINDUSTAN LEVER	TATA POWER
RICHTER GEDEON	HINDUSTAN PETROLEUM	TATA STEEL
SYNERGON	HINDUSTAN ZINC	TECH MAHINDRA
SZEKESFEHERVARI HUTOIPAR FEVITAN	HOUSING DEVELOPMENT FIN.	ULTRATECH CEMENT
TISZAI VEGYI KOM	I-FLEX SOLUTIONS	UNION BANK OF INDIA
TVNETWORK	ICICI BANK	UNITECH
ZWACK UNICUM	INDIABULLS FINL.SVS.	UNITED PHOSPHORUS
	INDIAN HOTELS	UNITED SPIRITS
	INDIAN OIL	UTI BANK
	INDIAN OVERSEAS BANK	VIDEOCON INDUSTRIES
	INDIAN PETROCHEM.	VIDESH SANCHAR NIGAM
	INFOSYS TECHNOLOGIES	WIPRO
	INFR.DEV.FINANCE CO.	ZEE ENTERTAINMENT ENTS.
	ITC	
	JAIPRAKASH ASSOCIATES	
	JINDAL STEEL & POWER	
	JSW STEEL	
	KOTAK MAHINDRA BANK	
INDONESIA	ISRAEL	KOREA
ANEKA TAMBANG CDI.	AFRICA	AMOREPACIFIC
APEXINDO PRATAMA DUTA	AFRICA ISRAEL PROPERTIES	ASIANA AIRLINE
ASTRA AGRO LESTARI	ALONY HETZ PR.& INVS.	CHEIL INDUSTRIES
ASTRA INTERNATIONAL	AZORIM	CJ
BAKRIE & BROTHERS	BEZEQ	DAEGU BANK
BAKRIE TELECOM	BIOCANCELL THERAPEUTICS	DAELIM INDUSTRIAL
BANK CENTRAL ASIA	BLUE SQUARE ISR	DAEWOO ENGR.& CON.
BANK DANAMON INDONESIA	CLAL INDUSTRIES	DAEWOO INTERNATIONAL
BANK INTL.INDONESIA BII	CLAL INSURANCE ENTS.HDG.	DAEWOO SECURITIES
BANK MANDIRI	DELEK AUTOMOTIVE SYSTEMS	DAEWOO SHIPBLDG.MAR. ENGR.
BANK NEGARA INDONESIA	DELEK GROUP	DAISHIN SECURITIES
BANK NIAGA	DELEK REAL ESTATE	DONGBU INSURANCE
BANK NISP	DISCOUNT BK.	DONGKUK STEEL MILL
BANK PAN INDONESIA	DISCOUNT INVESTMENTS	DOOSAN
BANK PERMATA	ELBIT IMAGING	DOOSAN HVY.INDS.AND CON.
BANK RAKYAT INDONESIA	ELBIT SYSTEMS	DOOSAN INFRACORE
BANK UOB BUANA	ELECTRA 1	GS ENGR. & CON.
BERLIAN LAJU TANKER	FIBI 1	GS HOLDINGS
BIMANTARA CITRA	FRUTAROM	HALLA CLIMATE CONTROL
BUMI RESOURCES	G T C	HANA FINANCIAL GROUP
CIPUTRA DEVELOPMENT	GAZIT	HANAROTELECOM
ENERGI MEGA PERSADA	GAZIT GLOBE	HANJIN HEAVY INDUSTRIES
EXCELCOMINDO PRATAMA	HAREL INSURANCE INVS.	HANJIN SHIPPING
GUDANG GARAM	HOUSING & CONSTRUCTION	HANKOOK TIRE

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NONG SHIM	CMOCTEZ	RCENTRO 'A'
ORION	COCA-COLA FEMSA 'L'	SAB
PACIFIC	COMERCI 'UBC'	SANMEX 'B'
POSCO	CONTAL	SARE 'B'
PUSAN BANK	DESC 'A'	SIMEC 'B'
S-OIL	DESC 'B'	SORIANA 'B'
SAMSUNG	ELEKTRA	TELECOM 'A1'
SAMSUNG ELTO.MECH.	FEMSA 'UB'	TELMEX 'A'
SAMSUNG ELECTRONICS	FEMSA 'UBD'	TELMEX 'L'
SAMSUNG ELTN.PF.	FRAGUA 'B'	TLEVISA 'CPO'
SAMSUNG ENGINEERING	GAP 'B'	TVAZTCA 'CPO'
SAMSUNG FIRE & MAR.IN.	GBM 'O'	URBI
SAMSUNG HEAVY INDS.	GCARSO 'A1'	VALLE 'B'
SAMSUNG SDI	GCC	VITRO 'A'
SAMSUNG SECURITIES	GEO 'B'	VZT
SAMSUNG TECHWIN	GEUPEC 'B'	WALMEX 'V'
SEOUL BROADCASTING SY.	GFAMSA 'A'	
SHINHAN FINL.GROUP	GFINBUR 'O'	
SHINSEGAE	GFNORTE 'O'	
SK	GIGANTE	
SK NETWORKS	GISSA	
SK TELECOM	GMARTI	
S1	GMD 'B'	
TONG YANG INVESTMENT BK.	GMEXICO 'B'	
WOONGJIN COWAY	GMODELO 'C'	
WOORI FINANCE HOLDINGS	GMODERN	
WOORI INV. SECS.	GNP	
YUHAN	GPH 1	
	GPROFUT	
	GRUMA 'B'	
	HERDEZ	
	HOMEX	
	ICA	
	ICH 'B'	
MALAYSIA		PERU
AFFIN HOLDINGS	MMC	ACEROS CAP
AIR ASIA	MULPHA INTERNATIONAL	ALICORP CAP
AMCORPGROUP	NESTLE (MALAYSIA)	ATACocha CAP
AMINVESTMENT GROUP	ORIENTAL HOLDINGS	ATACocha INVERSION
AMMB HOLDINGS	PETRONAS DAGANGAN	BACKUS 'A'
ASIATIC DEVELOPMENT	PETRONAS GAS	BACKUS 'B'
ASTRO ALL ASIA NETWORKS	PLUS EXPRESSWAYS	BACKUS INVERSION
BATU KAWAN	POS MAL.&SVS.HDG.	BANCO INTERBANC CAP
BERJAYA SPORTS TOTO	PPB GROUP	BUENAVENTURA CAP
BINTULU PORT HOLDINGS	PPB OIL PALMS	CASAGR CAP
BRITISH AMER.TOB.(M)	PROTON HOLDINGS	CEMENTOS LIMA CAP
BUMIPUTRA-COMMERCE HLDG.	PUBLIC BANK	CEMENTOS LIMA INVN
BURSA MALAYSIA	PUNCAK NIAGA HOLDINGS	CEMENT.PCMY.CAP
CARLSBERG BREWERY MAL.	RESORTS WORLD	CEPER B CAP

DIGI.COM	RHB CAP.	CERVESUR CAP
DRB-HICOM	ROAD BUILDER HDG.	COCESUR CAP
EON CAPITAL	SARAWAK ENTER.	CIA.MNA.CERRO CORRIDOR
FRASER & NEAVE HLDG.	SHELL REFINING	CREDITO CAP
GAMUDA	SIME DARBY	EDEGEL
GENTING	SIME UEP PROPERTIES	EDELNOR CAP
GOLDEN HOPE PLTN.	SP SETIA	EL BROCAL CAP
GREEN PACKET	STAR PUBLICATION (MAL.)	ENERSUC1
GUINNESS ANCHOR	TA ANN HOLDINGS	FERREYROS CAP
HIGHLANDS & LOWLANDS	TELEKOM MALAYSIA	GESTIONES RECPS.DE ATVS.
HONG LEONG BANK	TENAGA NASIONAL	GRANA Y MONTERO
HONG LEONG FINL.GP.	TIME DOTCOM	HORIZONTE CAP
IGB	TITAN CHEMICALS	IEQSA
IJM	TOP GLOVE	INPACBC1
INDUSTRIAL CONC.PRDS.	TRANSMILE GROUP	INTEGRA 'C' CAP
IOI	UEM BUILDERS	LUZ DEL SUR CAP
IOI PROPERTIES	UEM WORLD	MAPFRE PERU VIDA CAP
KFC HOLDINGS (MALAYSIA)	UMW HOLDINGS	MILPO CAP
KLCC PROPERTY HOLDINGS	UNITED PLANTATIONS	MINERA CORONA CAP
KNM GROUP	YTL	MINSUR INVERSION
KUALA LUMPUR KEPONG	YTL CEMENT	PERUANO SUIZA CAP
KULIM MALAYSIA	YTL POWER	PODERC1
KUMPULAN GUTHRIE	ZELAN BERHAD	PROFUTURO CAP
KURNIA ASIA		RELAPAC1
LAFARGE MALAYAN CEMENT		SAN JUAN CAP
LINGKARAN TRANS KOTA		SCOTIABANK PERU
LION DIVERSIFIED HDG.		SCOTIABANK PERU PF.
MAGNUM		SIDERC1
MALAKOFF		SOLUCION
MALAYAN BANKING		STHN.PERU COPPER INV.1
MALAYSIA AIRPORTS HDG.		TELEFONICA DEL PERU 'B'
MALAYSIAN AIRLINE SY.		TMOVILC1
MALAYSIAN BULK CARRIERS		VOLCAN 'A'
MALAYSIAN OXYGEN		VOLCAN 'B'
MALAYSIAN PACIFIC INDS.		VOLCAN INVERSION
MALAYSIAN PLANTATIONS		
MAXIS COMMUNICATION		
MEDIA PRIMA		
MISC BHD.		
PHILIPPINE	PAKISTAN	POLAND
ABOITIZ EQUITY VENT.	ABBOTT LABS.(PAK.)	AGORA
ABS-CBN BCAST.	ADAMJEE INSURANCE	ASSECO POLAND
ALLIANCE GLOBAL GP. SUSP - SUSP.19/02/07	ALLIED BANK	BANK BPH
ASIAN TERMINALS	ARIF HABIB SECURITIES	BANK MILLENNIUM
AYALA	ASKARI COMMERCIAL BANK	BANK ZACHODNI WBK
AYALA LAND	ATTOCK PETROLEUM	BARLINEK
BANCO DE ORO	BANK AL HABIB	BIOTON
BANK OF THE PHILP.ISLE.	BANK AL-FALAH LIMITED	BORYSZEW
BENPRES HOLDINGS	BANK OF PUNJAB	BOS

CHINA BANKING	BESTWAY CEMENT	BRE BANK
DIGITAL TELECOM.	D G CEMENT	BUDIMEX
DMCI HOLDINGS	DAWOOD HERCULES	CCC
EQUITABLE PCI BANK	EFU GENERAL INSURANCES	CERSANIT
FILINVEST DEV.	ENGRO CHEMICAL	CIECH
FILINVEST LAND	FAUJI FERTILIZER	COMARCH
FIRST GEN	FAUJI FERTILIZER BIN QAS	DOM DEVELOPMENT
FIRST METRO INV.	FAYSAL BANK	DZPOLSKA
FIRST PHILP.HDG.	GLAXOSMITHKLINE PAK.	ECHO INVESTMENT
GLOBE TELECOM	HABIB METRO BANK	EMPIK MEDIA & FASHION
HOLCIM PHILPS.	HUB POWER	FAMUR
INTL.CTNR.TERM.SVS.	IBRAHIM FIBRES	FORTIS BANK POLSKA
JG SUMMIT HDG.	ICI PAKISTAN	GETIN HOLDING
JOLLIBEE FOODS	INDUS MOTORS	GRUPA LOTOS
MANILA ELECTRIC 'A'	KARACHI ELECTRIC SUPP.	GRUPA ZYWIEC
MANILA ELECTRIC 'B'	KOT ADDU POWER	GTC
MANILA WATER	LAKSON TOBACCO	HANDLOWY
MEGAWORLD	LUCKY CEMENT	IMPEXMETAL
METROPOLITAN BK.& TST.	MCB BANK	ING BANK SLASKI BSK
PAXYS	NAT.BANK OF PAKISTAN	KETY
PETRON	NATIONAL REFINERY	KGHM
PHILEX MINING	NESTLE PAKISTAN	KOELNER
PHILP.LONG DSN.TEL.	NISHAT MILLS	KREDYT B PBI
PHILIPPINE NAT.BK.	OIL & GAS DEVELOPMENT	KRUSZWICA
PHILIPPINE SAVINGS BANK	PACKAGES	LPP
PHILTRUST BANK	PAK SUZUKI MOTOR	MULTIMEDIA POLSKA
PILIPINO TELEPHONE	PAKISTAN OILFIELDS	NETIA
PNOC ENERGY DEV.	PAKISTAN PETROLEUM	ORBIS
PNOC EXPLORATION 'B'	PAKISTAN SERVICES	PBG
REPUBLIC CEMENT INFREQUENTLY TRADED	PAKISTAN STATE OIL	PEKAO
RIZAL COML.BKG. 'A'	PAKISTAN TOBACCO	PFLEIDERER GRAJEWO
ROBINSONS LD.	PIAC	PKNORLEN
SAN MIGUEL 'A'	PICIC	PKO BANK
SAN MIGUEL 'B'	PRIME COMMERCIAL BANK	POLIMEXMS
SECURITY BANK	PTCLA	POLISH OIL AND GAS
SM DEVELOPMENT 'A'	SHELL PAKISTAN	PROKOM SOFTWARE
SM INVESTMENTS	SONERI BANK	PULAWY
SM PRIME HOLDINGS	SUI NORTHERN GAS	STALPRODKUT
TANDUAY HOLDINGS	SUI SOUTHERN GAS	SWIECIE
UNION BK.OF THE PHILPS.	UNILEVER PAKISTAN	TELEKOMUNIKACJA POLSKA
UNIVERSAL ROBINA	UNITED BANK	TVN
ROMANIA	RUSSIA	SOUTH AFRICA
AEROSTAR BACAU	AEROFLOT	ABSA GROUP
AMONIL SLOBOZIA	ANK BASHNEFT	AECI
ANTIBIOTICE IASI	BALTIKA BREW.	AFRICAN BANK INVS.
APCAROM BUZAU	COMSTAR-UNITED TELSMS.	AFRICAN OXYGEN
ARMATURA CLUJ NAPOCA	GAZPROM	AFN.RAINBOW MRLS.
ARTROM SLATINA	GAZPROM NEFT	ALEXANDER FORBES
AZOMURES TG MURES	IRKUTSKENERGO	ALLIED ELTN.PTG.PREF.

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RMB	ADVANCED SEMICON.ENGR.	SINOPAC FINL.HDG.
SANLAM	ADVANTECH	TAISHIN FINL.HLDG.
SANTAM	ASIA CEMENT	TAIWAN CEMENT
SAPPI	ASUSTEK COMPUTER	TAIWAN COOPERATIVE BANK
SASOL	AU OPTRONICS	TAIWAN FERTILIZER
SHOPRITE	CATCHER TECHNOLOGY	TAIWAN MOBILE
SPAR GROUP	CATHAY FINL.HLDG.	TAIWAN SEMICON.MNFG.
STANDARD BK.GP.	CHANG HWA COML.BANK	TATUNG
STEINHOFF INTL.	CHI MEI OPTOELECTRONICS	UNI-PRESIDENT ENTS.
SUN INTERNATIONAL	CHINA AIR LINES	UNITED MICRO ELTN.
TELKOM	CHINA DEV.FINL.HLDG.	VIA TECHNOLOGIES
TIGER BRANDS	CHINA STEEL	WALSIN LIHWA
TONGAAT HLT.GP.	CHINATRUST FINL.HLDG.	WINBOND ELTN.
TRUWORTHS INTL.	CHUNGHWA PICTURE TUBES	WISTRON
WESTERN AREAS	CHUNGHWA TELECOM.	YUANTA CORE PAC.SECS.
WOOLWORTHS HDG.	COMPAL COMMUNICATIONS	YULON MOTOR
	COMPAL ELECTRONICS	
	DELTA ELECTRONICS	
	E SUN FINL.HLDG.	
	EVA AIRWAYS	
	EVERGREEN MAR.	
	FAR EASTERN TEXTILE	
	FAR EASTONE TELECOM.	
	FIRST FINANCIAL HLDG.	
	FORMOSA CHEMS.& FIBER	
	FORMOSA PETROCHEM.	
	FORMOSA PLASTICS	
	FOXCONN TECHNOLOGY	
	FUBON FINL.HLDG.	
	FUHWA FINL.HLDG.	
	HIGH TECH COMPUTER	
	HON HAI PRECN.INDS.	
	HUA NAN FINANCIAL HLDG.	
	INNOLUX DISPLAY	
	INOTERA MEMORIES	
	INVENTEC	
	LARGAN PRECISION	
	LITE-ON TECHNOLOGY	
	MEDIATEK	
	MEGA FINANCIAL	
	MOTECH INDUSTRIES	
	NAN YA PCB	
	NAN YA PLASTICS	
	NANYA TECHNOLOGY	
	NOVATEK MICROEL.	
	POU CHEN	
	POWERCHIP SEMICON.	
	POWERTECH TECHNOLOGY	
	PRESIDENT CHAIN STORE	
	PROMOS TECHS.	
	QUANTA COMPUTER	

	SHIN KONG FINL.HLDG.	
THAILAND	TURKEY	VENUZUELA
ADVANCE AGRO	ACIBADEM	BANCO CARIBE 'A'
ADVANCED INFO SER.	AKBANK	BANCO DE VENEZUELA
AIRPORTS OF THAILAND	AKCANS	BANCO EXTERIOR
AROMATICS THAILAND	AKSIGORTA	BANCO HIPOTECARIO ACTIVO
BANGKOK BANK	ANADOLU CAM SANAYII	BANCO OCCIDENTAL
BANGKOK DUSIT MED.SVS.	ANADOLU EFES	BANCO PROVINCIAL
BANGKOK EXPRESSWAY	ANADOLU HAYAT EMEKLILIK	BANESCO BANCO UNIVERSAL
BANK OF AYUDHYA	ARCELIK	CANTV
BANPU PUBLIC	ASYA KATILIM BANKASI	CEMEX '1'
BEC WORLD	AYGAZ	CEMEX '2'
BIG C SUPERCENTRE	BIM BIRLESIK MAGAZALAR	CENTRAL BANCO UNIVERSAL
BUMRUNGRAD HOSPITAL	BSH EV ALETLERI SANVETC.	CERAMICA CARABOBO
CAL-COMP ELECTRONICS	CARREFOURSA GRUBU 'A'	CORIMON 'A'
CENTRAL PATTANA	CIMSA CIMENTO	CORPN.BANCA
CHAROEN POKPHAND FOODS	COCA COLA ICECEK	CORPN.GPO.QUIM.
CP SEVEN ELEVEN	DENIZ BANK	CORPN.INDL.DE ENGA.
DELTA ELECTRONICS	DOGAN HOLDING	DOMG.Y CIA CARACAS
ELECTRICITY GENERATING	DOGAN YAYIN HOLDING	ECONOINVEST CAPITAL 'A'
GLOW ENERGY	ECZACIBASI ILAC	ECONOINVEST CAPITAL 'B'
HANA MICROELECTRONIC	ENKA INSAAT	ELECTRICIDAD DE CARACAS
IRPC	EREGLI DEMIR CELIK	ENVASES VENEZOLANOS
ITALIAN-THAI DEVELOPMENT	FINANSBANK	FABRICA NAC.DE CEMENT.
KASIKORNBANK	FORD OTOMOTIVE SANAY	FONDO DE VALORES INMBS.
KHON KAEN SUGAR	FORTIS BANK	GRUPO ZULIANO
KRUNG THAI BANK	GARANTI BANKASI	HL BOULTON & COMPANY
LAND AND HOUSES	HURRIYET GAZETECILIK	INMUEBLES BOLSA DE VLRS.
MCOT	IS GAYRIMENKUL	INMUEMBLES Y VALORES
MINOR INTERNATIONAL	KENT GIDA	INVESTMENT TACOA 'A'
PRECIOUS SHIPPING	KOC HOLDINGS	INVESTMENT TACOA 'B'
PTT	MIGROS TURK	MANPA
PTT CHEMICAL PUBLIC	NUH CIMENTO	MANTEX
PTT EXPLORATION & PRDN.	PETKIM AS	MERCANTIL SERV.FINCO.'A'
RATCHABURI ELECTRICITY	PETROL OFISI	MERCANTIL SERV.FINCO.'B'
RAYONG REFINERY	SABANCI HOLDING	PROAGRO
SHIN	SELCUK ECZA DEPOSU	PRODUCTOS EFE
SIAM CEMENT	T SISE CAM	PROTINAL
SIAM CITY BANK	TESCO KIPA KITLE	RON SANTA TERESA
SIAM CITY CEMENT	TOFAS	SIVENSA
SIAM COMMERCIAL BANK	TRAKYA CAM	SUDAMTEX 'A'
SIAM COMMERCIAL BK.PF.	TUPRAS	SUDAMTEX 'B'
SIAM MAKRO	TURK EKONOMI BANKASI	SUELOPETROL 'B'
THAI AIRWAYS INTL.	TURK HAVA YOLLARI	TERMINALES MARACAIBO
THAI OIL	TURKCELL	TORDISCA
THAI PLASTIC CHM.	TURKIYE IS BANK 'C'	VENASETA 'A'
THAI UNION FROZEN PRDS.	TURKIYE KALKINMA	VENASETA 'B'
THANACHART CAPITAL	TKI.VAKIFLEAR BANKASI	VENCRED

THORESEN THAI AG.	ULKER GIDA	VENEPAL 'A'
TMB BANK	YAPI KREDİ BK.	VENEPAL 'B'
TPI POLENE	YAPI KREDİ FINANSAL	VENEZOLANO DE CREDITO
TRUE CORPORATION	YAZICILAR HOLDING	VENGAS

Appendix A.8

Table 4.3 Descriptive Statistics of Firm Specific Attributes

The table below is representation of the key statistical attributes of the firm specific factors selected to be employed in this study. The associated measures are all calculated after the two-step winsorisation procedure has been completed in order to mitigate the influence of extreme observations. The data were extracted from DataStream International. Refer to Table 1 for definitions of all firm specific attributes. In addition the Jacque Bera test for normality p-value is specified with the null hypothesis for this test being that the population follows a normal distribution. At the 5% significance level, all p-values in excess on 0.05 result in the null hypothesis being upheld and the population considered normal. The contrary is true for p-values less than 0.05, whereby the population is then inferred to be non-normal.

Code	Mean	Med	Std Dev	Kurt	Skew	Min	Max	JacB
A_Turn	0.64	0.51	0.52	3.66	1.10	-0.10	2.12	0.00
BTMV	0.95	0.65	1.11	8.04	1.85	-3.06	5.01	0.00
Cps	787.91	4.57	2721.86	17.31	3.36	-11889.85	13837.59	0.00
CFtTD	19.76	0.29	225.76	309.72	16.87	0.00	4420.70	0.00
DY	2.81	1.69	3.61	7.46	2.01	0.00	17.21	0.00
DtMVE	1.60	0.04	3.59	30.01	4.80	0.00	27.25	0.00
EPS	180.65	1.61	665.17	24.33	4.63	-170.27	3892.01	0.00
12_EPS	2.4	0.002	81.99	24.13	0.16	-442.52	448.98	0.00
24_EPS	4.61	0.09	109.55	20.59	0.25	-544.29	555.87	0.00
6_EPS	1.39	0.00	55.04	31.05	0.23	-338.65	341.36	0.00
EY	1.91	0.03	7.40	34.15	5.37	-1.00	52.87	0.00
ICBT	289.66	3.82	3995.90	430.84	19.76	-17421.00	92456.68	0.00
LnMV	9.42	9.04	2.89	2.73	0.33	0.78	18.07	0.00
LnP	0.33	0.27	2.01	3.29	-0.13	-5.54	6.24	0.00
MOM_12M	0.35	0.13	1.13	107.97	8.08	-0.99	19.29	0.00
MOM_18M	0.57	0.21	1.89	176.75	10.72	-0.99	37.71	0.00

MOM_1M	0.05	0.0005	0.82	1009.758	30.26	-0.99	29.33	0.00
MOM_24M	0.823	0.30	2.54	133.31	9.58	-0.99	42.196	0.00
MOM_3M	0.187	0.025	2.161	514.74	21.671	-0.99	54.79	0.00
MOM_6M	0.37	0.06	3.45	379.77	18.57	-0.99	75.805	0.00
MTBV	2.37	1.32	6.68	83.05	6.58	-66.04	71.51	0.00
MVTrade	5093.52	268.57	17832.39	56.05	6.78	-25.00	167548.5	0.00
MVTradeMV	45781.52	0.01	162963.2	16.51	3.82	0.00	779910.9	0.00
MVTMV_1	2.54	-0.007	9.255	31.88	5.18	-1.00	64.37	0.00
MVTMV_3	3.58	0.017	14.57	46.99	6.34	-1.00	121.12	0.00
MVTMV_6	4.14	0.01	16.21	40.67	5.90	-1.00	125.593	0.00
MVTMV_12	2.38	0.00	8.69	31.61	5.16	-1.00	60.23	0.00
NS	107979.7	14.3802	420112.5	24.19545	4.63	7.90	2420017	0.00
P	7.28	1.31	16.96	18.78	3.89	0.00	96.89	0.00
PC	7.54	5.49	14.46	14.24	0.983	-57.87	73.75	0.00
PE	2.86	0.09	9.67	35.93	5.26	-9.60	80.93	0.00
Quick	1.27	0.88	1.95	115.70	9.23	0.02	28.87	0.00
ROCE	10.77	9.22	11.1	5.37	0.49	-24.45	46.12	0.00
ROE	12.28	12.19	22.8	10.86	-0.70	-90.83	114.770	0.00
SalestP	32.005	0.99	134.02	20.34	4.311	-596.06	674.28	0.00
TDtTA	0.24	0.22	0.189	2.87	0.66	0.00	0.797	0.00
TV	0.005	0.0007	0.03	162.18	12.25	0.00	0.42	0.00
VO	2919.26	232.50	8357.96	22.52	4.33	-0.70	50357.26	0.00
VO_1	2.60	0.00	9.49	32.42	5.21	-58.33	66.57	0.00
VO_3	4.01	0.03	17.65	59.27	7.13	-152.13	164.24	0.00
VO_6	4.06	0.04	17.62	57.31	7.01	-3.00	161.73	0.00
VO_12	4.55	0.07	17.85	42.53	6.04	-1.00	141.24	0.00

Appendix A.9

Definitions of DataStream International Items

Definitions of DataStream International Items

Definitions of DataStream International items used to construct the firm-specific attributes tested in this paper. The DataStream International code is listed in brackets after the item. The definitions are based on the DataStream International Online Definitions.

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.

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.

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.

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.

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.

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)

Market value divided by the net tangible assets.

Net Profit Margin (717)

Profits after tax (adjusted) divided by total sales.

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).

Price/Cashflow Ratio (PC)

Current price divided by cash earnings per share for the appropriate financial year, adjusted for capital changes.

Quick Assets Ratio (742)

Total current assets minus total stock and work in progress, divided by total current liabilities.

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 Equity (Published) (1506)

Earned for ordinary, divided by equity capital and reserves minus total intangibles.

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.

Total Debtors and Equivalent (370)

The total of balances outstanding which are 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 Return (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.

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.

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 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).

Appendix B

University of Cape Town

Appendix B.1

Significance of Attributes: CAPM Adjusted Returns (EMI)

The table below contains the results of the Univariate Cross Sectional Regressions run on CAPM adjusted returns data. The 90 day US Treasury Bill was used as the proxy for the riskless rate and the DataStream International Emerging Markets Index chosen as a good approximation of the market. The standardised firm specific characteristics at the beginning of the month are regressed against the total CAPM adjusted firm return for that month and every month over the sample period spanning 1 January 1997 to the 31st December 2006. Risk adjustment entails the removing of that component defined as systematic in order to gauge the pervasiveness of the identified style factors. The beta coefficients and associated t-stats are represented below in order to communicate those attributes that are significant in explaining the variation in returns.

Attribute	T-Statistic	Beta Coefficient	Attribute	T-Statistic	Beta Coefficient
BTMV	6.7684	0.0099	CFtTD	1.1690	0.0008
SalestP	5.1422	0.0072	MOM_12M	1.1266	0.0028
PTBV	-4.9239	-0.0066	12_EPS	1.1136	0.0009
MTBV	-4.8949	-0.0062	Payout	-0.9725	-0.0006
PC	-4.2412	-0.0042	MOM_6M	0.9366	0.0031
DY	4.1327	0.0043	Diffdivtp12	0.9250	0.0005
LnMV	-3.6980	-0.0048	Quick	-0.8555	-0.0007
LnP	-3.3111	-0.0059	VO	0.8432	0.0008
DtMVE	3.1051	0.0050	VO_12	-0.7936	-0.0010
MVTMV_3	3.0761	0.0027	ROE	0.7614	0.0011
VO_6	2.9630	0.0026	EPS	-0.7426	-0.0008
A_Turn	2.8519	0.0029	24_EPS	0.6858	0.0006
P	-2.7452	-0.0048	MOM_24M	-0.4105	-0.0008
MVTrade	-2.6450	-0.0164	Casheps	0.2800	0.0004
VO_3	2.5108	0.0022	MOM_3M	-0.2780	-0.0008
MVTMV_1	2.4909	0.0021	Diffdivtp6	-0.2442	-0.0001
ICBT	2.1035	0.0015	TDtTA	-0.2262	-0.0003
ROCE	2.0303	0.0028	MOM_1M	-0.2030	-0.0005
MVTradeMV	2.0058	0.0470	TV	-0.1552	-0.0002
PE	1.7241	0.0179	6_EPS	0.0915	0.0001
MVTMV_6	1.4649	0.0013	Diffdivtp24	0.0809	0.0001
EY	1.4563	0.0172	NS	0.0487	0.0001
VO_1	1.3453	0.0011	MOM_18M	-0.0368	-0.0001
MVTMV_12	-1.3120	-0.0077			

Appendix B.2

Significance of Attributes: CAPM Adjusted Returns (WMI)

The table below contains the results of the Univariate Cross Sectional Regressions run on CAPM adjusted returns data. The 90 day US Treasury Bill was used as the proxy for the riskless rate and the DataStream International World Markets Index chosen as a good approximation of the market. The standardised firm specific characteristics at the beginning of the month are regressed against the total CAPM adjusted firm return for that month and every month over the sample period spanning 1 January 1997 to the 31st December 2006. Risk adjustment entails the removing of that component defined as systematic in order to gauge the pervasiveness of the identified style factors. The beta coefficients and associated t-stats are represented below in order to communicate those attributes that are significant in explaining the variation in returns.

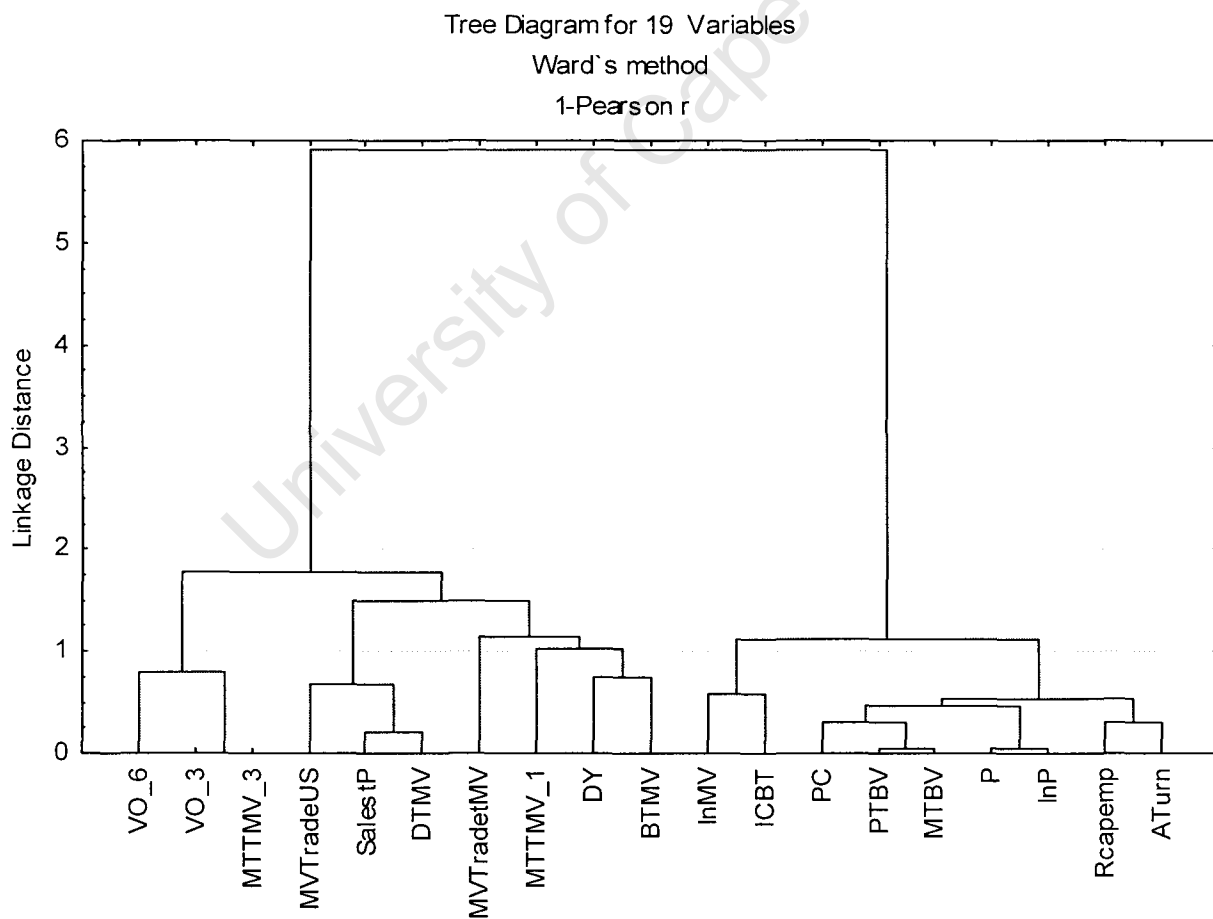
Attribute	T-Statistic	Beta Coefficient	Attribute	T-Statistic	Beta Coefficient
BTMV	5.6899	0.0106	Quick	-1.3351	-0.0011
MTBV	-5.2452	-0.0071	Diffdivtp12	1.3006	0.0008
PTBV	-5.1141	-0.0076	MOM_6M	1.2806	0.0043
SalestP	4.9531	0.0072	MVTMV_12	-1.2118	-0.0064
PC	-4.2464	-0.0046	MOM_12M	1.1364	0.0030
DY	3.5359	0.0041	VO_1	0.9292	0.0008
LnMV	-3.4823	-0.0050	24_EPS	0.9095	0.0008
LnP	-3.4298	-0.0064	EPS	-0.8196	-0.0009
DtMVE	2.9358	0.0052	CFtTD	0.6528	0.0005
MVTrade	-2.8670	-0.0175	Diffdivtp24	0.6455	0.0004
P	-2.7712	-0.0052	MVTMV_6	0.5569	0.0005
MVTMV_3	2.7128	0.0024	ROE	0.4568	0.0007
A_Turn	2.6530	0.0030	6_EPS	0.3889	0.0003
VO_6	2.5975	0.0023	TV	0.3849	0.0005
PE	2.2541	0.0236	Casheps	0.3725	0.0005
ICBT	2.0059	0.0014	VO_12	-0.3409	-0.0004
MVTMV_1	1.9782	0.0018	NS	0.2167	0.0003
VO_3	1.9501	0.0018	MOM_24M	-0.2056	-0.0004
12_EPS	1.8307	0.0016	Diffdivtp6	-0.1314	-0.0001
ROCE	1.7767	0.0025	MOM_18M	0.1257	0.0003
MVTradeMV	1.7383	0.0482	TDtTA	-0.1223	-0.0002
MOM_1M	-1.4952	-0.0044	MOM_3M	0.1147	0.0004
EY	1.4153	0.0178	VO	0.1004	0.0001
Payout	-1.3609	-0.0010			

Appendix B.3

Cluster Analysis : CAPM (Emerging Market Index) Adjusted Returns

Tree Diagram representing the Clusters of Monthly Payoffs: CAPM (EMI) Adjusted Returns

A Vertical Tree Diagram is depicted below showing the cluster analysis of the monthly payoffs to the standardised firm-specific attributes. The attributes presented are those found to be significant at a 5% level after the previous univariate testing procedure has been undertaken. Wards method is used with the Pearson clustering algorithm being used to sort the attributes into their relevant clusters.

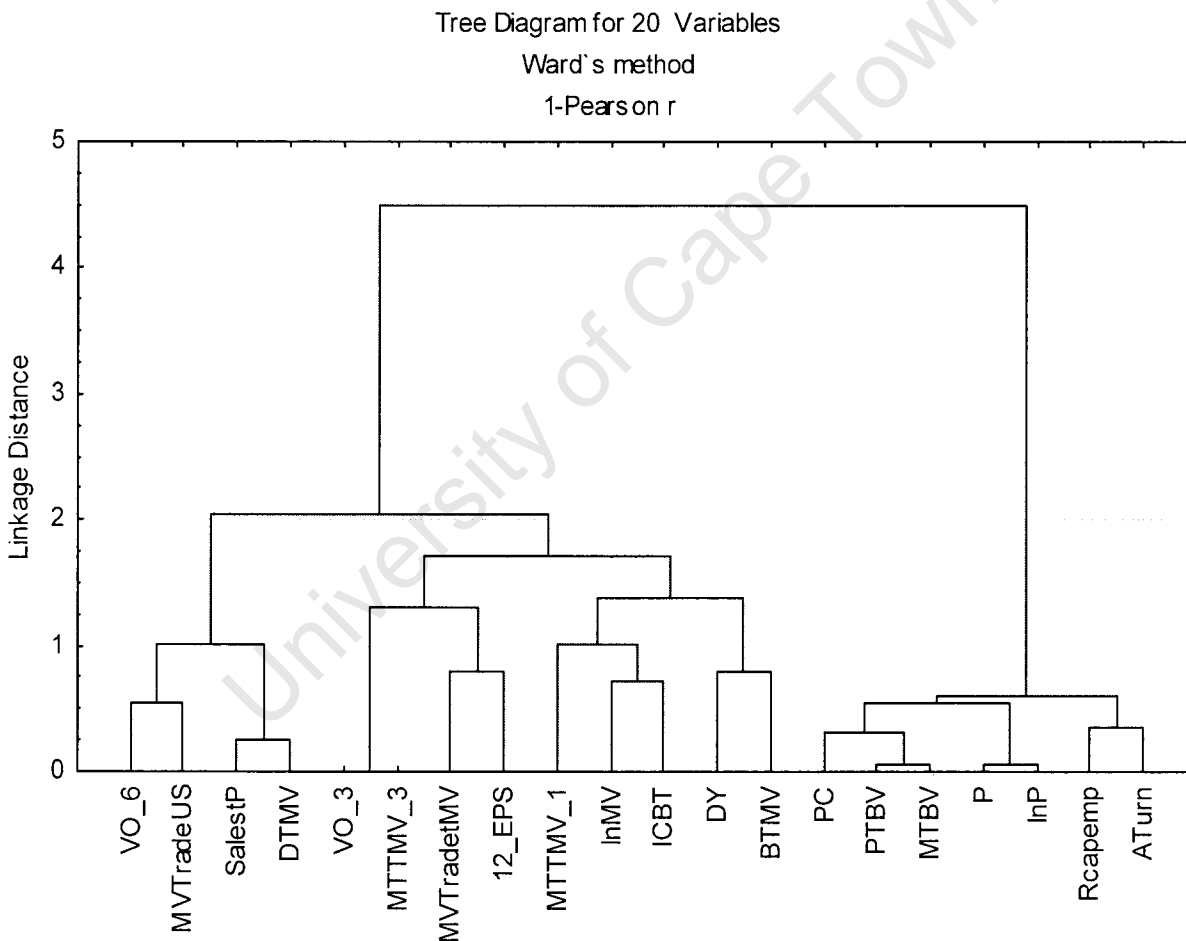


Appendix B.4

Cluster Analysis: CAPM (World Market Index) Adjusted Returns

Tree Diagram representing the Clusters of Monthly Payoffs: CAPM (WMI) Adjusted Returns

A Vertical Tree Diagram is depicted below showing the cluster analysis of the monthly payoffs to the standardised firm-specific attributes. The attributes presented are those found to be significant at a 5% level after the previous univariate testing procedure has been undertaken. Wards method is used with the Pearson clustering algorithm being used to sort the attributes into their relevant clusters.



Appendix B.5

Significance of Attributes: APT Adjusted Returns (EMI and WMI)

The table below contains the results of the Multivariate Cross Sectional Regressions run on APT adjusted returns data. The 90 day US Treasury Bill was used as the proxy for the riskless rate and the DataStream International World Markets Index chosen as a good approximation of the market. The standardised firm specific characteristics at the beginning of the month are regressed against the total APT adjusted firm return for that month and every month over the sample period spanning 1 January 1997 to the 31st December 2006. Risk adjustment entails the removing of that component defined as systematic in order to gauge the pervasiveness of the identified style factors. The beta coefficients and associated t-stats are represented below in order to communicate those attributes that are significant in explaining the variation in returns.

Attribute	T-Statistic	Beta Coefficient	Attribute	T-Statistic	Beta Coefficient
EY	2.6776	0.0019	MOM_24M	-0.5789	-0.0003
MOM_3M	2.0097	0.0011	Diffdivtp24	-0.5656	-0.0005
MOM_6M	2.0086	0.0011	BTMV	-0.5437	-0.0003
24_EPS	-1.9341	-0.0012	SalestP	0.5129	0.0003
EPS	-1.9289	-0.0011	MVTMV_1	-0.4506	-0.0003
TDtTA	1.6348	0.0010	MOM_1M	-0.4387	-0.0003
VO_6	1.6207	0.0012	Diffdivtp6	0.3768	0.0003
MVTMV_6	-1.5367	-0.0011	Casheps	-0.3566	-0.0003
MVTMV_3	1.5357	0.0011	ROCE	-0.3396	-0.0002
Quick	-1.4291	-0.0011	6_EPS	-0.3101	-0.0002
VO	-1.3677	-0.0010	MOM_12M	0.2833	0.0002
PC	-1.2142	-0.0007	MVTMV_12	-0.2023	-0.0002
MTBV	-1.1193	-0.0007	DY	0.1880	0.0001
PE	1.0599	0.0007	LnP	-0.1849	-0.0001
P	1.0100	0.0006	ICBT	-0.1826	-0.0001
CftTD	-0.9991	-0.0007	NS	0.1605	0.0001
PTBV	-0.9803	-0.0006	VO_3	-0.1300	-0.0001
12_EPS	-0.9479	-0.0006	MVTrade	-0.0977	-0.0001
Diffdivtp12	-0.8473	-0.0007	LnMV	-0.0962	-0.0001
DtMVE	0.8122	0.0006	A_Turn	0.0915	0.0001
MVTradeMV	0.8089	0.0005	MOM_18M	0.0464	0.0000
VO_1	0.7682	0.0006	ROE	0.0398	0.0000
Payout	-0.7357	-0.0004	VO_12	0.0269	0.0000
TV	0.6666	0.0005			

Appendix B.6

Correlation Matrix of Significant Style Factors

Presented in the table below is a complete correlation matrix of Pearson coefficients of the final list of the monthly payoffs to the standardised firm-specific attributes found to be significant in the univariate testing procedure performed on the unadjusted return data. Those attributes exhibiting a correlation of greater than 0.9 or less than -0.9 are indicated in bold white text with a black background. Furthermore, those attributes exhibiting a correlation of 0.7 or greater, or -0.7 or less are reflected in white text with a grey background. The data analysed relates to the sample period 1st January 1997 to 31st December 2006. All data were sourced from the DataStream International database.

	ATurn	BTMV	DTMV	DY	EY	InMV	InP	MTBV	MTTMV_1	MTTMV_3	MVTradeUS	PC	P	PTBV	Rcapemp	Sales1P	VO_3	VO_5
ATurn	1.00	-0.10	-0.09	-0.03	-0.22	0.18	-0.68	-0.55	-0.07	-0.07	-0.40	0.57	0.55	0.66	0.70	-0.38	0.00	-0.21
BTMV	-0.10	1.00	0.30	0.24	0.21	-0.09	-0.34	-0.38	-0.06	-0.01	-0.05	-0.20	-0.20	-0.20	-0.20	0.25	0.02	-0.01
DTMV	-0.09	0.30	1.00	0.17	0.39	-0.10	-0.75	-0.75	-0.21	0.13	0.45	-0.70	-0.70	-0.77	-0.82	0.61	0.17	0.09
DY	-0.03	0.24	0.17	1.00	0.29	-0.21	-0.26	-0.15	0.00	0.07	-0.08	0.71	0.70	0.79	-0.05	0.22	0.07	-0.00
EY	0.22	0.21	0.39	0.29	1.00	-0.10	-0.34	-0.30	0.00	0.04	0.10	-0.37	-0.37	0.35	-0.31	0.39	0.07	0.03
InMV	0.18	0.09	-0.10	-0.21	-0.10	1.00	0.41	0.13	-0.14	-0.12	-0.43	0.15	0.37	0.27	0.03	-0.29	-0.14	-0.20
InP	0.68	0.34	-0.75	0.26	0.34	0.41	1.00	0.75	-0.08	-0.17	-0.52	0.00	0.94	0.75	0.70	0.60	0.20	-0.07
MTBV	0.55	-0.38	-0.75	-0.16	-0.30	0.13	-0.75	1.00	-0.03	0.00	-0.35	0.60	0.74	0.94	0.72	0.67	0.03	0.02
MTTMV_1	0.02	0.00	0.21	0.00	0.00	-0.14	-0.08	-0.03	1.00	0.12	0.00	-0.03	-0.05	-0.03	-0.07	0.03	0.13	0.10
MTTMV_3	0.02	0.01	0.13	0.07	0.04	-0.17	0.17	0.00	0.12	1.00	0.31	-0.04	-0.12	-0.02	0.02	0.11	0.99	0.43
MVTradeUS	-0.40	-0.05	0.45	-0.08	0.10	-0.43	-0.52	-0.35	0.06	0.31	1.00	-0.45	-0.58	-0.43	-0.38	0.62	0.34	0.31
PC	0.57	-0.20	-0.70	-0.21	-0.32	0.16	0.75	0.58	-0.03	-0.04	0.45	1.00	0.72	0.75	0.64	-0.68	-0.08	-0.03
P	0.55	-0.20	-0.75	-0.20	-0.32	0.37	0.94	0.75	-0.03	-0.12	0.58	0.73	1.00	0.70	0.70	-0.64	-0.15	-0.10
PTBV	0.66	-0.20	-0.77	-0.19	-0.35	0.22	0.75	0.94	-0.03	-0.02	-0.43	0.76	0.75	1.00	0.72	-0.73	-0.00	-0.01
Rcapemp	0.70	-0.20	-0.82	-0.05	-0.31	0.03	0.70	0.72	-0.07	0.02	-0.38	0.64	0.70	0.72	1.00	-0.63	-0.01	0.02
Sales1P	0.38	0.25	0.60	0.22	0.39	-0.20	-0.60	-0.67	0.00	0.11	0.62	-0.68	-0.54	-0.73	0.63	1.00	0.15	0.12
VO_3	0.00	0.02	0.17	0.07	0.07	-0.14	-0.20	-0.03	0.13	0.99	0.34	-0.08	-0.10	-0.06	0.01	0.15	1.00	0.44
VO_5	0.01	-0.01	0.09	-0.09	0.03	-0.20	-0.07	0.02	0.10	0.43	0.31	-0.08	0.10	0.01	0.02	0.12	0.44	1.00

Appendix C

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Appendix C.1

Augmented Dickey Fuller Tests

Results of logarithmically transformed macroeconomic variables

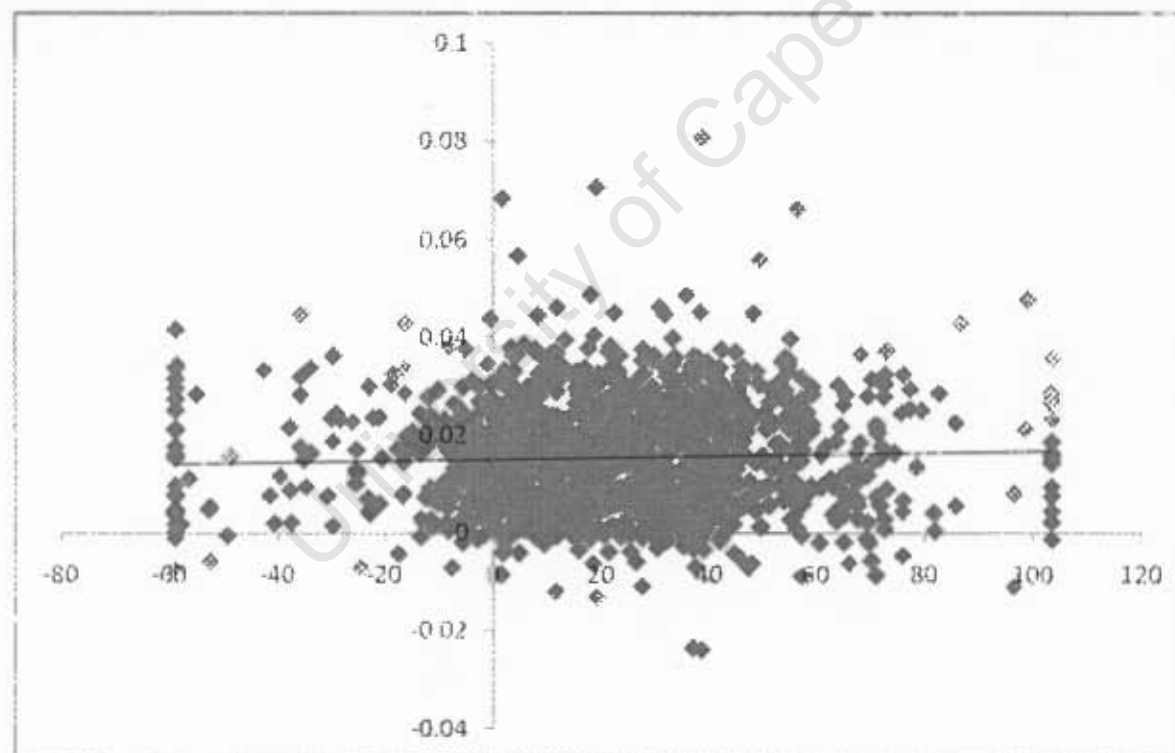
Presented in the table below is the output for the Augmented Dickey Fuller (ADF) test run on the fifteen logarithmically transformed candidate macroeconomic variables. ADF test statistics, there associated p-values and the number of lagged differences are included. All the variables were tested at the 95% significance level with rejection of the null hypothesis inferring a series exhibit a constant mean and variance, namely the attribute termed 'stationarity'. All data were sourced from the DataStream International Database.

Variable	ADF Statistic	p-values	Lagged differences
LCRBINDEX	-1.05	0.9347	0
LGOLDPRICE	-1.90	0.6514	0
LOILBRENTCR	-3.17	0.0816	0
LPLATINUM	-2.38	0.3865	0
LRANDDOLLAR	-1.38	0.8708	0
LUSBA3M	-1.88	0.6644	0
LUSEXPIND	0.19	0.9981	0
LUSGLT10YR	-2.60	0.2792	0
LUSMONSUPP	-2.18	0.4977	0
LUSPPI	-1.95	0.6251	0
LUSPRIME	0.99	0.9999	0
LUSSHTRM	-0.79	0.9646	0
LUSTBILL3M	0.40	0.9990	0
LUSUNEMP	-2.67	0.2491	0
LYUANDOLLAR	1.87	0.9999	0

Appendix C.2

Scatter Plot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the US Export Index

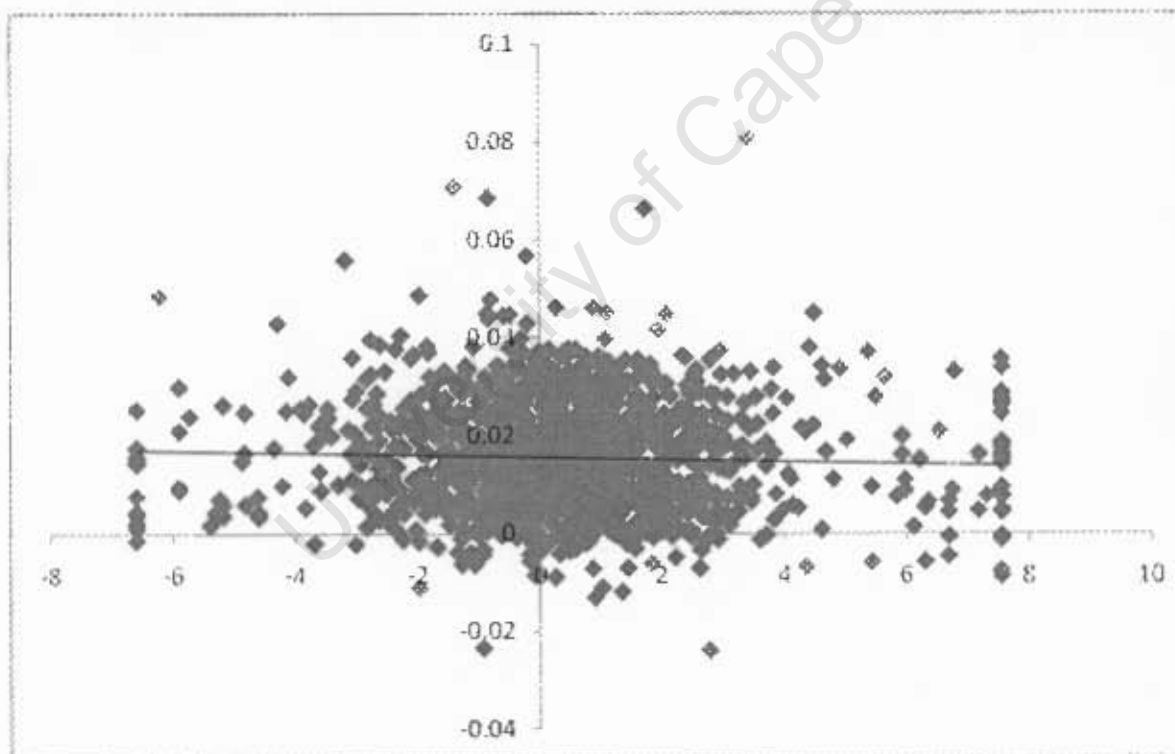
The figure below attempts to present the relationship between the returns on listed emerging market shares and their exposure to certain macroeconomic factors, in this case the US Export Index. Fundamental to modern finance theory is that only systematic exposure to risk factors is rewarded with the commensurate return. The diagrammatic representation aims to assess whether or not increased exposure to such macroeconomic variables enables such factors to price risk, whereby increased exposure to such a factor is rewarded with improved return. The mean monthly share return on all 1290 emerging market stocks are plotted on the vertical axis against their respective monthly betas on the horizontal axis in order to discover any such risk: return relationship. The out-sample period spanning from the 1st of January 2000 to the 31st of December 2006 is analysed. All data were sourced from DataStream International Database.



Appendix C.3

Figure 6.4 Scatter Plot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the Rand/US Dollar Exchange Rate

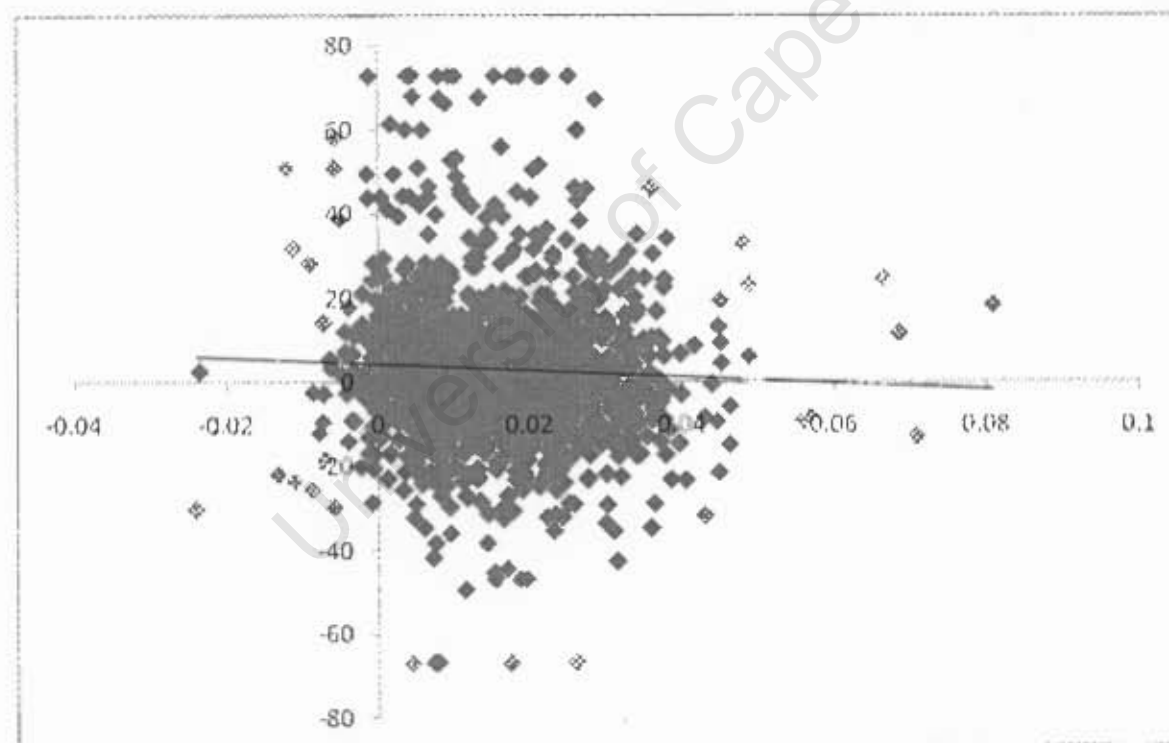
The figure below attempts to present the relationship between the returns on listed emerging market shares and their exposure to certain macroeconomic factors, in this case the R/\$ Exchange Rate. Fundamental to modern finance theory is that only systematic exposure to risk factors is rewarded with the commensurate return. The diagrammatic representation aims to assess whether or not increased exposure to such macroeconomic variables enables such factors to price risk, whereby increased exposure to such a factor is rewarded with improved return. The mean monthly share return on all 1290 emerging market stocks are plotted on the vertical axis against their respective monthly betas on the horizontal axis in order to discover any such risk: return relationship. The out-sample period spanning from the 1st of January 2000 to the 31st of December 2006 is analysed. All data were sourced from DataStream International Database.



Appendix C.4

Figure 6.4 Scatter Plot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the alterations to the US Money Supply

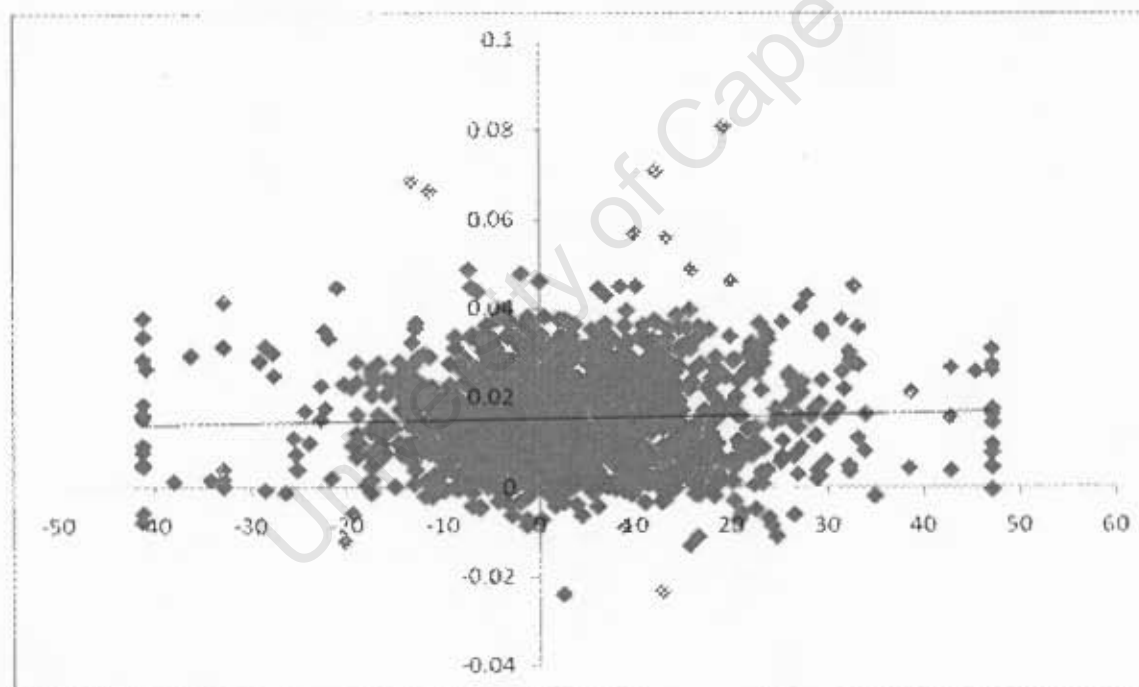
The figure below attempts to present the relationship between the returns on listed emerging market shares and their exposure to certain macroeconomic factors, in this case the US Money Supply. Fundamental to modern finance theory is that only systematic exposure to risk factors is rewarded with the commensurate return. The diagrammatic representation aims to assess whether or not increased exposure to such macroeconomic variables enables such factors to price risk, whereby increased exposure to such a factor is rewarded with improved return. The mean monthly share return on all 1290 emerging market stocks are plotted on the vertical axis against their respective monthly betas on the horizontal axis in order to discover any such risk: return relationship. The out-sample period spanning from the 1st of January 2000 to the 31st of December 2006 is analysed. All data were sourced from DataStream International Database.



Appendix C.5

Figure 6.4 Scatter Plot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to US Producer Price Inflation

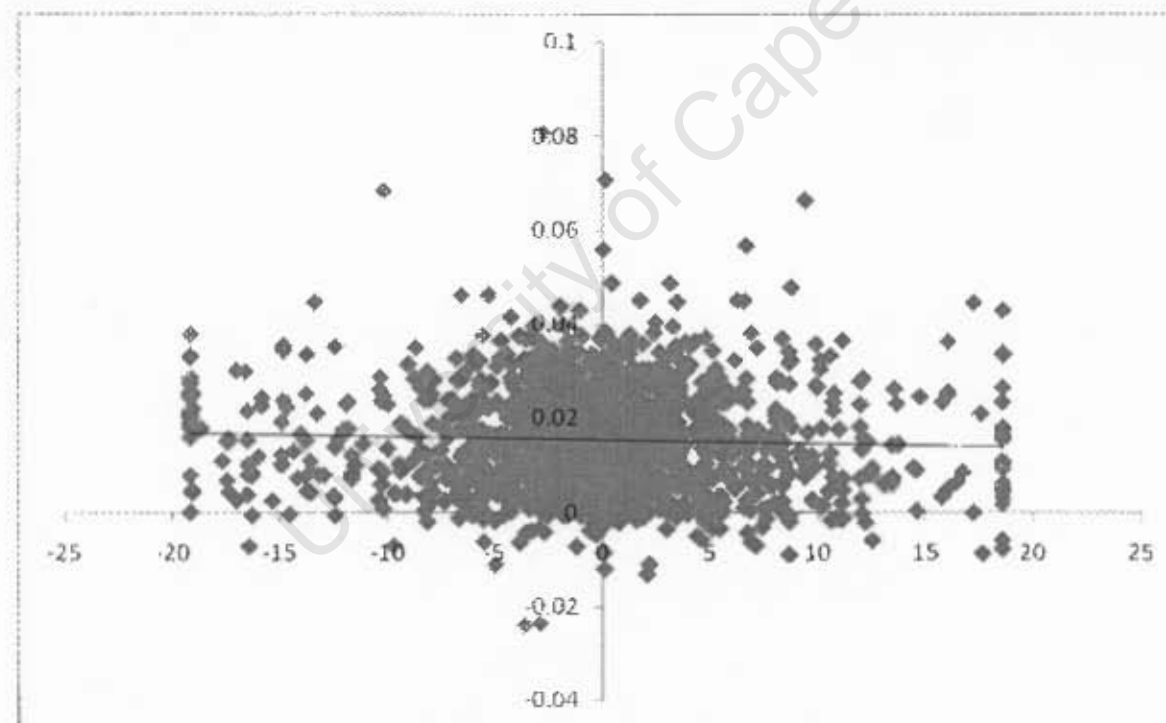
The figure below attempts to present the relationship between the returns on listed emerging market shares and their exposure to certain macroeconomic factors, in this case the US PPI. Fundamental to modern finance theory is that only systematic exposure to risk factors is rewarded with the commensurate return. The diagrammatic representation aims to assess whether or not increased exposure to such macroeconomic variables enables such factors to price risk, whereby increased exposure to such a factor is rewarded with improved return. The mean monthly share return on all 1290 emerging market stocks are plotted on the vertical axis against their respective monthly betas on the horizontal axis in order to discover any such risk: return relationship. The out-sample period spanning from the 1st of January 2000 to the 31st of December 2006 is analysed. All data were sourced from DataStream International Database



Appendix C.6

Figure 6.4 Scatter Plot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the US Short Term Interest Rate

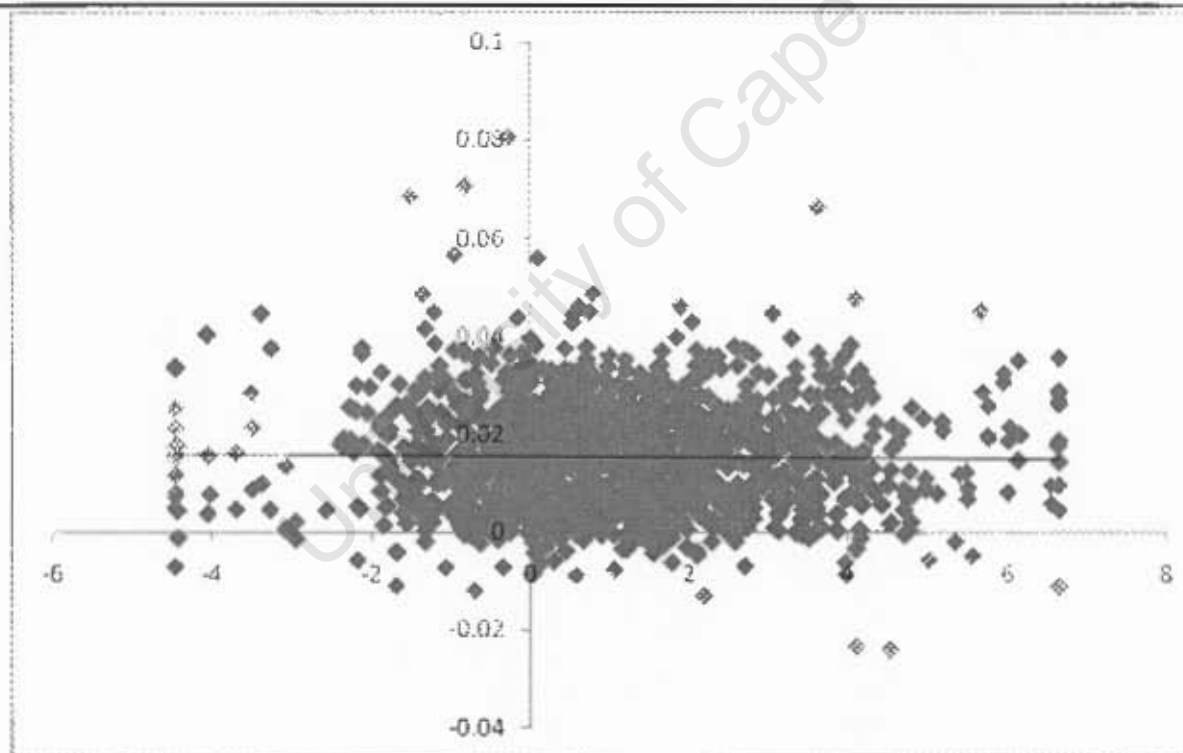
The figure below attempts to present the relationship between the returns on listed emerging market shares and their exposure to certain macroeconomic factors, in this case the US Short Term Interest Rate. Fundamental to modern finance theory is that only systematic exposure to risk factors is rewarded with the commensurate return. The diagrammatic representation aims to assess whether or not increased exposure to such macroeconomic variables enables such factors to price risk, whereby increased exposure to such a factor is rewarded with improved return. The mean monthly share return on all 1290 emerging market stocks are plotted on the vertical axis against their respective monthly betas on the horizontal axis in order to discover any such risk: return relationship. The out-sample period spanning from the 1st of January 2000 to the 31st of December 2006 is analysed. All data were sourced from DataStream International Database



Appendix C.7

Figure 6.4 Scatter Plot of Mean Monthly Emerging Market Stock Return versus Monthly Beta Exposure to the US Three month Treasury Bill

The figure below attempts to present the relationship between the returns on listed emerging market shares and their exposure to certain macroeconomic factors, in this case the US Treasury Bill. Fundamental to modern finance theory is that only systematic exposure to risk factors is rewarded with the commensurate return. The diagrammatic representation aims to assess whether or not increased exposure to such macroeconomic variables enables such factors to price risk, whereby increased exposure to such a factor is rewarded with improved return. The mean monthly share return on all 1290 emerging market stocks are plotted on the vertical axis against their respective monthly betas on the horizontal axis in order to discover any such risk: return relationship. The out-sample period spanning from the 1st of January 2000 to the 31st of December 2006 is analysed. All data were sourced from DataStream International Database



Appendix D

Appendix D.1: Expected Return Model constructed using trailing 1-month moving average timing model – Style (Full Sample)

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the one month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	-0.0034	0.0526	-0.0845	0.0006	0.0862	0.0333	0.0080	0.0925	0.2151	0.0105	0.0931	0.2364	0.0150	0.0916	0.3473	0.0193	0.0981	0.4250	0.0263	0.1054	0.5680	0.0297	0.1045	0.6304	0.0334	0.1008	0.6378	0.0357	0.0948	0.6814
BTMV	0.0161	0.0672	0.4892	0.0185	0.0760	0.5539	0.0244	0.0849	0.6986	0.0246	0.0861	0.7020	0.0279	0.0837	0.7881	0.0305	0.0875	0.8238	0.0402	0.1007	0.9389									
CTTD	-0.0023	0.0393	-0.0714	0.0106	0.0664	0.2879	0.0227	0.0784	0.6095	0.0255	0.0841	0.6880	0.0271	0.0836	0.7310	0.0272	0.0849	0.7105	0.0323	0.1019	0.7410	0.0360	0.0990	0.8208	0.0383	0.0959	0.8031	0.0391	0.0944	0.7926
12_EPS	-0.0053	0.0452	-0.1492	0.0100	0.0664	0.2889	0.0193	0.0765	0.5512	0.0239	0.0851	0.6514	0.0270	0.0827	0.7411	0.0266	0.0848	0.6908	0.0344	0.0985	0.7898	0.0389	0.0973	0.8805	0.0435	0.0972	0.9091			
DTMV	0.0020	0.0690	0.0652	0.0135	0.0825	0.3833	0.0211	0.0894	0.5777	0.0230	0.0907	0.6372	0.0259	0.0886	0.7244	0.0262	0.0870	0.7064	0.0340	0.1016	0.8035	0.0375	0.0976	0.8736	0.0399	0.0950	0.8576	0.0410	0.0934	0.8521
DY	0.0077	0.0523	0.2519	0.0208	0.0655	0.6522	0.0246	0.0766	0.7391	0.0280	0.0854	0.7983																		
EPS	0.0030	0.0776	0.0882	0.0132	0.0737	0.4114	0.0200	0.0765	0.5920	0.0227	0.0855	0.6341	0.0241	0.0840	0.6789	0.0251	0.0855	0.6654	0.0308	0.1032	0.7138	0.0350	0.1013	0.8043	0.0359	0.0941	0.7612	0.0365	0.0933	0.7658
EY	-0.0017	0.0523	-0.0412	0.0127	0.0675	0.3611	0.0186	0.0794	0.5115	0.0205	0.0847	0.5274	0.0201	0.0827	0.5185	0.0199	0.0797	0.4903	0.0217	0.1053	0.4702	0.0240	0.1026	0.5102	0.0210	0.1021	0.4112	0.0226	0.1026	0.4347
ICBT	0.0029	0.0382	0.0936	0.0123	0.0692	0.3445	0.0232	0.0805	0.6440	0.0246	0.0829	0.6833	0.0263	0.0806	0.7336	0.0287	0.0834	0.7601	0.0330	0.1033	0.7783	0.0379	0.1011	0.8794	0.0421	0.1004	0.8887	0.0421	0.0981	0.8620
LNVM	0.0167	0.0751	0.5235																									0.0392	0.0964	0.8001
LNP	-0.0075	0.0746	-0.2488	0.0068	0.0739	0.2070	0.0132	0.0779	0.3871	0.0159	0.0853	0.4416	0.0201	0.0830	0.5675	0.0230	0.0826	0.6154	0.0311	0.1045	0.7203	0.0357	0.0996	0.8181	0.0381	0.0988	0.8053			
MOM_6M	0.0148	0.0804	0.4312	0.0213	0.0810	0.6406																								
MTBV	0.0088	0.0601	0.2642	0.0167	0.0795	0.4846	0.0233	0.0889	0.6524	0.0226	0.0818	0.6359	0.0246	0.0795	0.6996	0.0283	0.0828	0.7626	0.0348	0.1014	0.8103	0.0397	0.0993	0.9263	0.0407	0.0984	0.8656	0.0426	0.0946	0.8887
MTTMV_1	-0.0083	0.0589	-0.2448	-0.0035	0.0854	-0.0904	0.0036	0.0924	0.0877	0.0091	0.0924	0.2004	0.0132	0.0903	0.3015	0.0172	0.0975	0.3734	0.0226	0.1091	0.4727	0.0263	0.1091	0.5444	0.0299	0.1063	0.5554	0.0318	0.1042	0.5653
MTTMV_3	0.0015	0.0520	0.0808	0.0107	0.0885	0.3476	0.0223	0.0896	0.5917	0.0253	0.0878	0.6425	0.0282	0.0870	0.7146	0.0346	0.0917	0.8138	0.0398	0.1021	0.8689	0.0429	0.0991	0.9254						
MTTMV_6	0.0074	0.0622	0.1853	0.0128	0.0881	0.3611	0.0197	0.0970	0.5071	0.0214	0.0962	0.5413	0.0259	0.0961	0.6538	0.0336	0.1035	0.7993	0.0322	0.1028	0.7612	0.0375	0.0998	0.8687	0.0414	0.0967	0.8867	0.0427	0.0944	0.8869
MVTRADMV	-0.0003	0.0731	0.0010	0.0133	0.0862	0.3907	0.0179	0.0913	0.4994	0.0200	0.0923	0.5445	0.0236	0.0877	0.6515	0.0286	0.0924	0.7299	0.0295	0.0986	0.7106	0.0332	0.0973	0.7954	0.0303	0.0958	0.6691	0.0326	0.0934	0.6947
MVTRACE	0.0000	0.0852	0.0271	0.0121	0.0878	0.3597	0.0177	0.0924	0.5081	0.0204	0.0908	0.5532	0.0256	0.0846	0.7032	0.0325	0.0914	0.8239	0.0351	0.1032	0.8325	0.0388	0.1001	0.9125	0.0394	0.0987	0.8343	0.0396	0.0964	0.8168
PC	0.0114	0.0575	0.3530	0.0159	0.0725	0.4783	0.0231	0.0826	0.6564	0.0229	0.0851	0.6518	0.0258	0.0824	0.7360	0.0281	0.0847	0.7579	0.0366	0.1034	0.8744	0.0406	0.1013	0.9545	0.0430	0.0991	0.9300	0.0433	0.0975	0.9076
P	-0.0013	0.0660	-0.0459	0.0080	0.0709	0.2501	0.0146	0.0748	0.4325	0.0185	0.0831	0.5186	0.0228	0.0807	0.6478	0.0241	0.0815	0.6504	0.0307	0.1029	0.7197	0.0352	0.0997	0.8163	0.0386	0.0985	0.8205	0.0398	0.0958	0.8187
PTBV	0.0141	0.0568	0.4373	0.0182	0.0786	0.5375	0.0250	0.0889	0.7103																					
ROCE	0.0106	0.0679	0.2766	0.0128	0.0779	0.3194	0.0226	0.0878	0.5867	0.0278	0.0882	0.7403	0.0292	0.0869	0.7867															
SALESTP	0.0106	0.0695	0.3154	0.0147	0.0819	0.4240	0.0233	0.0879	0.6431	0.0222	0.0899	0.6142	0.0234	0.0866	0.6533	0.0237	0.0859	0.6369	0.0340	0.1020	0.8064	0.0379	0.0975	0.8909	0.0400	0.0987	0.8651	0.0422	0.0962	0.8880
VO_1	-0.0037	0.0564	-0.0845	0.0004	0.0846	0.0385	0.0086	0.0910	0.2392	0.0149	0.0894	0.3652	0.0194	0.0873	0.4772	0.0234	0.0944	0.5413	0.0265	0.1010	0.5787	0.0307	0.0999	0.6649	0.0336	0.0971	0.6633	0.0362	0.0941	0.6883
VO_3	0.0017	0.0522	0.0907	0.0109	0.0889	0.3551	0.0222	0.0891	0.5899	0.0260	0.0874	0.6567	0.0287	0.0863	0.7228	0.0349	0.0917	0.8173	0.0401	0.1026	0.8728	0.0429	0.0992	0.9228	0.0390	0.0992	0.8245	0.0405	0.0980	0.8323
VO_6	0.0089	0.0612	0.2155	0.0138	0.0878	0.3736	0.0194	0.0962	0.5054	0.0224	0.0970	0.5625	0.0268	0.0971	0.6738	0.0350	0.1049	0.8298												
FACTOR NR.	1			2			3			4			5			6			7		8			9			10			
SIGNIFICANT	0.0167			0.0213			0.0250			0.0280			0.0292			0.0350			0.0402		0.0429			0.0435			0.0433			
FACTOR	LNVM			MOM_6M			PTBV			DY			ROCE			VO_6			BTMV		MTTMV_3			12_EPS			PC			

Appendix D.2: Expected Return Model constructed using trailing 3-month moving average timing model – Style (Full Sample)

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the three month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	5E-05	0.0526	-0.0845	0.0188	0.0712	0.4697	0.0259	0.0734	0.7458	0.0164	0.0833	0.4303
BTMV	0.0237	0.0672	0.4892									
CITD	0.0057	0.0393	-0.0714	0.0212	0.0581	0.6119	0.0293	0.0680	0.8510	0.0224	0.0732	0.6366
12_EPS	0.0010	0.0452	-0.1492	0.0228	0.0569	0.6714	0.0319	0.0689	0.9164	0.0287	0.0680	0.8013
DTMV	0.0059	0.0690	0.0652	0.0249	0.0664	0.7377	0.0350	0.0661	0.9951			
DY	0.0122	0.0523	0.2519	0.0265	0.0668	0.8210	0.0314	0.0697	0.9083	0.0310	0.0700	0.9034
EPS	0.0057	0.0776	0.0882	0.0200	0.0764	0.6162	0.0315	0.0707	0.9060	0.0274	0.0774	0.7894
EY	-0.0007	0.0523	-0.0412	0.0129	0.0696	0.3689	0.0311	0.0765	0.8859	0.0153	0.0679	0.4123
ICBT	0.0027	0.0382	0.0936	0.0215	0.0563	0.6499	0.0311	0.0710	0.9098	0.0268	0.0712	0.7727
LNMV	0.0092	0.0751	0.5235	0.0244	0.0766	0.7568	0.0301	0.0694	0.8674	0.0283	0.0775	0.8233
LNP	0.0043	0.0746	-0.2488	0.0187	0.0666	0.6115	0.0311	0.0689	0.8920	0.0278	0.0730	0.8353
MOM_6M	0.0019	0.0804	0.4312	0.0237	0.0754	0.7198	0.0329	0.0688	0.9490	0.0280	0.0818	0.8093
MTBV	0.0120	0.0601	0.2642	0.0255	0.0552	0.7733	0.0300	0.0693	0.8802	0.0286	0.0687	0.8351
MTTMV_1	0.0002	0.0589	-0.2448	0.0169	0.0711	0.4165	0.0268	0.0734	0.7719	0.0165	0.0829	0.4024
MTTMV_3	0.0037	0.0520	0.0808	0.0243	0.0606	0.5892	0.0269	0.0709	0.7669	0.0223	0.0812	0.5578
MTTMV_6	0.0112	0.0622	0.1853	0.0191	0.0685	0.4455	0.0263	0.0733	0.7587	0.0234	0.0787	0.5518
MVTRADEM	-9E-05	0.0731	0.0010	0.0188	0.0741	0.5148	0.0307	0.0752	0.8884	0.0236	0.0823	0.6123
MVTRADE	0.0175	0.0852	0.0271	0.0261	0.0705	0.7293	0.0300	0.0741	0.8704	0.0275	0.0824	0.7271
PC	0.0145	0.0575	0.3530	0.0253	0.0619	0.7791	0.0306	0.0693	0.8852	0.0297	0.0712	0.8614
P	0.0043	0.0660	-0.0459	0.0225	0.0615	0.7116	0.0309	0.0690	0.8903	0.0287	0.0695	0.8481
PTBV	0.0157	0.0568	0.4373	0.0242	0.0566	0.7348	0.0303	0.0668	0.8853	0.0274	0.0709	0.7982
ROCE	0.0139	0.0679	0.2766	0.0318	0.0692	0.9189						
SALESTP	0.0093	0.0695	0.3154	0.0266	0.0678	0.7982	0.0299	0.0697	0.8659	0.0291	0.0717	0.8328
VO_1	0.0051	0.0564	-0.0845	0.0192	0.0677	0.4848	0.0273	0.0738	0.7869	0.0185	0.0808	0.4653
VO_3	0.0039	0.0522	0.0907	0.0242	0.0606	0.5889	0.0269	0.0708	0.7670	0.0221	0.0814	0.5537
VO_6	0.0108	0.0612	0.2155	0.0190	0.0679	0.4425	0.0273	0.0728	0.7893	0.0227	0.0790	0.5382
FACTOR NR.	1			2			3			4		
SIGNIFICANT	0.0237			0.0318			0.0350			0.0310		
FACTOR	BTMV			ROCE			DTMV			DY		

Appendix D.3: Expected Return Model constructed using trailing 6-month moving average timing model – Style (Full Sample)

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the six month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	
ATURN	-0.0047	0.0522	-0.1635	0.0193	0.0843	0.5450	0.0212	0.0839	0.6063	0.0260	0.0815	0.6936	0.0359	0.0794	0.8896	0.0371	0.0796	0.9227	0.0368	0.0776	0.9138	0.0303	0.0701	0.7522	0.0352	0.0777	0.8729	
BTMV	0.0217	0.0662	0.6562	0.0284	0.0701	0.8711	0.0403	0.0791	1.0824																			
CTTD	0.0025	0.0395	0.0605	0.0187	0.0693	0.5392	0.0299	0.0792	0.7697	0.0364	0.0802	0.9360	0.0406	0.0795	1.0289	0.0420	0.0794	1.0658	0.0423	0.0796	1.0740	0.0428	0.0821	1.0689	0.0417	0.0816	1.0442	
12_EPS	-0.0063	0.0452	-0.1884	0.0193	0.0684	0.5973	0.0313	0.0780	0.8408	0.0376	0.0728	0.9787	0.0399	0.0723	1.0212	0.0431	0.0742	1.1033	0.0440	0.0754	1.1234	0.0438	0.0779	1.1216	0.0423	0.0748	1.0931	
DTMV	0.0061	0.0687	0.1839	0.0193	0.0812	0.5829	0.0333	0.0898	0.8831	0.0377	0.0879	1.0004	0.0413	0.0835	1.0806	0.0432	0.0834	1.1312	0.0435	0.0827	1.1372	0.0442	0.0845	1.1430	0.0439	0.0829	1.1374	
DY	0.0163	0.0504	0.5354	0.0242	0.0653	0.7819	0.0362	0.0779	1.0083	0.0407	0.0797	1.0941	0.0443	0.0771	1.1747													
EPS	0.0164	0.0739	0.5115	0.0208	0.0727	0.6675	0.0338	0.0794	0.9370	0.0415	0.0777	1.0911	0.0437	0.0768	1.1382	0.0448	0.0796	1.1688	0.0466	0.0804	1.2145							
EY	0.0025	0.0492	0.0911	0.0135	0.0748	0.3904	0.0224	0.0844	0.6004	0.0325	0.0775	0.8096	0.0377	0.0746	0.9072	0.0375	0.0820	0.9109	0.0381	0.0816	0.9234	0.0360	0.0825	0.8767	0.0366	0.0807	0.8865	
ICBT	0.0007	0.0366	0.0352	0.0164	0.0703	0.5065	0.0296	0.0794	0.7888	0.0411	0.0762	1.0809	0.0437	0.0750	1.1353	0.0442	0.0754	1.1533	0.0447	0.0763	1.1639	0.0454	0.0811	1.1633	0.0446	0.0790	1.1507	
LNMV	0.0236	0.0738	0.7605																									
LNP	0.0036	0.0744	0.1421	0.0203	0.0757	0.6656	0.0335	0.0820	0.9357	0.0380	0.0768	1.0161	0.0415	0.0745	1.0985	0.0426	0.0757	1.1307	0.0436	0.0766	1.1539	0.0431	0.0780	1.1274	0.0435	0.0763	1.1403	
MOH_GH	-0.0041	0.0800	-0.1182	0.0121	0.0818	0.4004	0.0289	0.0853	0.8051	0.0405	0.0812	1.0892	0.0422	0.0815	1.1245	0.0446	0.0829	1.1845	0.0456	0.0823	1.2051	0.0455	0.0847	1.1820	0.0437	0.0836	1.1355	
MTBV	0.0131	0.0586	0.3923	0.0239	0.0711	0.7291	0.0329	0.0829	0.8683	0.0430	0.0776	1.1387																
MTTMV_1	-0.0017	0.0596	-0.0567	0.0158	0.0820	0.4333	0.0204	0.0860	0.5755	0.0246	0.0838	0.6516	0.0347	0.0816	0.8511	0.0363	0.0814	0.8925	0.0363	0.0788	0.8941	0.0349	0.0819	0.8477	0.0334	0.0788	0.8256	
MTTMV_3	-0.0009	0.0523	-0.0119	0.0176	0.0808	0.5073	0.0170	0.0847	0.4963	0.0195	0.0729	0.5116	0.0293	0.0715	0.7015	0.0313	0.0724	0.7625	0.0330	0.0721	0.8105	0.0324	0.0803	0.8111	0.0309	0.0782	0.7720	
MTTMV_6	0.0080	0.0609	0.2039	0.0190	0.0766	0.5012	0.0249	0.0819	0.6668	0.0224	0.0844	0.5705	0.0275	0.0826	0.6845	0.0285	0.0795	0.7222	0.0293	0.0824	0.7408	0.0312	0.0905	0.7729	0.0289	0.0860	0.7241	
MVTRADTMV	0.0036	0.0730	0.1169	0.0199	0.0872	0.6077	0.0299	0.0793	0.8345	0.0390	0.0815	1.0481	0.0388	0.0807	1.0311	0.0431	0.0772	1.1448	0.0437	0.0770	1.1581	0.0458	0.0786	1.1992				
MVTRADE	0.0230	0.0817	0.6572	0.0346	0.0809	0.9651																						
PC	0.0141	0.0567	0.4329	0.0240	0.0723	0.7384	0.0363	0.0832	0.9758	0.0417	0.0798	1.1193	0.0439	0.0774	1.1579	0.0450	0.0773	1.1880										
P	0.0029	0.0650	0.1202	0.0186	0.0679	0.6124	0.0307	0.0768	0.8563	0.0372	0.0727	0.9968	0.0399	0.0707	1.0560	0.0419	0.0735	1.1102	0.0430	0.0746	1.1354	0.0439	0.0780	1.1446	0.0431	0.0757	1.1300	
PTBV	0.0123	0.0560	0.3787	0.0217	0.0724	0.6655	0.0342	0.0822	0.9103	0.0420	0.0790	1.1175	0.0403	0.0755	1.0647	0.0416	0.0758	1.0987	0.0430	0.0750	1.1388	0.0453	0.0784	1.1810	0.0444	0.0764	1.1653	
ROCE	0.0080	0.0678	0.2504	0.0174	0.0821	0.5172	0.0283	0.0887	0.7437	0.0374	0.0890	0.9795	0.0420	0.0834	1.0907	0.0440	0.0833	1.1361	0.0449	0.0829	1.1606	0.0455	0.0864	1.1648	0.0414	0.0847	1.0542	
SALESTP	0.0180	0.0685	0.5491	0.0219	0.0774	0.6558	0.0335	0.0815	0.8868	0.0388	0.0790	1.0261	0.0415	0.0751	1.0820	0.0435	0.0765	1.1364	0.0434	0.0761	1.1310	0.0447	0.0805	1.1516	0.0439	0.0789	1.1372	
VO_1	-0.0016	0.0562	-0.0444	0.0205	0.0815	0.5664	0.0231	0.0851	0.6551	0.0275	0.0838	0.7340	0.0371	0.0810	0.9225	0.0387	0.0818	0.9616	0.0390	0.0793	0.9697	0.0368	0.0815	0.9075	0.0354	0.0783	0.8864	
VO_3	0.0015	0.0524	0.0551	0.0166	0.0818	0.4856	0.0168	0.0851	0.4916	0.0195	0.0733	0.5120	0.0295	0.0721	0.7039	0.0315	0.0732	0.7651	0.0330	0.0726	0.8097	0.0324	0.0806	0.8116	0.0315	0.0788	0.7830	
VO_6	0.0062	0.0604	0.1672	0.0185	0.0760	0.4883	0.0248	0.0823	0.6626	0.0227	0.0850	0.5760	0.0274	0.0830	0.6799	0.0284	0.0801	0.7195	0.0289	0.0829	0.7327	0.0311	0.0905	0.7701	0.0289	0.0861	0.7238	
FACTOR NR.	1			2			3			4			5			6			7			8			9			
SIGNIFICANT	0.0236			0.0346			0.0403			0.0430			0.0443			0.0450			0.0466			0.0458			0.0446			
FACTOR	LNMV			MVTRADE			BTMV			MTBV			DY			PC			EPS			MVTRADTMV			ICBT			

Appendix D.4: Expected Return Model constructed using trailing 12-month moving average timing model – Style (Full Sample)

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the twelve month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	-0.0025	0.0526	-0.0658	0.0280	0.0719	0.7430	0.0343	0.0869	0.8746	0.0386	0.0826	0.9817	0.0393	0.0768	0.9853	0.0402	0.0763	1.0060
BTMV	0.0303	0.0634	0.9288															
CTTD	-0.0002	0.0388	-0.0172	0.0294	0.0581	0.8472	0.0366	0.0783	0.9460	0.0416	0.0844	1.0900	0.0426	0.0826	1.0905	0.0447	0.0829	1.1449
12_EPS	-0.0021	0.0456	-0.0602	0.0310	0.0591	0.9113	0.0362	0.0727	0.9690	0.0387	0.0780	1.0455	0.0401	0.0766	1.0584	0.0421	0.0791	1.1098
DTMV	0.0055	0.0688	0.1818	0.0259	0.0646	0.7932	0.0336	0.0837	0.8938	0.0387	0.0837	1.0381	0.0399	0.0821	1.0478	0.0422	0.0818	1.1113
DY	0.0154	0.0502	0.5085	0.0340	0.0551	1.0418	0.0403	0.0753	1.1047	0.0449	0.0785	1.2268	0.0474	0.0770	1.2655			
EPS	0.0051	0.0741	0.1701	0.0280	0.0661	0.8560	0.0392	0.0775	1.0532	0.0418	0.0790	1.1290	0.0422	0.0786	1.1146	0.0433	0.0804	1.1477
EY	0.0050	0.0473	0.1524	0.0229	0.0686	0.6453	0.0316	0.0808	0.7866	0.0322	0.0783	0.8142	0.0343	0.0793	0.8452	0.0322	0.0826	0.8007
ICBT	-0.0056	0.0361	-0.1742	0.0275	0.0579	0.8281	0.0409	0.0720	1.0846	0.0452	0.0765	1.2054						
LMV	0.0073	0.0770	0.2443	0.0257	0.0672	0.7904	0.0329	0.0808	0.8849	0.0389	0.0804	1.0525	0.0401	0.0793	1.0608	0.0425	0.0797	1.1295
LNP	0.0027	0.0732	0.0970	0.0241	0.0644	0.7459	0.0358	0.0739	0.9675	0.0407	0.0761	1.1079	0.0418	0.0755	1.1125	0.0443	0.0742	1.1821
MOM_6M	0.0023	0.0784	0.0974	0.0313	0.0655	0.9840	0.0440	0.0775	1.1992									
MTBV	0.0066	0.0603	0.2018	0.0293	0.0547	0.8927	0.0411	0.0719	1.1063	0.0433	0.0766	1.1714	0.0447	0.0755	1.1846	0.0471	0.0767	1.2504
MTTMV_1	0.0002	0.0604	0.0101	0.0307	0.0717	0.8032	0.0347	0.0879	0.8790	0.0378	0.0817	0.9554	0.0383	0.0764	0.9597	0.0393	0.0759	0.9823
MTTMV_3	0.0042	0.0509	0.1125	0.0149	0.0730	0.4021	0.0287	0.0729	0.7120	0.0345	0.0772	0.8639	0.0383	0.0747	0.9258	0.0394	0.0765	0.9561
MTTMV_6	0.0028	0.0606	0.0942	0.0218	0.0617	0.5436	0.0332	0.0783	0.8359	0.0368	0.0808	0.9324	0.0382	0.0792	0.9416	0.0393	0.0791	0.9754
MVTRADEMV	0.0043	0.0748	0.1518	0.0346	0.0675	0.9389	0.0372	0.0783	1.0158	0.0401	0.0806	1.0962	0.0441	0.0782	1.1742	0.0412	0.0804	1.1020
MVTRADE	0.0246	0.0823	0.6926	0.0398	0.0744	1.0812												
PC	0.0152	0.0565	0.4692	0.0330	0.0577	1.0016	0.0431	0.0749	1.1580	0.0448	0.0790	1.2147	0.0462	0.0790	1.2288	0.0470	0.0797	1.2525
P	0.0053	0.0630	0.1787	0.0277	0.0584	0.8374	0.0372	0.0709	1.0043	0.0421	0.0753	1.1480	0.0438	0.0751	1.1653	0.0460	0.0765	1.2781
PTBV	0.0148	0.0565	0.4543	0.0314	0.0564	0.9518	0.0411	0.0732	1.1045	0.0424	0.0769	1.1515	0.0443	0.0767	1.1746	0.0467	0.0777	1.2413
ROCE	0.0072	0.0683	0.2268	0.0288	0.0625	0.8668	0.0358	0.0816	0.9546	0.0407	0.0846	1.0859	0.0420	0.0851	1.1008	0.0435	0.0861	1.1388
SALESTP	0.0221	0.0671	0.6353	0.0358	0.0572	1.0522	0.0401	0.0736	1.0551	0.0418	0.0769	1.1178	0.0436	0.0749	1.1442	0.0452	0.0756	1.1860
VO_1	0.0001	0.0571	0.0175	0.0293	0.0691	0.7581	0.0372	0.0858	0.9536	0.0389	0.0792	0.9822	0.0400	0.0750	0.9997	0.0408	0.0751	1.0162
VO_3	0.0038	0.0513	0.0995	0.0148	0.0731	0.4018	0.0286	0.0733	0.7101	0.0343	0.0773	0.8590	0.0382	0.0747	0.9239	0.0392	0.0766	0.9532
VO_6	0.0003	0.0601	0.0210	0.0240	0.0597	0.5957	0.0335	0.0780	0.8414	0.0367	0.0805	0.9275	0.0380	0.0789	0.9357	0.0391	0.0787	0.9675
FACTOR NR.	1			2			3			4			5			6		
SIGNIFICANT	0.0303			0.0398			0.0440			0.0452			0.0474			0.0471		
FACTOR	BTMV			MVTRADE			MOM_6M			ICBT			DY			MTBV		

Appendix D.5: Expected Return Model constructed using trailing 18-month moving average timing model – Style (Full Sample)

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the eighteen month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	0.0023	0.0522	0.0238	0.0166	0.0856	0.5296	0.0274	0.0861	0.7721	0.0336	0.0777	0.8980	0.0289	0.0835	0.7984	0.0308	0.0856	0.8306	0.0057	0.0835	0.1829
BTMV	0.0306	0.0645	0.9433	0.0413	0.0761	1.1213															
CTTD	-0.0022	0.0391	-0.0695	0.0291	0.0779	0.7687	0.0412	0.0782	1.0690	0.0431	0.0770	1.1185	0.0441	0.0743	1.1208	0.0450	0.0723	1.1339	0.0374	0.0761	0.9858
12_EPS	-0.0037	0.0446	-0.1049	0.0275	0.0732	0.7539	0.0401	0.0726	1.0607	0.0426	0.0705	1.1315	0.0447	0.0705	1.1623	0.0424	0.0704	1.0812	0.0494	0.0743	1.2835
DTMV	0.0104	0.0659	0.3115	0.0223	0.0835	0.5965	0.0379	0.0775	1.0084	0.0412	0.0746	1.1015	0.0431	0.0758	1.1275	0.0404	0.0669	1.0778	0.0272	0.0649	0.6989
DY	0.0120	0.0494	0.3991	0.0371	0.0761	1.0462	0.0464	0.0733	1.2594												
EPS	-0.0109	0.0677	-0.3420	0.0165	0.0850	0.4749	0.0325	0.0768	0.8884	0.0330	0.0768	0.9082	0.0341	0.0781	0.9187	0.0365	0.0709	0.9537	0.0490	0.0753	1.2721
EY	0.0053	0.0422	0.1458	0.0204	0.0792	0.5033	0.0309	0.0761	0.7546	0.0252	0.0748	0.6288	0.0237	0.0695	0.6003	0.0202	0.0718	0.5186	0.0098	0.0744	0.2469
ICBT	0.0019	0.0372	0.0674	0.0280	0.0787	0.7547	0.0434	0.0729	1.1533	0.0480	0.0728	1.2750									
LNMV	-0.0033	0.0764	-0.1000	0.0220	0.0848	0.6239	0.0338	0.0804	0.9227	0.0362	0.0791	0.9861	0.0375	0.0794	1.0001	0.0392	0.0786	1.0180	0.0442	0.0698	1.1507
LNP	0.0057	0.0726	0.1987	0.0314	0.0819	0.8966	0.0377	0.0766	1.0284	0.0415	0.0751	1.1321	0.0429	0.0753	1.1477	0.0443	0.0720	1.1516	0.0422	0.0713	1.0965
MOM_6M	0.0025	0.0759	0.1085	0.0288	0.0816	0.8127	0.0442	0.0831	1.2095	0.0471	0.0835	1.2800	0.0488	0.0820	1.3013	0.0490	0.0814	1.2825	-0.0011	0.0762	-0.0030
MTBV	0.0115	0.0596	0.3608	0.0243	0.0796	0.6599	0.0377	0.0768	1.0251	0.0427	0.0734	1.1638	0.0443	0.0736	1.1822	0.0458	0.0714	1.1930	0.0182	0.0752	0.5111
MTTMV_1	0.0047	0.0593	0.1351	0.0154	0.0873	0.4978	0.0254	0.0886	0.7244	0.0310	0.0801	0.8452	0.0277	0.0846	0.7761	0.0295	0.0863	0.8029	0.0111	0.0790	0.3140
MTTMV_3	0.0020	0.0499	0.0815	0.0225	0.0778	0.5822	0.0288	0.0767	0.7100	0.0307	0.0761	0.7578	0.0340	0.0757	0.8154	0.0375	0.0750	0.8838	0.0339	0.0737	0.8825
MTTMV_8	0.0046	0.0600	0.1362	0.0285	0.0845	0.7501	0.0342	0.0842	0.8621	0.0367	0.0820	0.9211	0.0386	0.0805	0.9428	0.0371	0.0837	0.8871	0.0321	0.0809	0.8301
MVTRADEMV	0.0090	0.0750	0.2342	0.0301	0.0791	0.8430	0.0397	0.0794	1.0817	0.0389	0.0792	1.0577	0.0399	0.0793	1.0606	0.0394	0.0768	1.0213	0.0031	0.0699	0.0797
MVTRADE	0.0307	0.0824	0.8564																		
PC	0.0182	0.0553	0.5496	0.0332	0.0799	0.9023	0.0441	0.0761	1.1867	0.0466	0.0752	1.2586	0.0487	0.0755	1.2905	0.0490	0.0747	1.2741			
P	-0.0083	0.0616	-0.2597	0.0274	0.0755	0.7770	0.0411	0.0721	1.1120	0.0440	0.0741	1.1970	0.0453	0.0736	1.2071	0.0464	0.0727	1.2054	0.0492	0.0746	1.2763
PTBV	0.0196	0.0548	0.6069	0.0285	0.0768	0.7838	0.0373	0.0774	1.0075	0.0433	0.0735	1.1745	0.0450	0.0738	1.1940	0.0472	0.0716	1.2245	0.0172	0.0726	0.4827
ROCE	0.0077	0.0652	0.2550	0.0263	0.0823	0.7079	0.0408	0.0785	1.0721	0.0411	0.0795	1.0844	0.0419	0.0797	1.0845	0.0424	0.0784	1.0892	0.0414	0.0759	1.0853
SALESTP	0.0281	0.0626	0.8320	0.0393	0.0744	1.0580	0.0463	0.0732	1.2189	0.0475	0.0728	1.2542	0.0489	0.0724	1.2681						
VO_1	0.0019	0.0562	0.0609	0.0179	0.0864	0.5635	0.0294	0.0849	0.8333	0.0323	0.0797	0.8852	0.0298	0.0838	0.8315	0.0306	0.0863	0.8316	0.0255	0.0805	0.7024
VO_3	-0.0012	0.0503	0.0011	0.0224	0.0781	0.5808	0.0288	0.0772	0.7102	0.0308	0.0763	0.7587	0.0342	0.0759	0.8186	0.0376	0.0751	0.8864	0.0344	0.0739	0.8945
VO_8	0.0043	0.0593	0.1279	0.0284	0.0848	0.7484	0.0342	0.0846	0.8616	0.0371	0.0819	0.9310	0.0389	0.0803	0.9506	0.0372	0.0838	0.8909	0.0341	0.0815	0.8804
FACTOR NR.	1			2			3			4			5			6			7		
SIGNIFICANT	0.0307			0.0413			0.0464			0.0480			0.0489			0.0490			0.0494		
FACTOR	MVTRADE			BTMV			DY			ICBT			SALESTP			PC			12_EPS		

Appendix D.6: Expected Return Model constructed using trailing 1-month moving average timing model – Style (Restricted Sample)

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the one month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	0.0047	0.0302	0.1552	0.0448	0.0608	1.3064	0.0490	0.0570	1.3884	0.0548	0.0684	1.5526	0.0561	0.0923	1.5538	0.0600	0.0886	1.6417
BTMV	0.0502	0.0724	1.5882															
CTTD	0.0020	0.0387	0.0661	0.0467	0.0605	1.4067	0.0484	0.0585	1.4482	0.0585	0.0633	1.7452	0.0602	0.0875	1.7776	0.0635	0.0835	1.8538
12_EPS	0.0163	0.0435	0.5244	0.0478	0.0666	1.4855	0.0496	0.0653	1.5034	0.0545	0.0672	1.6504	0.0572	0.0906	1.7237	0.0614	0.0856	1.8341
DTMV	-0.0012	0.0652	-0.0163	0.0393	0.0719	1.2846	0.0417	0.0615	1.3356	0.0505	0.0657	1.5927	0.0538	0.0868	1.6709	0.0571	0.0818	1.7585
DY	0.0095	0.0556	0.3113	0.0462	0.0658	1.4605	0.0459	0.0639	1.4417	0.0558	0.0680	1.7253	0.0605	0.0885	1.8516	0.0633	0.0845	1.9289
EPS	0.0000	0.0848	-0.0066	0.0340	0.0833	1.0618	0.0349	0.0776	1.0600	0.0459	0.0761	1.3991	0.0501	0.0938	1.5230	0.0555	0.0869	1.6687
EY	-0.0006	0.0534	-0.0205	0.0330	0.0735	0.9575	0.0386	0.0689	1.1138	0.0467	0.0729	1.3243	0.0533	0.0907	1.4971	0.0549	0.0879	1.5349
ICBT	0.0018	0.0346	0.0565	0.0463	0.0592	1.4411	0.0473	0.0572	1.4582	0.0549	0.0635	1.6782	0.0563	0.0860	1.7106	0.0596	0.0812	1.7942
LNBMV	0.0090	0.0959	0.2856	0.0418	0.0817	1.3150	0.0447	0.0817	1.3743	0.0536	0.0771	1.6405	0.0579	0.0937	1.7705	0.0601	0.0910	1.8239
LNP	0.0047	0.0868	0.1671	0.0337	0.0864	1.1180	0.0322	0.0831	1.0664	0.0446	0.0853	1.4281	0.0498	0.0953	1.5716	0.0527	0.0883	1.6518
MOM_6M	0.0123	0.0921	0.4117	0.0521	0.0909	1.6605	0.0536	0.0830	1.6877	0.0600	0.0874	1.8381						
MTBV	0.0196	0.0577	0.6147	0.0535	0.0640	1.6508												
MTTMV_1	-0.0081	0.0548	-0.1851	0.0303	0.0819	0.8080	0.0342	0.0792	0.9159	0.0435	0.0776	1.1649	0.0421	0.0935	1.1647	0.0438	0.0904	1.1960
MTTMV_3	0.0058	0.0564	0.1946	0.0389	0.0765	0.9852	0.0405	0.0762	1.0327	0.0425	0.0821	1.0675	0.0429	0.0947	1.1012	0.0415	0.0890	1.0759
MTTMV_6	0.0038	0.0593	0.1298	0.0199	0.0881	0.5616	0.0255	0.0859	0.6969	0.0392	0.0865	1.0424	0.0386	0.0992	1.0412	0.0402	0.0913	1.0734
MVTRADEMV	-0.0002	0.0401	-0.0124	0.0399	0.0673	1.0039	0.0418	0.0674	1.0189	0.0506	0.0714	1.2161	0.0569	0.0799	1.3716	0.0603	0.0772	1.4684
MVTRADE	-0.0065	0.1065	-0.1464	0.0305	0.0957	0.9217	0.0290	0.0946	0.8752	0.0381	0.0896	1.1207	0.0418	0.1011	1.2146	0.0433	0.0964	1.2420
PC	0.0220	0.0602	0.6978	0.0485	0.0635	1.4986	0.0488	0.0649	1.5000	0.0585	0.0658	1.7777	0.0615	0.0869	1.8588	0.0627	0.0855	1.8917
P	0.0036	0.0716	0.1241	0.0371	0.0774	1.2079	0.0376	0.0716	1.2081	0.0448	0.0779	1.4132	0.0508	0.0915	1.5822	0.0546	0.0826	1.6817
PTBV	0.0233	0.0656	0.7269	0.0481	0.0653	1.4834	0.0498	0.0590	1.5439	0.0596	0.0618	1.8215	0.0634	0.0829	1.9246			
ROCE	0.0121	0.0619	0.3775	0.0522	0.0718	1.6343	0.0583	0.0639	1.7963									
SALESTP	-0.0018	0.0348	-0.0526	0.0379	0.0669	1.0768	0.0423	0.0645	1.1743	0.0498	0.0619	1.3721	0.0518	0.0924	1.4141	0.0551	0.0903	1.4932
VO_1	-0.0053	0.0524	-0.1625	0.0305	0.0789	0.7865	0.0369	0.0762	0.9628	0.0429	0.0742	1.1186	0.0395	0.0944	1.0440	0.0420	0.0917	1.0959
VO_3	0.0050	0.0557	0.1749	0.0393	0.0751	1.0028	0.0413	0.0749	1.0578	0.0428	0.0809	1.0775	0.0440	0.0958	1.1295	0.0418	0.0887	1.0821
VO_6	0.0049	0.0588	0.1663	0.0194	0.0870	0.5494	0.0245	0.0856	0.6739	0.0390	0.0865	1.0370	0.0387	0.0994	1.0421	0.0401	0.0914	1.0722
FACTOR NR.	1			2			3			4			5			6		
SIGNIFICANT	0.0502			0.0535			0.0583			0.0600			0.0634			0.0635		
FACTOR	BTMV			MTBV			ROCE			MOM_6M			PTBV			CTTD		

Appendix D.7: Expected Return Model constructed using trailing 3-month moving average timing model – Style (Restricted Sample)

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the three month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	0.0041	0.0306	0.1351	0.0452	0.0731	1.3275	0.0592	0.0762	1.6889	0.0673	0.0765	1.8922
BTMV	0.0469	0.0756	1.5015									
CTTD	0.0013	0.0367	0.0414	0.0477	0.0733	1.4695	0.0546	0.0745	1.6653	0.0638	0.0767	1.9219
12_EPS	0.0129	0.0448	0.4228	0.0515	0.0712	1.5972	0.0651	0.0709	1.9752	0.0708	0.0758	2.1366
DTMV	0.0077	0.0648	0.2659	0.0434	0.0787	1.4081	0.0567	0.0772	1.7945	0.0637	0.0771	1.9963
DY	0.0178	0.0539	0.5744	0.0517	0.0647	1.6460	0.0624	0.0728	1.9404	0.0690	0.0755	2.1360
EPS	0.0231	0.0801	0.7618	0.0576	0.0765	1.7899	0.0619	0.0769	1.9042	0.0663	0.0776	2.0325
EY	0.0028	0.0539	0.0822	0.0395	0.0701	1.1442	0.0497	0.0727	1.4113	0.0550	0.0793	1.5492
ICBT	0.0074	0.0338	0.2397	0.0462	0.0685	1.4707	0.0571	0.0727	1.7665	0.0660	0.0762	2.0192
LNMV	0.0125	0.0932	0.4115	0.0436	0.0878	1.4102	0.0522	0.0823	1.6399	0.0602	0.0802	1.8682
LNP	0.0351	0.0804	1.1943	0.0595	0.0831	1.8662	0.0686	0.0774	2.1227			
MOM_6M	0.0103	0.0892	0.3589	0.0497	0.0856	1.6151	0.0561	0.0899	1.7834	0.0618	0.0869	1.9410
MTBV	0.0211	0.0568	0.6622	0.0497	0.0669	1.5620	0.0597	0.0669	1.8530	0.0657	0.0754	2.0306
MTTMV_1	0.0102	0.0548	0.2807	0.0467	0.0807	1.2104	0.0554	0.0818	1.4426	0.0659	0.0940	1.6866
MTTMV_3	0.0065	0.0564	0.2195	0.0444	0.0730	1.1250	0.0476	0.0775	1.2208	0.0610	0.0890	1.5504
MTTMV_6	0.0098	0.0588	0.2781	0.0317	0.0834	0.8388	0.0382	0.0888	1.0057	0.0557	0.1047	1.3883
MVTRADEMV	0.0090	0.0392	0.2666	0.0436	0.0736	1.1115	0.0607	0.0696	1.5220	0.0596	0.0801	1.5145
MVTRADE	0.0141	0.1065	0.4469	0.0455	0.0857	1.3276	0.0481	0.0864	1.3785	0.0590	0.0853	1.6309
PC	0.0323	0.0546	1.0245	0.0492	0.0670	1.5459	0.0625	0.0718	1.9323	0.0676	0.0772	2.0840
P	0.0231	0.0685	0.7815	0.0536	0.0705	1.6793	0.0649	0.0669	1.9879	0.0642	0.0742	1.9947
PTBV	0.0260	0.0639	0.8170	0.0472	0.0633	1.4646	0.0594	0.0665	1.8250	0.0644	0.0749	1.9803
ROCE	0.0158	0.0610	0.4967	0.0606	0.0755	1.8940						
SALESTP	-0.0026	0.0350	-0.0724	0.0371	0.0783	1.0532	0.0511	0.0776	1.4388	0.0603	0.0802	1.6743
VO_1	0.0041	0.0527	0.1129	0.0446	0.0839	1.1582	0.0503	0.0855	1.2898	0.0625	0.0960	1.5825
VO_3	0.0089	0.0553	0.2833	0.0447	0.0729	1.1335	0.0477	0.0768	1.2275	0.0611	0.0885	1.5556
VO_6	0.0082	0.0588	0.2399	0.0313	0.0827	0.8283	0.0379	0.0886	0.9998	0.0554	0.1046	1.3823
FACTOR NR.	1			2			3			4		
SIGNIFICANT	0.0469			0.0606			0.0686			0.0708		
FACTOR	BTMV			ROCE			LNP			12_EPS		

Appendix D.8: Expected Return Model constructed using trailing 6-month moving average timing model – Style (Restricted Sample)

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the six month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	-0.0008	0.0313	-0.0171	0.0467	0.0724	1.3849	0.0665	0.0848	1.6929	0.0561	0.0976	1.5184	0.0649	0.0917	1.5456	0.0645	0.0883	1.5345	0.0657	0.0931	1.5631
BTMV	0.0477	0.0744	1.5376																		
CTTD	-0.0012	0.0365	-0.0358	0.0494	0.0708	1.5241	0.0605	0.0807	1.6460	0.0636	0.0953	1.7710	0.0696	0.0884	1.5860	0.0688	0.0889	1.5707	0.0724	0.0913	1.6437
12_EPS	0.0099	0.0418	0.3186	0.0493	0.0761	1.5325	0.0555	0.0801	1.5197	0.0552	0.0923	1.5463	0.0536	0.0870	1.2913	0.0599	0.0837	1.3771	0.0628	0.0836	1.4428
DTMV	0.0152	0.0616	0.5041	0.0480	0.0744	1.5602	0.0555	0.0909	1.5671	0.0549	0.0996	1.8466	0.0658	0.0900	1.5296	0.0667	0.0894	1.5503	0.0688	0.0925	1.5950
DY	0.0205	0.0514	0.6718	0.0582	0.0568	1.8473	0.0665	0.0794	1.8817	0.0711	0.0904	2.0256	0.0739	0.0894	1.7398	0.0753	0.0870	1.7664	0.0762	0.0890	1.7855
EPS	0.0271	0.0768	0.8889	0.0582	0.0796	1.8258	0.0671	0.0850	1.8684	0.0654	0.0945	1.8600	0.0703	0.0835	1.6617	0.0705	0.0847	1.6572	0.0734	0.0856	1.7244
EY	0.0097	0.0534	0.2834	0.0423	0.0685	1.2225	0.0491	0.0811	1.3102	0.0496	0.0943	1.3706	0.0535	0.0910	1.2073	0.0558	0.0903	1.2503	0.0599	0.0900	1.3375
ICBT	0.0026	0.0349	0.0824	0.0487	0.0686	1.5488	0.0661	0.0775	1.8322	0.0681	0.0907	1.9196	0.0723	0.0811	1.6798	0.0719	0.0819	1.6704	0.0740	0.0840	1.7133
LNMV	0.0145	0.0918	0.4783	0.0531	0.0733	1.7053	0.0669	0.0842	1.8791	0.0707	0.0910	2.0098	0.0712	0.0858	1.7004	0.0748	0.0869	1.7545	0.0767	0.0882	1.7944
LNP	0.0289	0.0821	0.9710	0.0617	0.0826	1.9282	0.0633	0.1009	1.8179	0.0694	0.0952	1.9790	0.0682	0.0890	1.6563	0.0743	0.0880	1.7477	0.0762	0.0891	1.7863
MOM_6M	0.0110	0.0875	0.3906	0.0539	0.0804	1.7616	0.0679	0.0911	1.9390												
MTBV	0.0200	0.0561	0.6268	0.0528	0.0632	1.6607	0.0632	0.0836	1.7987	0.0692	0.0914	1.9802	0.0741	0.0837	1.7380						
MTTMV_1	0.0026	0.0564	0.0805	0.0505	0.0773	1.3195	0.0451	0.0968	1.2626	0.0524	0.1036	1.4947	0.0500	0.0974	1.1942	0.0481	0.0960	1.1677	0.0500	0.0994	1.2039
MTTMV_3	0.0031	0.0567	0.1343	0.0481	0.0843	1.1925	0.0405	0.0847	1.0943	0.0497	0.0914	1.3554	0.0585	0.0824	1.2959	0.0570	0.0827	1.2737	0.0602	0.0820	1.3443
MTTMV_6	0.0108	0.0598	0.2993	0.0384	0.0775	0.9992	0.0305	0.0959	0.8782	0.0329	0.1012	0.9704	0.0441	0.0906	1.0296	0.0441	0.0905	1.0242	0.0486	0.0935	1.1171
MVTRADEMV	0.0086	0.0397	0.2492	0.0518	0.0664	1.3390	0.0665	0.0801	1.5124	0.0716	0.0827	1.6976									
MVTRADE	0.0321	0.1010	0.9046	0.0634	0.0804	1.7880															
PC	0.0280	0.0561	0.8891	0.0542	0.0641	1.7017	0.0666	0.0818	1.8511	0.0704	0.0906	1.9927	0.0697	0.0850	1.6750	0.0760	0.0858	1.7756			
P	0.0203	0.0686	0.6794	0.0565	0.0692	1.7736	0.0606	0.0885	1.7265	0.0671	0.0906	1.9114	0.0686	0.0839	1.6391	0.0725	0.0855	1.7016	0.0746	0.0869	1.7433
PTBV	0.0267	0.0627	0.8441	0.0538	0.0628	1.6825	0.0604	0.0832	1.7212	0.0668	0.0922	1.9095	0.0690	0.0857	1.6264	0.0688	0.0835	1.6231	0.0722	0.0855	1.7005
ROCE	0.0198	0.0601	0.6094	0.0553	0.0799	1.7639	0.0643	0.0883	1.7939	0.0657	0.0993	1.8547	0.0724	0.0906	1.6622	0.0720	0.0888	1.6599	0.0729	0.0929	1.6847
SALESTP	0.0037	0.0337	0.1186	0.0429	0.0753	1.2399	0.0653	0.0832	1.6069	0.0571	0.0982	1.4902	0.0636	0.0910	1.4919	0.0636	0.0888	1.4902	0.0641	0.0926	1.5058
VO_1	0.0064	0.0532	0.1762	0.0481	0.0865	1.2447	0.0448	0.0976	1.2623	0.0491	0.1051	1.4059	0.0467	0.0974	1.1089	0.0464	0.0936	1.1153	0.0485	0.0969	1.1573
VO_3	0.0050	0.0558	0.1854	0.0481	0.0844	1.1943	0.0407	0.0848	1.1007	0.0499	0.0915	1.3589	0.0586	0.0825	1.2983	0.0570	0.0828	1.2750	0.0603	0.0822	1.3453
VO_6	0.0101	0.0595	0.2802	0.0392	0.0774	1.0213	0.0308	0.0955	0.8867	0.0331	0.1006	0.9725	0.0442	0.0906	1.0317	0.0442	0.0905	1.0267	0.0487	0.0934	1.1177
FACTOR NR.	1			2			3			4			5			6			7		
SIGNIFICANT	0.0477			0.0634			0.0679			0.0716			0.0741			0.0760			0.0767		
FACTOR	BTMV			MVTRADE			MOM_6M			MVTRADEMV			MTBV			PC			LNMV		

Appendix D.9: Expected Return Model constructed using trailing 12-month moving average timing model – Style (Restricted Sample)

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the twelve month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	0.007	0.029	0.247	0.044	0.074	1.334	0.061	0.072	1.777	0.064	0.089	1.902	0.074	0.071	1.874	0.074	0.075	1.895	0.078	0.074	1.959	0.080	0.075	2.000	0.078	0.088	1.577
BTMV	0.045	0.075	1.478																								
CTTD	0.003	0.037	0.114	0.039	0.072	1.252	0.059	0.066	1.828	0.064	0.086	1.987	0.074	0.069	1.847	0.076	0.072	1.896	0.073	0.078	1.833	0.072	0.081	1.805	0.076	0.084	1.544
12_EPS	0.003	0.043	0.104	0.052	0.073	1.623	0.061	0.066	1.887	0.068	0.086	2.128	0.074	0.073	1.858	0.076	0.075	1.930	0.077	0.075	1.950	0.079	0.075	1.984	0.062	0.078	1.244
DTMV	0.020	0.061	0.646	0.040	0.080	1.341	0.059	0.065	1.882	0.067	0.084	2.135	0.075	0.068	1.939	0.076	0.071	1.967	0.079	0.073	2.014	0.080	0.073	2.047	0.082	0.088	1.696
DY	0.021	0.050	0.684	0.055	0.057	1.761	0.066	0.064	2.077	0.072	0.082	2.267	0.073	0.070	1.886	0.075	0.072	1.930	0.078	0.074	1.982	0.079	0.075	2.017	0.082	0.089	1.689
EPS	0.012	0.081	0.403	0.043	0.078	1.531	0.058	0.072	1.824	0.064	0.088	2.043	0.076	0.070	1.935	0.078	0.072	2.000									
EY	0.003	0.051	0.109	0.042	0.068	1.235	0.055	0.064	1.574	0.061	0.074	1.748	0.059	0.080	1.424	0.063	0.081	1.518	0.065	0.082	1.555	0.068	0.080	1.600	0.078	0.092	1.524
ICBT	0.006	0.036	0.183	0.044	0.070	1.427	0.059	0.061	1.855	0.067	0.079	2.106	0.070	0.068	1.805	0.072	0.071	1.867	0.076	0.072	1.952	0.078	0.073	1.994	0.083	0.088	1.691
LNMV	0.010	0.091	0.356	0.040	0.073	1.313	0.056	0.065	1.779	0.063	0.082	2.013	0.070	0.070	1.798	0.072	0.071	1.851	0.074	0.073	1.880	0.076	0.074	1.929	0.078	0.086	1.618
LNP	0.019	0.085	0.627	0.051	0.087	1.577	0.060	0.072	1.901	0.067	0.083	2.137	0.076	0.068	1.951	0.077	0.070	1.998	0.080	0.073	2.036						
MOM_6M	0.018	0.086	0.615	0.057	0.088	1.882	0.067	0.083	2.141																		
MTBV	0.015	0.058	0.484	0.049	0.068	1.615	0.065	0.061	2.036	0.069	0.078	2.203	0.074	0.068	1.912	0.076	0.070	1.962	0.078	0.072	2.008	0.080	0.072	2.041	0.081	0.084	1.679
MTTMV_1	-0.006	0.055	-0.087	0.053	0.075	1.412	0.061	0.073	1.634	0.066	0.088	1.825	0.070	0.082	1.620	0.073	0.084	1.693	0.076	0.084	1.743	0.073	0.085	1.669	0.079	0.092	1.591
MTTMV_3	0.001	0.057	0.114	0.041	0.091	1.014	0.057	0.086	1.439	0.059	0.106	1.520	0.073	0.080	1.520	0.077	0.081	1.598	0.078	0.087	1.635	0.082	0.087	1.699	0.083	0.090	1.703
MTTMV_6	0.013	0.061	0.356	0.039	0.073	1.013	0.054	0.073	1.393	0.055	0.094	1.426	0.066	0.074	1.413	0.070	0.079	1.490	0.067	0.091	1.434	0.071	0.086	1.507	0.062	0.095	1.316
MVTRADEMV	0.005	0.039	0.150	0.051	0.063	1.336	0.061	0.063	1.547	0.074	0.068	1.901															
MVTRADE	0.025	0.101	0.716	0.044	0.084	1.255	0.056	0.089	1.555	0.060	0.102	1.703	0.068	0.094	1.646	0.065	0.097	1.566	0.062	0.103	1.515	0.062	0.105	1.498	0.058	0.093	1.276
PC	0.026	0.057	0.844	0.054	0.068	1.719	0.065	0.061	2.026	0.070	0.078	2.220	0.076	0.071	1.951												
P	0.013	0.070	0.440	0.047	0.074	1.490	0.059	0.061	1.856	0.067	0.077	2.136	0.074	0.067	1.904	0.076	0.069	1.956	0.078	0.071	2.001	0.079	0.072	2.028	0.085	0.088	1.744
PTBV	0.020	0.065	0.642	0.054	0.065	1.692	0.064	0.063	2.003	0.070	0.078	2.205	0.073	0.069	1.891	0.075	0.071	1.929	0.077	0.072	1.977	0.079	0.073	2.007	0.080	0.086	1.654
ROCE	0.026	0.059	0.820	0.061	0.065	1.917																					
SALESTP	0.004	0.034	0.114	0.042	0.069	1.221	0.054	0.072	1.538	0.060	0.089	1.744	0.074	0.072	1.851	0.076	0.073	1.904	0.078	0.074	1.938	0.080	0.075	1.980	0.074	0.092	1.487
VO_1	-0.003	0.054	-0.085	0.047	0.085	1.217	0.059	0.075	1.559	0.065	0.097	1.736	0.070	0.084	1.567	0.073	0.086	1.621	0.077	0.088	1.712	0.074	0.090	1.649	0.078	0.093	1.556
VO_3	0.001	0.056	0.110	0.040	0.091	1.005	0.057	0.086	1.440	0.059	0.106	1.522	0.073	0.080	1.520	0.077	0.080	1.596	0.078	0.087	1.631	0.083	0.088	1.713			
VO_6	0.014	0.060	0.374	0.042	0.071	1.077	0.055	0.073	1.418	0.056	0.094	1.448	0.066	0.075	1.411	0.070	0.080	1.488	0.067	0.090	1.439	0.071	0.086	1.509	0.062	0.099	1.311
FACTOR NR.	1			2			3			4			5			6			7			8			9		
SIGNIFICANT	0.04547			0.06056			0.06719			0.07364			0.07564			0.07823			0.07975			0.08343			0.08461		
FACTOR	BTMV			ROCE			MOM_6M			MVTRADEMV			PC			EPS			LNP			VO_3			P		

Appendix D.10: Expected Return Model constructed using trailing 18-month moving average timing model – Style (Restricted Sample)

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the eighteen month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	0.0052	0.0294	0.1771	0.0544	0.0645	1.6130	0.0739	0.0565	2.1010	0.0801	0.0748	2.2931															
BTMV	0.0549	0.0646	1.7673																								
CITD	0.0076	0.0372	0.2427	0.0463	0.0693	1.4414	0.0713	0.0559	2.1512	0.0751	0.0768	2.2764	0.0601	0.0683	1.6783	0.0713	0.0883	1.9657	0.0752	0.0869	2.0705	0.0736	0.0891	2.0150	0.0637	0.0975	1.7622
12_EPS	0.0047	0.0429	0.1553	0.0625	0.0630	1.9310	0.0691	0.0585	2.1120	0.0794	0.0780	2.4399	0.0816	0.0799	2.2891												
DTMV	0.0171	0.0599	0.5589	0.0541	0.0611	1.7261	0.0697	0.0529	2.1832	0.0792	0.0727	2.4837	0.0806	0.0746	2.3102	0.0824	0.0807	2.3147									
DY	0.0171	0.0513	0.5671	0.0578	0.0567	1.8483	0.0710	0.0563	2.2174	0.0793	0.0725	2.4780	0.0801	0.0751	2.2901	0.0812	0.0794	2.2765	0.0823	0.0809	2.3086	0.0826	0.0808	2.2941	0.0825	0.0793	2.2962
EPS	-0.0009	0.0793	-0.0395	0.0542	0.0664	1.7157	0.0673	0.0565	2.0767	0.0773	0.0728	2.4033	0.0793	0.0750	2.2514	0.0782	0.0781	2.2072	0.0798	0.0791	2.2494	0.0799	0.0789	2.2317	0.0809	0.0792	2.2600
EY	0.0049	0.0517	0.1505	0.0505	0.0653	1.4580	0.0610	0.0601	1.7366	0.0700	0.0682	1.9995	0.0720	0.0757	1.8766	0.0723	0.0762	1.8673	0.0729	0.0765	1.8844	0.0724	0.0764	1.8530	0.0715	0.0753	1.8319
ICBT	0.0051	0.0365	0.1614	0.0547	0.0601	1.7360	0.0679	0.0541	2.0982	0.0771	0.0716	2.3912	0.0795	0.0740	2.2525	0.0814	0.0799	2.2641	0.0825	0.0806	2.2951						
LNMV	-0.0028	0.0916	-0.0913	0.0497	0.0672	1.6110	0.0662	0.0555	2.0721	0.0752	0.0702	2.3609	0.0758	0.0723	2.1785	0.0775	0.0783	2.1819	0.0786	0.0791	2.2127	0.0783	0.0785	2.1851	0.0790	0.0799	2.2099
LNP	0.0051	0.0871	0.1720	0.0450	0.0715	1.4459	0.0657	0.0603	2.0592	0.0755	0.0727	2.3751	0.0792	0.0754	2.2765	0.0764	0.0790	2.1646	0.0785	0.0792	2.2217	0.0820	0.0794	2.2919	0.0824	0.0794	2.3002
MOM_6M	0.0210	0.0848	0.7281	0.0683	0.0724	2.2049	0.0784	0.0725	2.4543																		
MTBV	0.0241	0.0534	0.7774	0.0539	0.0643	1.7480	0.0699	0.0532	2.1874	0.0770	0.0705	2.4181	0.0796	0.0731	2.2784	0.0811	0.0780	2.2745	0.0824	0.0793	2.3110	0.0828	0.0793	2.3007	0.0820	0.0779	2.2862
MTTMV_1	-0.0043	0.0547	-0.0505	0.0593	0.0718	1.5698	0.0692	0.0651	1.8153	0.0764	0.0770	2.0427	0.0790	0.0797	1.9341	0.0722	0.0823	1.7332	0.0711	0.0849	1.7089	0.0735	0.0838	1.7495	0.0710	0.0845	1.6867
MTTMV_3	0.0078	0.0551	0.2927	0.0506	0.0809	1.2522	0.0698	0.0703	1.7270	0.0745	0.0910	1.8663	0.0769	0.0941	1.7621	0.0706	0.0943	1.5894	0.0724	0.0961	1.6380	0.0724	0.0956	1.6211	0.0709	0.0955	1.5806
MTTMV_6	0.0156	0.0617	0.4181	0.0507	0.0652	1.3109	0.0677	0.0655	1.7310	0.0667	0.0829	1.7043	0.0721	0.0843	1.6847	0.0651	0.0890	1.4956	0.0645	0.0893	1.4818	0.0667	0.0864	1.5074	0.0649	0.0873	1.4695
MVTRADENV	0.0071	0.0378	0.2047	0.0555	0.0624	1.4505	0.0639	0.0610	1.6523	0.0773	0.0655	2.0137	0.0787	0.0679	2.0023	0.0794	0.0729	1.9794	0.0805	0.0743	2.0094	0.0793	0.0749	1.9648	0.0794	0.0735	1.9658
MVTRADE	0.0310	0.0998	0.8832	0.0494	0.0868	1.3896	0.0585	0.0777	1.6453	0.0686	0.0953	1.9088	0.0463	0.1151	1.2616	0.0447	0.1179	1.2075	0.0452	0.1183	1.2218	0.0474	0.1190	1.2663	0.0435	0.1175	1.1671
PC	0.0274	0.0566	0.8863	0.0559	0.0635	1.7965	0.0696	0.0573	2.1799	0.0778	0.0737	2.4443	0.0797	0.0747	2.2906	0.0814	0.0798	2.2922	0.0822	0.0807	2.3141	0.0828	0.0802	2.3090	0.0833	0.0803	2.3279
P	-0.0003	0.0721	-0.0139	0.0491	0.0678	1.5877	0.0657	0.0556	2.0640	0.0766	0.0713	2.4115	0.0794	0.0740	2.2826	0.0781	0.0776	2.2053	0.0816	0.0794	2.3006	0.0830	0.0803	2.3155			
PTBV	0.0290	0.0600	0.9357	0.0513	0.0674	1.6608	0.0682	0.0567	2.1376	0.0760	0.0715	2.3891	0.0779	0.0731	2.2373	0.0792	0.0773	2.2277	0.0803	0.0781	2.2593	0.0809	0.0780	2.2537	0.0804	0.0778	2.2465
ROCE	0.0262	0.0593	0.8313	0.0697	0.0552	2.1753																					
SALESTP	0.0051	0.0319	0.1617	0.0507	0.0635	1.4604	0.0675	0.0595	1.8785	0.0765	0.0773	2.1372	0.0769	0.0773	2.1512	0.0786	0.0823	2.1501	0.0788	0.0820	2.1590	0.0797	0.0824	2.1642	0.0786	0.0797	2.1394
VO_1	0.0014	0.0520	0.0361	0.0593	0.0739	1.5416	0.0694	0.0656	1.7874	0.0755	0.0861	1.9504	0.0791	0.0873	1.8816	0.0730	0.0858	1.7055	0.0715	0.0880	1.6704	0.0733	0.0862	1.6984	0.0709	0.0870	1.6369
VO_3	0.0083	0.0541	0.3031	0.0502	0.0788	1.2475	0.0697	0.0702	1.7263	0.0744	0.0911	1.8657	0.0769	0.0941	1.7517	0.0706	0.0943	1.5882	0.0723	0.0961	1.6360	0.0723	0.0955	1.6192	0.0708	0.0954	1.5781
VO_6	0.0156	0.0611	0.4171	0.0518	0.0641	1.3395	0.0660	0.0643	1.6840	0.0681	0.0820	1.7389	0.0716	0.0843	1.6753	0.0653	0.0888	1.5008	0.0647	0.0891	1.4867	0.0671	0.0861	1.5164	0.0650	0.0871	1.4715
FACTOR NR.	1			2			3			4			5			6			7			8			9		
SIGNIFICANT	0.0549			0.0697			0.0784			0.0801			0.0816			0.0824			0.0825			0.0830			0.0833		
FACTOR	BTMV			ROCE			MOM_6M			A_TURN			12_EPS			DTMV			ICBT			P			PC		

Appendix D.11: Expected Return Model constructed using trailing 1-month moving average timing model – Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the one month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
Crbindex	0.0073	0.0700	0.2483	0.0014	0.0665	0.0329	0.0089	0.0735	0.1720	0.0134	0.0685	0.2970	0.0134	0.0673	0.3212
Goldprice	0.0013	0.0633	0.0365	0.0086	0.0752	0.2745	0.0106	0.0872	0.2930	0.0198	0.0726	0.5028	0.0190	0.0710	0.5075
Oilbrentcr	0.0126	0.0721	0.4144												
platinum	-0.0015	0.0543	-0.0525	0.0041	0.0680	0.1263	0.0154	0.0835	0.3959	0.0199	0.0699	0.4841	0.0187	0.0710	0.4833
randdollar	0.0061	0.0711	0.2270	0.0131	0.0652	0.4394	0.0201	0.0701	0.5098						
usexpind	0.0006	0.0520	0.0707	0.0021	0.0791	0.0609	-0.0052	0.0876	-0.0494	0.0129	0.0903	0.2346	0.0122	0.0945	0.2561
usglt10yr	0.0043	0.0686	0.1474	0.0137	0.0744	0.4541	0.0137	0.0798	0.3638	0.0190	0.0717	0.4814	0.0202	0.0762	0.5258
usmonsupp	0.0120	0.0541	0.3101	0.0151	0.0801	0.3915									
usppi	0.0005	0.0533	0.0216	0.0028	0.0683	0.0601	0.0039	0.0781	0.0893	0.0092	0.0785	0.2143	0.0089	0.0733	0.2604
usshrtrm	-0.0032	0.0784	-0.0757	0.0065	0.0703	0.2287	0.0160	0.0757	0.4230	0.0206	0.0710	0.5457			
FACTOR NR.	1			2			3			4			5		
SIGNIFICANT	0.0126			0.0151			0.0201			0.0206			0.0202		
FACTOR	<i>oilbrentcr</i>			<i>usmonsupp</i>			<i>randdollar</i>			<i>usshrtrm</i>			<i>usglt10yr</i>		

Appendix D.12: Expected Return Model constructed using trailing 3-month moving average timing model – Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the three month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
Crbindex	0.0199	0.0683	0.6814			
Goldprice	0.0078	0.0632	0.2710	0.0086	0.0700	0.2483
Oilbrentcr	0.0061	0.0732	0.2174	0.0034	0.0633	0.0365
platinum	0.0058	0.0544	0.2042	0.0183	0.0721	0.4144
randdollar	0.0010	0.0712	0.0436	0.0086	0.0543	-0.0525
usexpind	0.0071	0.0505	0.1832	0.0024	0.0711	0.2270
usglt10yr	-0.0011	0.0693	-0.0412	0.0057	0.0520	0.0707
usmonsupp	0.0181	0.0513	0.4869	0.0171	0.0686	0.1474
usppi	0.0037	0.0530	0.1040	0.0079	0.0541	0.3101
usshrtrm	0.0087	0.0762	0.2822	0.0154	0.0533	0.0216
FACTOR NR.	1					
SIGNIFICANT	0.0199					
FACTOR	crbindex					

Appendix D.13: Expected Return Model constructed using trailing 6-month moving average timing model – Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the six month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
Crbindex	0.0022	0.0764	0.0808	0.0062	0.0746	0.2241
Goldprice	0.0118			0.0062	0.0764	0.2141
Oilbrentcr	0.0091	0.0554	0.2831	0.0062	0.0609	0.2252
platinum	0.0049	0.0469	0.3334	0.0113	0.0766	0.3916
randdollar	0.0096	0.0877	0.5834			
usexpind	0.0008	0.0649	-0.0410	0.0184	0.0843	0.3802
usglt10yr	0.0114	0.0763	0.3631	0.0109	0.0729	0.3668
usmonsupp	0.0053	0.0626	0.1142	0.0076	0.0654	0.2903
usppi	0.0025	0.0441	0.0329	0.0061	0.0708	0.1986
usshrtrm	-0.0069	0.0726	0.0844	0.0002	0.0769	0.0221
FACTOR NR.	1			2		
SIGNIFICANT	0.0118			0.0184		
FACTOR	<i>goldprice</i>			<i>randdollar</i>		

Appendix D.14: Expected Return Model constructed using trailing 12-month moving average timing model – Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the twelve month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
Crbindex	0.0062	0.0708	0.2265	0.0175	0.0762	0.5979															
Goldprice	0.0074	0.0661	0.2605	0.0123	0.0749	0.4190	0.0145	0.0788	0.4922	0.0234	0.0916	0.4817									
Oilbrentcr	0.0066	0.0748	0.2288	0.0061	0.0726	0.2081	0.0100	0.0825	0.3450	0.0156	0.0949	0.3177	0.0217	0.0955	0.4394	0.0251	0.1032	0.4389	0.0297	0.0989	0.5430
platinum	0.0031	0.0552	0.1111	0.0108	0.0707	0.3635	0.0179	0.0656	0.6135	0.0180	0.0861	0.3949	0.0208	0.0829	0.4729	0.0345	0.0936	0.6287			
randedollar	0.0105	0.0694	0.3525																		
usexpind	0.0073	0.0499	0.2273	0.0173	0.0841	0.3200	0.0190	0.0902	0.4025												
usglt10yr	0.0080	0.0706	0.2724	0.0130	0.0748	0.4346	0.0174	0.0784	0.5971	0.0186	0.1097	0.4295	0.0206	0.1054	0.4423	0.0320	0.0998	0.5542	0.0353	0.0929	0.6474
usmonsupp	0.0053	0.0543	0.0899	0.0121	0.0691	0.2649	0.0170	0.0721	0.4778	0.0217	0.0852	0.4045	0.0312	0.0978	0.5448						
usppi	-0.0043	0.0552	-0.1705	-0.0093	0.0730	-0.2801	0.0064	0.0829	0.2129	0.0047	0.1072	0.1477	0.0063	0.1010	0.1810	0.0206	0.1144	0.3753	0.0245	0.1099	0.4697
usshtrrm	-0.0011	0.0729	-0.0457	0.0062	0.0639	0.2121	0.0140	0.0702	0.4811	0.0159	0.0908	0.3436	0.0218	0.0895	0.4534	0.0275	0.0956	0.4844	0.0310	0.0928	0.5739
FACTOR NR.	1			2			3			4			5			6			7		
SIGNIFICANT	0.0105			0.0175			0.0190			0.0234			0.0312			0.0345			0.0353		
FACTOR	<i>randedollar</i>			<i>crbindex</i>			<i>usexpind</i>			<i>goldprice</i>			<i>usmonsupp</i>			<i>platinum</i>			<i>usglt10yr</i>		

Appendix D.15: Expected Return Model constructed using trailing 18-month moving average timing model – Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the eighteen month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
Crindex	0.0071	0.0665	0.2557	0.0061	0.0668	0.2183	0.0086	0.0695	0.3044	0.0205	0.0858	0.5200
Goldprice	0.0103	0.0680	0.3716	0.0132	0.0677	0.4590						
Oilbrentcr	-0.0004	0.0744	0.0006	0.0017	0.0643	0.0619	0.0098	0.0766	0.3464	0.0172	0.0906	0.4817
platinum	0.0002	0.0546	-0.0093	0.0076	0.0655	0.2501	0.0120	0.0557	0.4103	0.0236	0.0808	0.5097
randdollar	0.0090	0.0653	0.3108	0.0114	0.0651	0.3796	0.0162	0.0725	0.5561	0.0270	0.0884	0.5721
usexpind	0.0107	0.0493	0.2262	0.0078	0.0704	0.1459	0.0244	0.0831	0.5672			
usglt10yr	0.0111	0.0701	0.3825									
usmonsupp	-0.0015	0.0498	-0.1181	-0.0027	0.0564	-0.1469	0.0113	0.0611	0.3416	0.0316	0.0932	0.6415
usppi	0.0033	0.0551	0.0994	-0.0055	0.0611	-0.1963	0.0037	0.0695	0.1412	0.0024	0.0998	0.1825
usshrtrm	-0.0081	0.0748	-0.2761	0.0042	0.0672	0.1375	0.0116	0.0680	0.4033	0.0209	0.0801	0.5018
FACTOR NR.	1			2			3			4		
SIGNIFICANT	0.0111			0.0132			0.0244			0.0316		
FACTOR	<i>usglt10yr</i>			<i>goldprice</i>			<i>usexpind</i>			<i>usmonsupp</i>		

Appendix D.16: Expected Return Model constructed using trailing 1-month moving average timing model – Style and Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the one month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	0.0017	0.0017	0.0017	0.0448	0.0608	1.3064	0.0490	0.0570	1.3884	0.0548	0.0684	1.5526	0.0596	0.0725	1.4877	0.0624	0.0760	1.5599
BTMV	0.0502	0.0502	0.0502															
CTTD	0.0020	0.0020	0.0020	0.0467	0.0605	1.4067	0.0484	0.0585	1.4482	0.0585	0.0633	1.7452	0.0628	0.0622	1.6193	0.0649	0.0678	1.6670
12_EPS	0.0163	0.0163	0.0163	0.0478	0.0666	1.4855	0.0496	0.0653	1.5034	0.0545	0.0672	1.6504	0.0625	0.0686	1.6624	0.0654	0.0669	1.7270
DTMV	-0.0012	-0.0012	-0.0012	0.0393	0.0719	1.2846	0.0417	0.0615	1.3356	0.0505	0.0657	1.5927	0.0595	0.0679	1.6402	0.0619	0.0674	1.6988
DY	0.0095	0.0095	0.0095	0.0462	0.0658	1.4605	0.0459	0.0639	1.4417	0.0558	0.0680	1.7253	0.0606	0.0667	1.6417	0.0638	0.0667	1.7240
EPS	0.0000	0.0000	0.0000	0.0340	0.0833	1.0618	0.0349	0.0776	1.0600	0.0459	0.0761	1.3991	0.0518	0.0812	1.3605	0.0547	0.0754	1.4446
EY	-0.0006	-0.0006	-0.0006	0.0330	0.0735	0.9575	0.0386	0.0689	1.1138	0.0467	0.0729	1.3243	0.0577	0.0676	1.4074	0.0575	0.0671	1.4141
ICBT	0.0018	0.0018	0.0018	0.0463	0.0592	1.4411	0.0473	0.0572	1.4582	0.0549	0.0635	1.6782	0.0612	0.0644	1.6132	0.0635	0.0637	1.6679
LNVM	0.0090	0.0090	0.0090	0.0418	0.0817	1.3150	0.0447	0.0817	1.3743	0.0536	0.0771	1.6405	0.0587	0.0796	1.5411	0.0579	0.0780	1.5454
LNP	0.0047	0.0047	0.0047	0.0337	0.0864	1.1180	0.0322	0.0831	1.0664	0.0446	0.0853	1.4281	0.0571	0.0706	1.5066	0.0593	0.0699	1.5743
MOM_6M	0.0123	0.0123	0.0123	0.0521	0.0909	1.6605	0.0536	0.0830	1.6877	0.0600	0.0874	1.8381	0.0661	0.0815	1.7356	0.0671	0.0827	1.7827
MTBV	0.0196	0.0196	0.0196	0.0535	0.0640	1.6508												
MTTMV_1	-0.0081	-0.0081	-0.0081	0.0303	0.0819	0.8080	0.0342	0.0792	0.9159	0.0435	0.0776	1.1649	0.0474	0.0866	0.9879	0.0421	0.0895	0.9937
MTTMV_3	0.0058	0.0058	0.0058	0.0389	0.0765	0.9852	0.0405	0.0762	1.0327	0.0425	0.0821	1.0675	0.0390	0.0848	0.8871	0.0371	0.0839	0.8588
MTTMV_6	0.0038	0.0038	0.0038	0.0199	0.0881	0.5616	0.0255	0.0859	0.6969	0.0392	0.0865	1.0424	0.0500	0.0946	1.1015	0.0491	0.0909	1.0668
MVTRADEMV	-0.0002	-0.0002	-0.0002	0.0399	0.0673	1.0039	0.0418	0.0674	1.0189	0.0506	0.0714	1.2161	0.0511	0.0826	1.1580	0.0546	0.0809	1.2769
MVTRADE	-0.0065	-0.0065	-0.0065	0.0305	0.0957	0.9217	0.0290	0.0946	0.8752	0.0381	0.0896	1.1207	0.0404	0.1016	1.0068	0.0387	0.0959	0.9824
PC	0.0220	0.0220	0.0220	0.0485	0.0635	1.4986	0.0488	0.0649	1.5000	0.0585	0.0658	1.7777	0.0623	0.0705	1.6443	0.0631	0.0681	1.6701
P	0.0036	0.0036	0.0036	0.0371	0.0774	1.2079	0.0376	0.0716	1.2081	0.0448	0.0779	1.4132	0.0608	0.0741	1.5455	0.0619	0.0683	1.5953
PTBV	0.0233	0.0233	0.0233	0.0481	0.0653	1.4834	0.0498	0.0590	1.5439	0.0596	0.0618	1.8215	0.0667	0.0622	1.7627			
ROCE	0.0121	0.0121	0.0121	0.0522	0.0718	1.6343	0.0583	0.0639	1.7963									
SALESTP	-0.0018	-0.0018	-0.0018	0.0379	0.0669	1.0768	0.0423	0.0645	1.1743	0.0498	0.0619	1.3721	0.0503	0.0723	1.2655	0.0524	0.0746	1.3431
VO_1	-0.0053	-0.0053	-0.0053	0.0305	0.0789	0.7865	0.0369	0.0762	0.9628	0.0429	0.0742	1.1186	0.0454	0.0850	0.9995	0.0440	0.0878	0.9748
VO_3	0.0050	0.0050	0.0050	0.0393	0.0751	1.0028	0.0413	0.0749	1.0578	0.0428	0.0809	1.0775	0.0390	0.0839	0.8908	0.0371	0.0833	0.8611
VO_8	0.0049	0.0049	0.0049	0.0194	0.0870	0.5494	0.0245	0.0856	0.6739	0.0390	0.0865	1.0370	0.0495	0.0947	1.0946	0.0485	0.0905	1.0557
Crbindex	0.0073	0.0073	0.0073	0.0431	0.0738	1.3537	0.0455	0.0703	1.3954	0.0529	0.0739	1.6138	0.0625	0.0833	1.6037	0.0653	0.0805	1.6799
Goldprice	0.0013	0.0013	0.0013	0.0390	0.0714	1.2265	0.0456	0.0711	1.3965	0.0509	0.0730	1.5501	0.0546	0.0774	1.4783	0.0574	0.0764	1.5489
Oilbrentcr	0.0126	0.0126	0.0126	0.0391	0.0697	1.2325	0.0419	0.0649	1.2953	0.0527	0.0670	1.6060	0.0582	0.0802	1.5429	0.0613	0.0730	1.6200
platinum	-0.0015	-0.0015	-0.0015	0.0429	0.0659	1.3605	0.0440	0.0635	1.3847	0.0521	0.0698	1.6078	0.0631	0.0723	1.6599	0.0660	0.0684	1.7295
randdollar	0.0061	0.0061	0.0061	0.0415	0.0663	1.3260	0.0438	0.0600	1.3763	0.0518	0.0659	1.5951	0.0616	0.0704	1.6471	0.0632	0.0682	1.6910
usexpind	0.0006	0.0006	0.0006	0.0292	0.0909	0.7360	0.0251	0.0881	0.7201	0.0414	0.0850	1.0336	0.0458	0.1003	1.0224	0.0470	0.1007	1.0558
usglt10yr	0.0043	0.0043	0.0043	0.0329	0.0699	1.0381	0.0352	0.0655	1.0866	0.0495	0.0664	1.5187	0.0603	0.0707	1.5931	0.0625	0.0666	1.6515
usmonsups	0.0120	0.0120	0.0120	0.0487	0.0716	1.3496	0.0467	0.0660	1.3038	0.0647	0.0640	1.7067						
usppi	0.0005	0.0005	0.0005	0.0350	0.0680	1.0414	0.0370	0.0663	1.0893	0.0499	0.0698	1.4144	0.0545	0.0770	1.4238	0.0605	0.0716	1.5301
usshttrm	-0.0032	-0.0032	-0.0032	0.0317	0.0814	1.0263	0.0380	0.0733	1.1802	0.0467	0.0744	1.4555	0.0584	0.0744	1.5844	0.0611	0.0722	1.6516
FACTOR NR.	1			2			3			4			5			6		
SIGNIFICANT	0.0502			0.0535			0.0583			0.0647			0.0667			0.0671		
FACTOR	BTMV			MTBV			ROCE			usmonsups			PTBV			MOM_6M		

Appendix D.16: (continued) Expected Return Model constructed using trailing 1-month moving average timing model – Style and Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the one month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
0.0605	0.0967	1.4841	0.0609	0.1034	1.4254	0.0615	0.1002	1.4261	0.0634	0.1029	1.4584
0.0696	0.0863	1.7370									
0.0664	0.0862	1.7334	0.0700	0.0899	1.7228	0.0717	0.0872	1.7588			
0.0636	0.0860	1.7353	0.0651	0.0892	1.6860	0.0666	0.0864	1.7119	0.0688	0.0900	1.7288
0.0658	0.0845	1.7806	0.0661	0.0880	1.6974	0.0674	0.0862	1.7189	0.0692	0.0897	1.7383
0.0574	0.0873	1.5282	0.0590	0.0891	1.4977	0.0602	0.0882	1.5243	0.0652	0.0886	1.6146
0.0618	0.0937	1.4829	0.0604	0.0958	1.3814	0.0605	0.0924	1.3816	0.0615	0.0943	1.3915
0.0651	0.0823	1.7039	0.0687	0.0864	1.6903	0.0690	0.0859	1.6958	0.0712	0.0885	1.7237
0.0623	0.0919	1.6676	0.0649	0.0925	1.6317	0.0662	0.0903	1.6595	0.0664	0.0939	1.6493
0.0614	0.0851	1.6432	0.0637	0.0878	1.6119	0.0650	0.0832	1.6427	0.0660	0.0877	1.6533
0.0445	0.1124	1.1023	0.0441	0.1170	1.0620	0.0485	0.1107	1.1427	0.0510	0.1044	1.1419
0.0429	0.1043	0.9941	0.0445	0.1016	0.9934	0.0432	0.1008	0.9624	0.0420	0.0988	0.9162
0.0496	0.1086	1.0645	0.0478	0.1099	1.0139	0.0488	0.1074	1.0086	0.0451	0.1054	0.9483
0.0579	0.0882	1.3505	0.0610	0.0927	1.3201	0.0604	0.0926	1.3045	0.0641	0.0947	1.3681
0.0450	0.1062	1.1271	0.0467	0.1107	1.1220	0.0486	0.1080	1.1516	0.0475	0.1056	1.1025
0.0659	0.0850	1.7317	0.0687	0.0879	1.7108	0.0691	0.0871	1.7152	0.0701	0.0905	1.7114
0.0631	0.0840	1.6565	0.0657	0.0882	1.6311	0.0667	0.0855	1.6540	0.0679	0.0891	1.6685
0.0561	0.0888	1.3871	0.0551	0.0924	1.3003	0.0552	0.0911	1.2961	0.0582	0.0936	1.3534
0.0438	0.1128	1.0163	0.0434	0.1169	0.9889	0.0465	0.1102	1.0346	0.0488	0.1046	1.0403
0.0433	0.1043	1.0019	0.0445	0.1012	0.9965	0.0433	0.1003	0.9647	0.0419	0.0986	0.9165
0.0490	0.1082	1.0547	0.0476	0.1098	1.0115	0.0486	0.1074	1.0072	0.0448	0.1053	0.9449
0.0671	0.0888	1.7375	0.0687	0.0932	1.6847	0.0706	0.0894	1.7316	0.0719	0.0911	1.7430
0.0614	0.0887	1.6447	0.0636	0.0941	1.6112	0.0641	0.0916	1.6301	0.0665	0.0924	1.6621
0.0635	0.0860	1.6846	0.0661	0.0882	1.6550	0.0664	0.0862	1.6589	0.0684	0.0880	1.6942
0.0676	0.0798	1.7879	0.0703	0.0840	1.7497						
0.0647	0.0847	1.7351	0.0687	0.0891	1.7259	0.0704	0.0866	1.7512	0.0714	0.0917	1.7485
0.0529	0.1182	1.1129	0.0557	0.1313	1.0946	0.0525	0.1351	1.0501	0.0534	0.1349	1.1248
0.0655	0.0831	1.7406	0.0674	0.0845	1.7000	0.0689	0.0845	1.7261	0.0707	0.0882	1.7556
0.0582	0.0855	1.5205	0.0546	0.0928	1.4166	0.0574	0.0902	1.4483	0.0588	0.0912	1.4975
0.0618	0.0843	1.6825	0.0632	0.0861	1.6310	0.0632	0.0837	1.6297	0.0638	0.0868	1.6193
7			8			9			10		
0.0696			0.0703			0.0717			0.0719		
CTTD			platinum			12_EPS			crbindex		

Appendix D.17: Expected Return Model constructed using trailing 3-month moving average timing model – Style and Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the three month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	0.0041	0.0306	0.1351	0.0452	0.0731	1.3275	0.0592	0.0762	1.6889	0.0673	0.0765	1.8922
BTMV	0.0469	0.0756	1.5015									
CTTD	0.0013	0.0367	0.0414	0.0477	0.0733	1.4695	0.0546	0.0745	1.6653	0.0638	0.0767	1.9219
12_EPS	0.0129	0.0448	0.4228	0.0515	0.0712	1.5972	0.0651	0.0709	1.9752	0.0708	0.0758	2.1366
DTMV	0.0077	0.0648	0.2659	0.0434	0.0787	1.4081	0.0567	0.0772	1.7945	0.0637	0.0771	1.9963
OY	0.0178	0.0539	0.5744	0.0517	0.0647	1.6460	0.0624	0.0728	1.9404	0.0690	0.0755	2.1360
EPS	0.0231	0.0801	0.7618	0.0576	0.0765	1.7899	0.0619	0.0769	1.9042	0.0663	0.0776	2.0325
EY	0.0028	0.0539	0.0822	0.0395	0.0701	1.1442	0.0497	0.0727	1.4113	0.0550	0.0793	1.5492
ICBT	0.0074	0.0338	0.2397	0.0462	0.0685	1.4707	0.0571	0.0727	1.7665	0.0660	0.0762	2.0192
LNMV	0.0125	0.0932	0.4115	0.0436	0.0878	1.4102	0.0522	0.0823	1.6399	0.0602	0.0802	1.8682
LNP	0.0351	0.0804	1.1943	0.0595	0.0831	1.8662	0.0686	0.0774	2.1227			
MOM_6M	0.0103	0.0892	0.3589	0.0497	0.0856	1.6151	0.0561	0.0899	1.7834	0.0618	0.0869	1.9410
MTBV	0.0211	0.0568	0.6622	0.0497	0.0669	1.5620	0.0597	0.0669	1.8530	0.0657	0.0754	2.0306
MTTMV_1	0.0102	0.0548	0.2807	0.0467	0.0807	1.2104	0.0554	0.0818	1.4426	0.0659	0.0940	1.6866
MTTMV_3	0.0065	0.0564	0.2195	0.0444	0.0730	1.1250	0.0476	0.0775	1.2208	0.0610	0.0890	1.5504
MTTMV_6	0.0098	0.0588	0.2781	0.0317	0.0834	0.8388	0.0382	0.0888	1.0057	0.0557	0.1047	1.3883
MVTRADEMV	0.0090	0.0392	0.2666	0.0436	0.0736	1.1115	0.0607	0.0696	1.5220	0.0596	0.0801	1.5145
MVTRADE	0.0141	0.1065	0.4469	0.0455	0.0857	1.3276	0.0481	0.0864	1.3785	0.0590	0.0853	1.6309
PC	0.0323	0.0546	1.0245	0.0492	0.0670	1.5459	0.0625	0.0718	1.9323	0.0676	0.0772	2.0840
P	0.0231	0.0685	0.7815	0.0536	0.0705	1.6793	0.0649	0.0669	1.9879	0.0642	0.0742	1.9947
PTBV	0.0260	0.0639	0.8170	0.0472	0.0633	1.4646	0.0594	0.0665	1.8250	0.0644	0.0749	1.9803
ROCE	0.0158	0.0610	0.4967	0.0606	0.0755	1.8940						
SALESTP	-0.0026	0.0350	-0.0724	0.0371	0.0783	1.0532	0.0511	0.0776	1.4388	0.0603	0.0802	1.6743
VO_1	0.0041	0.0527	0.1129	0.0446	0.0839	1.1582	0.0503	0.0855	1.2898	0.0625	0.0960	1.5825
VO_3	0.0089	0.0553	0.2833	0.0447	0.0729	1.1335	0.0477	0.0768	1.2275	0.0611	0.0885	1.5556
VO_6	0.0082	0.0588	0.2399	0.0313	0.0827	0.8283	0.0379	0.0886	0.9998	0.0554	0.1046	1.3823
Crindex	0.0199	0.0683	0.6814	0.0461	0.0771	1.4744	0.0625	0.0756	1.9294	0.0681	0.0793	2.0880
Goldprice	0.0078	0.0632	0.2710	0.0448	0.0716	1.4323	0.0574	0.0770	1.7884	0.0661	0.0782	2.0310
Oilbrentcr	0.0061	0.0732	0.2174	0.0394	0.0724	1.2722	0.0543	0.0751	1.6985	0.0639	0.0784	1.9687
platinum	0.0058	0.0544	0.2042	0.0460	0.0743	1.4708	0.0594	0.0746	1.8519	0.0667	0.0784	2.0601
randdollar	0.0010	0.0712	0.0436	0.0369	0.0798	1.2036	0.0528	0.0736	1.6474	0.0616	0.0757	1.8934
usexpind	0.0071	0.0505	0.1832	0.0233	0.0924	0.7318	0.0445	0.0976	1.0869	0.0617	0.0988	1.3760
usglt10yr	-0.0011	0.0693	-0.0412	0.0417	0.0749	1.3303	0.0570	0.0749	1.7625	0.0643	0.0775	1.9755
usmonsupp	0.0181	0.0513	0.4869	0.0432	0.0763	1.2851	0.0622	0.0770	1.7286	0.0715	0.0776	1.9668
usppi	0.0037	0.0530	0.1040	0.0393	0.0691	1.1414	0.0533	0.0745	1.4940	0.0616	0.0767	1.6810
usshrtm	0.0087	0.0762	0.2822	0.0399	0.0719	1.2791	0.0516	0.0731	1.6135	0.0597	0.0782	1.8449
FACTOR NR.	1			2			3			4		
SIGNIFICANT	0.0469			0.0606			0.0686			0.0715		
FACTOR	BTMV			ROCE			LNP			usmonsupp		

Appendix D.18: Expected Return Model constructed using trailing 6-month moving average timing model – Style and Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the six month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (S)	IR	IC (μ)	IC (S)	IR	IC (μ)	IC (S)	IR	IC (μ)	IC (S)	IR	IC (μ)	IC (S)	IR	IC (μ)	IC (S)	IR	IC (μ)	IC (S)	IR
ATURN	-0.0008	0.0313	-0.0171	0.0467	0.0724	1.3849	0.0665	0.0848	1.6929	0.0561	0.0976	1.5184	0.0649	0.0917	1.5456	0.0645	0.0883	1.5345	0.0657	0.0931	1.5631
BTMV	0.0477	0.0744	1.5376																		
CTTD	-0.0012	0.0365	-0.0358	0.0494	0.0708	1.5241	0.0605	0.0807	1.6460	0.0636	0.0953	1.7710	0.0696	0.0884	1.5860	0.0688	0.0889	1.5707	0.0724	0.0913	1.6437
12_EPS	0.0099	0.0418	0.3186	0.0493	0.0761	1.5325	0.0555	0.0801	1.5197	0.0552	0.0923	1.5463	0.0536	0.0870	1.2913	0.0599	0.0837	1.3771	0.0628	0.0836	1.4428
DTMV	0.0152	0.0616	0.5041	0.0480	0.0744	1.5602	0.0555	0.0909	1.5671	0.0649	0.0996	1.8466	0.0658	0.0900	1.5296	0.0667	0.0894	1.5503	0.0688	0.0925	1.5950
DY	0.0205	0.0514	0.6718	0.0582	0.0568	1.8473	0.0665	0.0794	1.8817	0.0711	0.0904	2.0256	0.0739	0.0894	1.7398	0.0753	0.0870	1.7664	0.0762	0.0890	1.7855
EPS	0.0271	0.0768	0.8889	0.0582	0.0796	1.8258	0.0671	0.0850	1.8684	0.0654	0.0945	1.8600	0.0703	0.0835	1.6617	0.0705	0.0847	1.6572	0.0734	0.0856	1.7244
EY	0.0097	0.0534	0.2834	0.0423	0.0685	1.2225	0.0491	0.0811	1.3102	0.0496	0.0943	1.3706	0.0535	0.0910	1.2073	0.0558	0.0903	1.2503	0.0599	0.0900	1.3375
ICBT	0.0026	0.0349	0.0824	0.0487	0.0686	1.5488	0.0661	0.0775	1.8322	0.0681	0.0907	1.9196	0.0723	0.0811	1.6798	0.0719	0.0819	1.6704	0.0740	0.0840	1.7133
LMNV	0.0145	0.0918	0.4783	0.0531	0.0733	1.7053	0.0669	0.0842	1.8791	0.0707	0.0910	2.0098	0.0712	0.0858	1.7004	0.0748	0.0869	1.7545	0.0767	0.0882	1.7944
LNP	0.0289	0.0821	0.9710	0.0617	0.0826	1.9282	0.0633	0.1009	1.8179	0.0694	0.0952	1.9790	0.0682	0.0890	1.6563	0.0743	0.0880	1.7477	0.0762	0.0891	1.7863
MOM_6M	0.0110	0.0875	0.3906	0.0539	0.0804	1.7616	0.0679	0.0911	1.9390												
MTBV	0.0200	0.0561	0.6268	0.0528	0.0632	1.6607	0.0632	0.0836	1.7987	0.0692	0.0914	1.9802	0.0741	0.0837	1.7380						
MTTMV_1	0.0026	0.0564	0.0805	0.0505	0.0773	1.3195	0.0451	0.0968	1.2626	0.0524	0.1036	1.4947	0.0500	0.0974	1.1942	0.0481	0.0960	1.1677	0.0500	0.0994	1.2039
MTTMV_3	0.0031	0.0567	0.1343	0.0481	0.0843	1.1925	0.0405	0.0847	1.0943	0.0497	0.0914	1.3554	0.0585	0.0824	1.2959	0.0570	0.0827	1.2737	0.0602	0.0820	1.3443
MTTMV_6	0.0108	0.0598	0.2993	0.0384	0.0775	0.9992	0.0305	0.0959	0.8782	0.0329	0.1012	0.9704	0.0441	0.0906	1.0296	0.0441	0.0905	1.0242	0.0486	0.0935	1.1171
MVTRADEMNV	0.0086	0.0397	0.2492	0.0518	0.0664	1.3390	0.0665	0.0801	1.5124	0.0716	0.0827	1.6976									
MVTRADE	0.0321	0.1010	0.9046	0.0634	0.0804	1.7880															
PC	0.0280	0.0561	0.8891	0.0542	0.0641	1.7017	0.0666	0.0818	1.8511	0.0704	0.0906	1.9927	0.0697	0.0850	1.6750	0.0760	0.0858	1.7756			
P	0.0203	0.0686	0.6794	0.0565	0.0692	1.7736	0.0606	0.0885	1.7265	0.0671	0.0906	1.9114	0.0686	0.0839	1.6391	0.0725	0.0855	1.7016	0.0746	0.0869	1.7433
PTBV	0.0267	0.0627	0.8441	0.0538	0.0628	1.6825	0.0604	0.0832	1.7212	0.0668	0.0922	1.9095	0.0690	0.0857	1.6264	0.0688	0.0835	1.6231	0.0722	0.0855	1.7005
ROCE	0.0198	0.0601	0.6094	0.0553	0.0799	1.7639	0.0643	0.0883	1.7939	0.0657	0.0993	1.8547	0.0724	0.0906	1.6622	0.0720	0.0888	1.6599	0.0729	0.0929	1.6847
SALESTP	0.0037	0.0337	0.1186	0.0429	0.0753	1.2399	0.0653	0.0832	1.6069	0.0571	0.0982	1.4902	0.0636	0.0910	1.4919	0.0636	0.0888	1.4902	0.0641	0.0926	1.5058
VO_1	0.0064	0.0532	0.1762	0.0481	0.0865	1.2447	0.0448	0.0976	1.2623	0.0491	0.1051	1.4059	0.0467	0.0974	1.1089	0.0464	0.0936	1.1153	0.0485	0.0969	1.1573
VO_3	0.0050	0.0558	0.1854	0.0481	0.0844	1.1943	0.0407	0.0848	1.1007	0.0499	0.0915	1.3589	0.0586	0.0825	1.2983	0.0570	0.0828	1.2750	0.0603	0.0822	1.3453
VO_6	0.0101	0.0595	0.2802	0.0392	0.0774	1.0213	0.0308	0.0955	0.8867	0.0331	0.1006	0.9725	0.0442	0.0906	1.0317	0.0442	0.0905	1.0267	0.0487	0.0934	1.1177
Crbindex	0.0022	0.0722	0.0814	0.0478	0.0792	1.4015	0.0608	0.0849	1.7157	0.0566	0.0964	1.6509	0.0661	0.0893	1.5967	0.0694	0.0855	1.6412	0.0678	0.0885	1.6283
Goldprice	0.0118	0.0638	0.4096	0.0465	0.0747	1.4888	0.0652	0.0794	1.8351	0.0659	0.0914	1.8812	0.0669	0.0851	1.6326	0.0710	0.0843	1.6819	0.0685	0.0856	1.6316
Oilbrentcr	0.0091	0.0738	0.2938	0.0447	0.0762	1.4309	0.0602	0.0835	1.6838	0.0655	0.0917	1.8630	0.0723	0.0827	1.6874	0.0702	0.0826	1.6450	0.0733	0.0836	1.7099
platinum	0.0049	0.0544	0.1640	0.0483	0.0699	1.5516	0.0642	0.0787	1.8047	0.0700	0.0877	1.9864	0.0686	0.0794	1.6459	0.0742	0.0802	1.7326	0.0757	0.0828	1.7627
randdollar	0.0096	0.0712	0.3159	0.0464	0.0791	1.5010	0.0559	0.0873	1.5850	0.0646	0.0922	1.8369	0.0721	0.0838	1.6757	0.0695	0.0845	1.6280	0.0715	0.0863	1.6658
usexpind	0.0008	0.0512	0.0380	0.0289	0.0906	0.8714	0.0545	0.1073	1.1401	0.0642	0.1134	1.3847	0.0715	0.1086	1.2699	0.0663	0.1090	1.2121	0.0664	0.1074	1.2050
usglt10yr	0.0114	0.0688	0.3880	0.0537	0.0629	1.7173	0.0652	0.0787	1.8302	0.0667	0.0934	1.8954	0.0611	0.0908	1.4878	0.0652	0.0899	1.5415	0.0662	0.0915	1.5641
usmonsopp	0.0053	0.0543	0.1753	0.0463	0.0786	1.4455	0.0582	0.0835	1.5252	0.0549	0.1024	1.5695	0.0504	0.1045	1.2383	0.0490	0.1042	1.2250	0.0505	0.1047	1.2552
usppi	0.0025	0.0538	0.0924	0.0420	0.0667	1.2265	0.0556	0.0868	1.4083	0.0634	0.0895	1.6474	0.0578	0.0894	1.3206	0.0569	0.0870	1.3022	0.0610	0.0890	1.3757
usshrtm	-0.0069	0.0737	-0.2290	0.0407	0.0700	1.3241	0.0562	0.0825	1.5783	0.0636	0.0929	1.8081	0.0719	0.0826	1.6648	0.0709	0.0825	1.6500	0.0725	0.0850	1.6827
FACTOR NR.	1			2			3			4			5			6			7		
SIGNIFICANT	0.0477			0.0634			0.0679			0.0716			0.0741			0.0760			0.0767		
FACTOR	BTMV			MVTRADE			MOM_6M			MVTRADEMNV			MTBV			PC			LMNV		

Appendix D.19: Expected Return Model constructed using trailing 12-month moving average timing model – Style and Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the twelve month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	0.0074	0.0287	0.2473	0.0439	0.0742	1.3338	0.0609	0.0718	1.7772	0.0643	0.0885	1.9024	0.0743	0.0708	1.8740	0.0744	0.0751	1.8946
BTMV	0.0455	0.0755	1.4783															
CTTD	0.0034	0.0370	0.1139	0.0393	0.0721	1.2519	0.0595	0.0662	1.8277	0.0642	0.0863	1.9874	0.0738	0.0686	1.8468	0.0759	0.0716	1.8964
12_EPS	0.0033	0.0431	0.1038	0.0519	0.0732	1.6228	0.0611	0.0656	1.8866	0.0682	0.0862	2.1283	0.0738	0.0730	1.8684	0.0763	0.0755	1.9304
DTMV	0.0198	0.0612	0.6457	0.0400	0.0800	1.3414	0.0588	0.0650	1.8816	0.0666	0.0845	2.1352	0.0751	0.0683	1.9393	0.0763	0.0709	1.9673
DY	0.0206	0.0498	0.6837	0.0552	0.0573	1.7608	0.0663	0.0645	2.0774	0.0719	0.0818	2.2666	0.0732	0.0699	1.8860	0.0749	0.0725	1.9303
EPS	0.0123	0.0815	0.4033	0.0483	0.0784	1.5312	0.0580	0.0722	1.8235	0.0641	0.0880	2.0433	0.0756	0.0701	1.9345	0.0782	0.0724	2.0005
EY	0.0035	0.0510	0.1086	0.0424	0.0681	1.2346	0.0550	0.0636	1.5744	0.0606	0.0743	1.7476	0.0593	0.0801	1.4239	0.0632	0.0810	1.5177
ICBT	0.0056	0.0356	0.1829	0.0440	0.0704	1.4268	0.0594	0.0609	1.8550	0.0669	0.0794	2.1062	0.0697	0.0680	1.8054	0.0721	0.0706	1.8671
LNBMV	0.0104	0.0913	0.3558	0.0400	0.0727	1.3131	0.0562	0.0651	1.7788	0.0631	0.0818	2.0133	0.0697	0.0698	1.7985	0.0718	0.0713	1.8513
LNP	0.0188	0.0849	0.6266	0.0505	0.0866	1.5767	0.0600	0.0719	1.9009	0.0669	0.0828	2.1375	0.0756	0.0680	1.9511	0.0775	0.0704	1.9978
MOM_6M	0.0177	0.0863	0.6153	0.0571	0.0877	1.8824	0.0672	0.0829	2.1413									
MTBV	0.0149	0.0581	0.4839	0.0494	0.0684	1.6154	0.0647	0.0606	2.0361	0.0695	0.0778	2.2033	0.0740	0.0679	1.9116	0.0760	0.0696	1.9623
MITTMV_1	-0.0055	0.0548	-0.0873	0.0534	0.0748	1.4118	0.0609	0.0734	1.6342	0.0665	0.0883	1.8253	0.0696	0.0819	1.6205	0.0734	0.0843	1.6930
MITTMV_3	0.0014	0.0571	0.1139	0.0409	0.0914	1.0138	0.0572	0.0857	1.4390	0.0593	0.1063	1.5200	0.0733	0.0797	1.5202	0.0768	0.0805	1.5978
MITTMV_6	0.0133	0.0606	0.3563	0.0390	0.0729	1.0132	0.0536	0.0727	1.3931	0.0547	0.0941	1.4255	0.0658	0.0744	1.4129	0.0697	0.0793	1.4897
MVTRADEMV	0.0053	0.0394	0.1502	0.0513	0.0633	1.3363	0.0606	0.0632	1.5474	0.0736	0.0679	1.9007						
MVTRADE	0.0248	0.1005	0.7164	0.0444	0.0839	1.2547	0.0557	0.0890	1.5548	0.0598	0.1024	1.7028	0.0680	0.0937	1.6457	0.0647	0.0971	1.5662
PC	0.0261	0.0573	0.8436	0.0543	0.0678	1.7191	0.0648	0.0612	2.0261	0.0703	0.0776	2.2200	0.0756	0.0707	1.9506			
P	0.0132	0.0698	0.4396	0.0471	0.0735	1.4901	0.0588	0.0611	1.8562	0.0672	0.0772	2.1362	0.0737	0.0665	1.9037	0.0758	0.0692	1.9559
PTBV	0.0199	0.0653	0.6418	0.0539	0.0652	1.6917	0.0639	0.0627	2.0025	0.0698	0.0784	2.2045	0.0735	0.0689	1.8906	0.0749	0.0707	1.9287
ROCE	0.0260	0.0592	0.8198	0.0606	0.0646	1.9169												
SALESTP	0.0037	0.0340	0.1141	0.0418	0.0692	1.2206	0.0535	0.0719	1.5380	0.0602	0.0893	1.7438	0.0742	0.0717	1.8515	0.0763	0.0728	1.9042
VO_1	-0.0033	0.0543	-0.0848	0.0467	0.0846	1.2167	0.0592	0.0755	1.5594	0.0651	0.0968	1.7358	0.0697	0.0835	1.5666	0.0727	0.0859	1.6215
VO_3	0.0012	0.0564	0.1100	0.0405	0.0910	1.0048	0.0572	0.0856	1.4398	0.0593	0.1062	1.5219	0.0732	0.0797	1.5196	0.0767	0.0805	1.5963
VO_6	0.0141	0.0599	0.3737	0.0416	0.0714	1.0770	0.0546	0.0733	1.4179	0.0556	0.0936	1.4481	0.0657	0.0747	1.4106	0.0697	0.0796	1.4883
Crbindex	0.0062	0.0708	0.2265	0.0366	0.0840	1.2145	0.0562	0.0690	1.7841	0.0617	0.0900	1.9717	0.0719	0.0704	1.8415	0.0719	0.0749	1.8616
Goldprice	0.0074	0.0661	0.2605	0.0456	0.0774	1.4853	0.0607	0.0685	1.9100	0.0669	0.0850	2.1222	0.0737	0.0681	1.8899	0.0759	0.0711	1.9453
Oilbrentcr	0.0066	0.0748	0.2288	0.0409	0.0852	1.3308	0.0579	0.0680	1.8171	0.0651	0.0843	2.0617	0.0708	0.0694	1.8167	0.0728	0.0716	1.8661
platinum	0.0031	0.0552	0.1111	0.0444	0.0713	1.4476	0.0596	0.0638	1.8745	0.0671	0.0795	2.1231	0.0718	0.0653	1.8405	0.0715	0.0707	1.8546
randdollar	0.0105	0.0694	0.3525	0.0441	0.0793	1.4551	0.0621	0.0665	1.9461	0.0684	0.0837	2.1623	0.0752	0.0693	1.9217	0.0770	0.0726	1.9681
usexpind	0.0073	0.0499	0.2273	0.0390	0.0856	1.0567	0.0475	0.0858	1.2650	0.0557	0.1120	1.4817	0.0612	0.1081	1.3752	0.0585	0.1058	1.3727
usglt10yr	0.0080	0.0706	0.2724	0.0490	0.0640	1.5811	0.0625	0.0636	1.9609	0.0697	0.0816	2.1957	0.0736	0.0686	1.8899	0.0757	0.0713	1.9415
usmonsupp	0.0053	0.0543	0.0899	0.0466	0.0690	1.4048	0.0498	0.0736	1.4638	0.0503	0.0976	1.5562	0.0495	0.0889	1.3240	0.0513	0.0910	1.3680
usppi	-0.0043	0.0552	-0.1705	0.0391	0.0711	1.1499	0.0564	0.0682	1.6095	0.0667	0.0815	1.9141	0.0656	0.0782	1.5933	0.0677	0.0794	1.6416
usshtrm	-0.0011	0.0729	-0.0457	0.0409	0.0718	1.3460	0.0595	0.0635	1.8757	0.0660	0.0833	2.0996	0.0732	0.0674	1.8787	0.0752	0.0709	1.9289
FACTOR NR.	1			2			3		4			5		6				
SIGNIFICANT	0.0455			0.0606			0.0672		0.0736			0.0756		0.0782				
FACTOR	BTMV			ROCE			MOM_6M		MVTRADEMV			PC		EPS				

Appendix D.19 (continued) Expected Return Model constructed using trailing 12-month moving average timing model – Style and Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the twelve month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
0.0784	0.0745	1.9589	0.0802	0.0751	2.0001	0.0777	0.0881	1.5774	0.0794	0.0874	1.6122	0.0799	0.0888	1.6194
0.0733	0.0778	1.8332	0.0722	0.0806	1.8048	0.0757	0.0841	1.5438	0.0757	0.0843	1.5478	0.0768	0.0860	1.5657
0.0771	0.0750	1.9497	0.0785	0.0750	1.9841	0.0619	0.0778	1.7436	0.0625	0.0778	1.2619	0.0659	0.0804	1.3280
0.0787	0.0726	2.0143	0.0801	0.0728	2.0468	0.0821	0.0879	1.6957	0.0835	0.0887	1.7267	0.0843	0.0912	1.7376
0.0776	0.0744	1.9823	0.0791	0.0746	2.0171	0.0822	0.0887	1.6891	0.0823	0.0873	1.6967	0.0844	0.0909	1.7347
0.0645	0.0821	1.5547	0.0679	0.0800	1.5997	0.0777	0.0923	1.5241	0.0783	0.0930	1.5401	0.0784	0.0939	1.5429
0.0761	0.0723	1.9521	0.0779	0.0733	1.9937	0.0832	0.0878	1.6913	0.0819	0.0855	1.6730	0.0855	0.0913	1.7369
0.0736	0.0726	1.8795	0.0757	0.0735	1.9295	0.0784	0.0857	1.6183	0.0793	0.0863	1.6385	0.0815	0.0878	1.6789
0.0798	0.0729	2.0357												
0.0784	0.0716	2.0082	0.0798	0.0720	2.0406	0.0810	0.0844	1.6785	0.0819	0.0843	1.7028	0.0834	0.0866	1.7271
0.0764	0.0843	1.7425	0.0733	0.0855	1.6687	0.0786	0.0920	1.5910	0.0785	0.0922	1.5932	0.0798	0.0923	1.6094
0.0782	0.0870	1.6349	0.0824	0.0873	1.6994	0.0830	0.0901	1.7026	0.0826	0.0887	1.6992	0.0849	0.0924	1.7401
0.0670	0.0905	1.4343	0.0706	0.0860	1.5071	0.0623	0.0986	1.3164	0.0627	0.0982	1.3286	0.0621	0.0978	1.3128
0.0625	0.1030	1.5147	0.0620	0.1051	1.4984	0.0578	0.0926	1.2757	0.0581	0.0926	1.2862	0.0595	0.0952	1.3159
0.0783	0.0713	2.0009	0.0795	0.0719	2.0277	0.0846	0.0884	1.7445						
0.0774	0.0724	1.9766	0.0787	0.0728	2.0070	0.0801	0.0854	1.6543	0.0809	0.0863	1.6742	0.0825	0.0887	1.7011
0.0784	0.0741	1.9380	0.0802	0.0750	1.9802	0.0742	0.0918	1.4872	0.0746	0.0911	1.5001	0.0751	0.0953	1.5050
0.0771	0.0877	1.7117	0.0743	0.0899	1.6486	0.0778	0.0928	1.5557	0.0778	0.0929	1.5590	0.0796	0.0924	1.5863
0.0779	0.0871	1.6314	0.0834	0.0882	1.7180									
0.0672	0.0897	1.4387	0.0707	0.0860	1.5088	0.0620	0.0987	1.3110	0.0624	0.0982	1.3234	0.0619	0.0978	1.3079
0.0775	0.0737	1.9648	0.0797	0.0746	2.0147	0.0793	0.0861	1.6285	0.0788	0.0851	1.6242	0.0819	0.0864	1.6860
0.0786	0.0720	1.9955	0.0801	0.0724	2.0315	0.0845	0.0901	1.7356	0.0858	0.0910	1.7630			
0.0756	0.0720	1.9203	0.0776	0.0721	1.9684	0.0797	0.0885	1.6322	0.0808	0.0885	1.6587	0.0829	0.0907	1.7028
0.0765	0.0678	1.9424	0.0780	0.0682	1.9784	0.0820	0.0874	1.6769	0.0833	0.0877	1.7048	0.0847	0.0895	1.7423
0.0790	0.0747	2.0046	0.0799	0.0746	2.0251	0.0812	0.0885	1.6763	0.0817	0.0886	1.6898	0.0828	0.0905	1.7126
0.0578	0.1107	1.3447	0.0657	0.1124	1.4258	0.0252	0.1206	0.7770	0.0389	0.1202	0.8987	0.0378	0.1255	0.9240
0.0780	0.0731	1.9842	0.0794	0.0730	2.0164	0.0826	0.0866	1.6970	0.0838	0.0871	1.7249	0.0862	0.0896	1.7743
0.0513	0.0926	1.3669	0.0521	0.0925	1.3851	0.0421	0.1059	1.0198	0.0431	0.1052	1.0399	0.0445	0.1066	1.0733
0.0719	0.0821	1.7231	0.0716	0.0825	1.7198	0.0662	0.0904	1.2976	0.0675	0.0902	1.3275	0.0696	0.0904	1.3687
0.0778	0.0723	1.9780	0.0792	0.0726	2.0104	0.0798	0.0876	1.6374	0.0804	0.0877	1.6546	0.0821	0.0904	1.6921
7 0.0798 LNP			8 0.0834 VO_3			9 0.0846 P			10 0.0858 Goldprice			11 0.0862 usglt10yr		

Appendix D.20 Expected Return Model constructed using trailing 18-month moving average timing model -- Style and Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the eighteen month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
ATURN	0.0052	0.0294	0.1771	0.0544	0.0645	1.6130	0.0739	0.0565	2.1010	0.0801	0.0748	2.2931						
BTMV	0.0549	0.0646	1.7673															
CTTD	0.0076	0.0372	0.2427	0.0463	0.0693	1.4414	0.0713	0.0559	2.1512	0.0751	0.0768	2.2764	0.0601	0.0683	1.6783	0.0713	0.0883	1.9657
12_EPS	0.0047	0.0429	0.1553	0.0625	0.0630	1.9310	0.0691	0.0585	2.1120	0.0794	0.0780	2.4399	0.0816	0.0799	2.2891			
DTMV	0.0171	0.0599	0.5589	0.0541	0.0611	1.7261	0.0697	0.0529	2.1832	0.0792	0.0727	2.4837	0.0806	0.0746	2.3102	0.0824	0.0807	2.3147
DY	0.0171	0.0513	0.5671	0.0578	0.0567	1.8483	0.0710	0.0563	2.2174	0.0793	0.0725	2.4780	0.0801	0.0751	2.2901	0.0812	0.0794	2.2765
EPS	-0.0009	0.0793	-0.0395	0.0542	0.0664	1.7157	0.0673	0.0565	2.0767	0.0773	0.0728	2.4033	0.0793	0.0750	2.2514	0.0782	0.0781	2.2072
EY	0.0049	0.0517	0.1505	0.0505	0.0653	1.4580	0.0610	0.0601	1.7366	0.0700	0.0682	1.9995	0.0720	0.0757	1.8766	0.0723	0.0762	1.8673
ICBT	0.0051	0.0365	0.1614	0.0547	0.0601	1.7360	0.0679	0.0541	2.0982	0.0771	0.0716	2.3912	0.0795	0.0740	2.2525	0.0814	0.0799	2.2641
LNBMV	-0.0028	0.0916	-0.0913	0.0497	0.0672	1.6110	0.0662	0.0555	2.0721	0.0752	0.0702	2.3609	0.0758	0.0723	2.1785	0.0775	0.0783	2.1819
LNP	0.0051	0.0871	0.1720	0.0450	0.0715	1.4459	0.0657	0.0603	2.0592	0.0755	0.0727	2.3751	0.0792	0.0754	2.2765	0.0764	0.0790	2.1646
MOM_6M	0.0210	0.0848	0.7281	0.0683	0.0724	2.2049	0.0784	0.0725	2.4543									
MTBV	0.0241	0.0534	0.7774	0.0539	0.0643	1.7480	0.0699	0.0532	2.1874	0.0770	0.0705	2.4181	0.0796	0.0731	2.2784	0.0811	0.0780	2.2745
MTTMV_1	-0.0043	0.0547	-0.0505	0.0593	0.0718	1.5698	0.0692	0.0651	1.8153	0.0764	0.0770	2.0427	0.0790	0.0797	1.9341	0.0722	0.0823	1.7332
MTTMV_3	0.0078	0.0551	0.2927	0.0506	0.0809	1.2522	0.0698	0.0703	1.7270	0.0745	0.0910	1.8663	0.0769	0.0941	1.7621	0.0706	0.0943	1.5894
MTTMV_6	0.0156	0.0617	0.4181	0.0507	0.0652	1.3109	0.0677	0.0655	1.7310	0.0667	0.0829	1.7043	0.0721	0.0843	1.6847	0.0651	0.0890	1.4956
MVTRADEMV	0.0071	0.0378	0.2047	0.0555	0.0624	1.4505	0.0639	0.0610	1.6523	0.0773	0.0655	2.0137	0.0787	0.0679	2.0023	0.0794	0.0729	1.9794
MVTRADE	0.0310	0.0998	0.8832	0.0494	0.0868	1.3896	0.0585	0.0777	1.6453	0.0686	0.0953	1.9088	0.0463	0.1151	1.2616	0.0447	0.1179	1.2075
PC	0.0274	0.0566	0.8863	0.0559	0.0635	1.7965	0.0696	0.0573	2.1799	0.0778	0.0737	2.4443	0.0797	0.0747	2.2906	0.0814	0.0798	2.2922
P	-0.0003	0.0721	-0.0139	0.0491	0.0678	1.5877	0.0657	0.0556	2.0640	0.0766	0.0713	2.4115	0.0794	0.0740	2.2826	0.0781	0.0776	2.2053
PTBV	0.0290	0.0600	0.9357	0.0513	0.0674	1.6608	0.0682	0.0567	2.1376	0.0760	0.0715	2.3891	0.0779	0.0731	2.2373	0.0792	0.0773	2.2277
ROCE	0.0262	0.0593	0.8313	0.0697	0.0552	2.1753												
SALESTP	0.0051	0.0319	0.1617	0.0507	0.0635	1.4604	0.0675	0.0595	1.8785	0.0765	0.0773	2.1372	0.0769	0.0773	2.1512	0.0786	0.0823	2.1501
VO_1	0.0014	0.0520	0.0361	0.0593	0.0739	1.5416	0.0694	0.0656	1.7874	0.0755	0.0861	1.9604	0.0791	0.0873	1.8816	0.0730	0.0858	1.7055
VO_3	0.0083	0.0541	0.3031	0.0502	0.0788	1.2475	0.0697	0.0702	1.7263	0.0744	0.0911	1.8657	0.0769	0.0941	1.7617	0.0706	0.0943	1.5882
VO_6	0.0156	0.0611	0.4171	0.0518	0.0641	1.3395	0.0660	0.0643	1.6840	0.0681	0.0820	1.7389	0.0716	0.0843	1.6753	0.0653	0.0888	1.5008
Crbindex	0.0071	0.0665	0.2557	0.0467	0.0765	1.5060	0.0674	0.0573	2.1006	0.0739	0.0795	2.3054	0.0801	0.0800	2.2764	0.0767	0.0849	2.1480
Goldprice	0.0103	0.0680	0.3716	0.0557	0.0632	1.7868	0.0702	0.0586	2.1778	0.0787	0.0759	2.4507	0.0796	0.0772	2.2654	0.0805	0.0804	2.2478
Oilbrentcr	-0.0004	0.0744	0.0006	0.0558	0.0730	1.7689	0.0692	0.0575	2.1400	0.0775	0.0734	2.4098	0.0798	0.0754	2.2650	0.0816	0.0800	2.2744
platinum	0.0002	0.0546	-0.0093	0.0526	0.0607	1.6831	0.0672	0.0563	2.0857	0.0773	0.0717	2.4088	0.0784	0.0735	2.2358	0.0797	0.0775	2.2293
randdollar	0.0090	0.0653	0.3108	0.0505	0.0726	1.6232	0.0691	0.0568	2.1404	0.0788	0.0721	2.4497	0.0800	0.0739	2.2742	0.0805	0.0793	2.2510
usexpind	0.0107	0.0493	0.2262	0.0385	0.0817	1.0979	0.0357	0.0917	1.1547	0.0498	0.1147	1.4594	0.0461	0.1218	1.3561	0.0391	0.1292	1.2899
usglt10yr	0.0111	0.0701	0.3825	0.0543	0.0612	1.7419	0.0689	0.0565	2.1422	0.0782	0.0729	2.4354	0.0798	0.0758	2.2740	0.0814	0.0806	2.2733
usmonsopp	-0.0015	0.0498	-0.1181	0.0515	0.0652	1.5610	0.0474	0.0787	1.4199	0.0458	0.1061	1.4174	0.0466	0.1087	1.3837	0.0513	0.1122	1.4397
usppi	0.0033	0.0551	0.0994	0.0513	0.0623	1.4741	0.0654	0.0592	1.8383	0.0773	0.0738	2.1854	0.0807	0.0812	2.1009	0.0825	0.0859	2.1098
usshrtm	-0.0081	0.0748	-0.2761	0.0491	0.0704	1.5875	0.0691	0.0547	2.1452	0.0774	0.0732	2.4129	0.0787	0.0745	2.2396	0.0800	0.0789	2.2328
FACTOR NR.	1			2			3		4			5			6			
SIGNIFICANT	0.0549			0.0697			0.0784		0.0801			0.0816			0.0825			
FACTOR	BTMV			ROCE			MOM_6M		A_TURN			12_EPS			usppi			

Appendix D.20 (continued) Expected Return Model constructed using trailing 18-month moving average timing model – Style and Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the eighteen month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

IC (μ)	IC (5)	IR	IC (μ)	IC (5)	IR	IC (μ)	IC (5)	IR	IC (μ)	IC (5)	IR	IC (μ)	IC (5)	IR	IC (μ)	IC (5)	IR
0.0825	0.0870	2.0552	0.0830	0.0872	2.0580	0.0841	0.0882	2.0853	0.0845	0.0871	2.1043	0.0851	0.0859	2.1121	0.0861	0.0865	2.1264
0.0835	0.0876	2.1354	0.0847	0.0860	2.1529												
0.0826	0.0866	2.1174	0.0840	0.0851	2.1361	0.0847	0.0860	2.1559	0.0852	0.0859	2.1781	0.0862	0.0851	2.1926	0.0871	0.0855	2.2015
0.0796	0.0848	2.0429	0.0806	0.0842	2.0580	0.0817	0.0850	2.0846	0.0824	0.0851	2.1137	0.0829	0.0842	2.1180	0.0836	0.0845	2.1247
0.0720	0.0815	1.7045	0.0729	0.0829	1.7215	0.0743	0.0833	1.7435	0.0773	0.0846	1.8195	0.0778	0.0830	1.8281	0.0785	0.0849	1.8403
0.0815	0.0840	2.0707	0.0828	0.0837	2.0867	0.0838	0.0844	2.1141	0.0847	0.0837	2.1463	0.0854	0.0833	2.1532	0.0863	0.0839	2.1620
0.0790	0.0857	2.0307	0.0804	0.0845	2.0498	0.0812	0.0849	2.0716	0.0822	0.0856	2.1061	0.0831	0.0849	2.1182	0.0841	0.0850	2.1320
0.0809	0.0852	2.0782	0.0821	0.0829	2.0966	0.0824	0.0833	2.1098	0.0835	0.0842	2.1448	0.0845	0.0834	2.1612	0.0853	0.0828	2.1687
0.0820	0.0851	2.0980	0.0838	0.0842	2.1248	0.0850	0.0850	2.1536	0.0858	0.0850	2.1826						
0.0776	0.0920	1.6980	0.0783	0.0908	1.7125	0.0790	0.0912	1.7245	0.0817	0.0934	1.7799	0.0835	0.0926	1.8129	0.0842	0.0923	1.8025
0.0796	0.0894	1.6131	0.0807	0.0888	1.6122	0.0815	0.0908	1.6354	0.0820	0.0908	1.6584	0.0835	0.0905	1.6891	0.0869	0.0928	1.7460
0.0666	0.0951	1.3693	0.0686	0.0930	1.3948	0.0687	0.0917	1.3900	0.0701	0.0969	1.4189	0.0696	0.0962	1.4266	0.0739	0.0982	1.4925
0.0792	0.0838	1.8500	0.0779	0.0873	1.8338	0.0781	0.0883	1.8451	0.0803	0.0886	1.8962	0.0817	0.0864	1.9257	0.0803	0.0854	1.8930
0.0468	0.1139	1.2419	0.0465	0.1127	1.2515	0.0497	0.1129	1.2905	0.0506	0.1147	1.3178	0.0582	0.1098	1.4648	0.0594	0.1106	1.4876
0.0831	0.0868	2.1378	0.0847	0.0851	2.1608	0.0852	0.0858	2.1761									
0.0816	0.0847	2.0930	0.0827	0.0830	2.1101	0.0835	0.0840	2.1317	0.0843	0.0843	2.1605	0.0850	0.0834	2.1716	0.0858	0.0835	2.1791
0.0794	0.0845	2.0565	0.0814	0.0831	2.0853	0.0823	0.0835	2.1065	0.0829	0.0843	2.1287	0.0836	0.0837	2.1462	0.0844	0.0840	2.1516
0.0805	0.0867	2.0022	0.0821	0.0862	2.0270	0.0834	0.0874	2.0594	0.0839	0.0864	2.0806	0.0842	0.0856	2.0850	0.0853	0.0853	2.0995
0.0796	0.0947	1.6769	0.0796	0.0946	1.6741	0.0804	0.0946	1.6895	0.0824	0.0960	1.7296	0.0839	0.0958	1.7514	0.0849	0.0953	1.7528
0.0798	0.0893	1.6156	0.0810	0.0889	1.6190	0.0819	0.0906	1.6429	0.0827	0.0906	1.6710	0.0842	0.0903	1.7027	0.0871	0.0929	1.7509
0.0668	0.0945	1.3704	0.0687	0.0928	1.3954	0.0689	0.0917	1.3924	0.0704	0.0968	1.4225	0.0698	0.0961	1.4302	0.0740	0.0981	1.4939
0.0812	0.0895	2.0740	0.0822	0.0894	2.0845	0.0831	0.0907	2.1102	0.0840	0.0899	2.1412	0.0847	0.0891	2.1486	0.0851	0.0889	2.1532
0.0824	0.0861	2.0983	0.0842	0.0853	2.1278	0.0850	0.0864	2.1485	0.0856	0.0862	2.1754	0.0866	0.0854	2.1890			
0.0837	0.0850	2.1266															
0.0812	0.0842	2.0731	0.0826	0.0836	2.0929	0.0835	0.0845	2.1165	0.0840	0.0843	2.1406	0.0846	0.0835	2.1480	0.0859	0.0847	2.1665
0.0823	0.0868	2.1046	0.0832	0.0867	2.1176	0.0842	0.0878	2.1402	0.0846	0.0873	2.1622	0.0852	0.0863	2.1707	0.0855	0.0861	2.1659
0.0353	0.1320	1.2371	0.0364	0.1337	1.2298	0.0410	0.1343	1.2980	0.0436	0.1348	1.3487	0.0411	0.1342	1.3165	0.0336	0.1327	1.2101
0.0825	0.0865	2.1122	0.0838	0.0856	2.1313	0.0846	0.0866	2.1544	0.0854	0.0861	2.1823	0.0861	0.0854	2.1912	0.0868	0.0864	2.1982
0.0508	0.1121	1.4652	0.0502	0.1136	1.4589	0.0529	0.1180	1.4987	0.0537	0.1176	1.5351	0.0526	0.1166	1.5285	0.0531	0.1171	1.5319
0.0816	0.0846	2.0776	0.0821	0.0845	2.0783	0.0832	0.0853	2.1067	0.0840	0.0852	2.1387	0.0846	0.0844	2.1450	0.0850	0.0850	2.1448
7 0.0837 <i>Oilbrentcr</i>			8 0.0847 <i>DTMV</i>			9 0.0852 <i>PC</i>			10 0.0858 <i>MTBV</i>			11 0.0866 <i>goldprice</i>			12 0.0871 <i>DY</i>		

Appendix D.20 (continued) Expected Return Model constructed using trailing 18-month moving average timing model – Style and Macroeconomic Variables

Presented in the table below are the results of the stepwise variant of Haugen and Baker (1996). The procedure begins by searching for a single explanatory variable with additions made thereafter in a stepwise fashion based on certain assessment criteria. The historical slopes of the variables are predicted using the eighteen month trailing moving average model and tested for significance using a two-step assessment. The forecasting ability of the timing model employed is first tested using the Information Coefficient (IC) of Grinold (1989), and the variable that displays the highest IC is taken to the next step where the above procedure is repeated using two variables, the first being that from the first step. The next step then follows whereby the next best cumulative combination of the first attribute with an identified second is output that produces the highest mean IC. This stepwise procedure continues until a multifactor model is generated that displays the highest average cumulative IC. The procedure is halted at any time when the subsequent inclusion of a candidate variable results in a reduction of the overall mean IC. The Information Ratio (IR) calculated is that of Qian and Hua (2004) and is the mean monthly IC divided by the standard deviation of the IC over the months. The mean IC and IR statistic of the multifactor models tested at each step in the procedure are displayed. Variables that are included in the model are represented in the presented significant factor list and highlighted in bold and italics within the presented table. The variables are listed in alphabetical order with the all data being extracted from DataStream International.

IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR	IC (μ)	IC (δ)	IR
0.0851	0.0875	2.1051	0.0894	0.0947	1.7783	0.0909	0.0970	1.8007	0.0913	0.0970	1.7978	0.0915	0.0958	1.8085	0.0947	0.0953	1.8670
0.0842	0.0846	2.1381	0.0882	0.0936	1.7952	0.0885	0.0932	1.7906	0.0902	0.0929	1.8168	0.0909	0.0924	1.8370	0.0916	0.0933	1.8494
0.0782	0.0857	1.8376	0.0740	0.0906	1.4453	0.0740	0.0904	1.4488	0.0747	0.0894	1.4536	0.0745	0.0881	1.4529	0.0747	0.0879	1.4475
0.0872	0.0838	2.1794	0.0888	0.0926	1.7693	0.0905	0.0935	1.7952	0.0904	0.0930	1.7910	0.0907	0.0917	1.8023	0.0905	0.0926	1.7980
0.0845	0.0850	2.1407	0.0869	0.0911	1.7433	0.0887	0.0932	1.7755	0.0895	0.0928	1.7836	0.0897	0.0918	1.7935	0.0903	0.0933	1.8036
0.0858	0.0831	2.1801	0.0908	0.0929	1.8237												
0.0841	0.0903	1.7905	0.0862	0.0918	1.6449	0.0878	0.0917	1.6736	0.0874	0.0918	1.6596	0.0871	0.0902	1.6607	0.0883	0.0914	1.6828
0.0886	0.0915	1.7869	0.0758	0.0992	1.5887	0.0765	0.0998	1.6038	0.0774	0.1005	1.6085	0.0768	0.0996	1.6077	0.0845	0.0977	1.7551
0.0719	0.0950	1.4638	0.0804	0.1008	1.4631	0.0834	0.0973	1.5196	0.0851	0.0958	1.5486	0.0855	0.0957	1.5631	0.0857	0.0942	1.5659
0.0797	0.0865	1.8824	0.0694	0.0881	1.3097	0.0706	0.0867	1.3274	0.0716	0.0891	1.3459	0.0711	0.0883	1.3381	0.0746	0.0889	1.4115
0.0605	0.1100	1.5083	0.0558	0.1130	1.2829	0.0576	0.1142	1.3092	0.0628	0.1140	1.3849	0.0616	0.1130	1.3730	0.0666	0.1139	1.4539
0.0862	0.0836	2.1887	0.0895	0.0918	1.8026	0.0914	0.0915	1.8416	0.0923	0.0912	1.8507						
0.0851	0.0843	2.1683	0.0861	0.0909	1.7390	0.0881	0.0921	1.7742	0.0887	0.0914	1.7769	0.0889	0.0901	1.7863	0.0891	0.0911	1.7923
0.0859	0.0848	2.1126	0.0833	0.0895	1.6260	0.0836	0.0891	1.6206	0.0835	0.0894	1.6130	0.0837	0.0881	1.6271	0.0844	0.0891	1.6418
0.0855	0.0930	1.7576	0.0878	0.0942	1.6453	0.0897	0.0937	1.6810	0.0888	0.0938	1.6609	0.0885	0.0921	1.6617	0.0900	0.0932	1.6914
0.0891	0.0916	1.7958															
0.0722	0.0950	1.4672	0.0807	0.1009	1.4660	0.0834	0.0972	1.5169	0.0852	0.0958	1.5473	0.0855	0.0957	1.5614	0.0858	0.0945	1.5660
0.0857	0.0891	2.1670	0.0866	0.0941	1.7542	0.0882	0.0953	1.7786	0.0897	0.0940	1.7996	0.0900	0.0926	1.8134	0.0898	0.0944	1.8095
0.0866	0.0848	2.1832	0.0873	0.0913	1.7596	0.0891	0.0926	1.7849	0.0894	0.0920	1.7865	0.0898	0.0905	1.8006	0.0900	0.0913	1.8105
0.0864	0.0857	2.1825	0.0893	0.0908	1.7905	0.0918	0.0926	1.8357									
0.0349	0.1344	1.2374	0.0075	0.1302	0.5847	0.0013	0.1309	0.5336	0.0094	0.1278	0.6056	-0.0038	0.1401	0.4781	-0.0043	0.1467	0.4950
0.0874	0.0865	2.2087	0.0892	0.0916	1.8002	0.0907	0.0936	1.8224	0.0917	0.0935	1.8355	0.0923	0.0923	1.8525	0.0417	0.1245	1.1209
0.0532	0.1169	1.5442	0.0397	0.1282	1.1085	0.0383	0.1273	1.0854	0.0393	0.1271	1.0831	0.0399	0.1269	1.0974			
0.0857	0.0851	2.1608	0.0866	0.0905	1.7414	0.0896	0.0921	1.7934	0.0903	0.0912	1.7987	0.0906	0.0898	1.8117	0.0917	0.0910	1.8335
13 0.0891 VO_3			14 0.0908 LNP			15 0.0918 randdollar			16 0.0923 P			17 0.0923 usglt10yr			18 0.0947 CTTD		