CHITONGWA SIAME

The Relationship Between Profitability and Liquidity in South African Listed Firms

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Supervisor: Professor Enrico Uliana

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Plagiarism declaration

I know the meaning of plagiarism and I declare that all of the work in this document, save for that which is properly acknowledged, is my own. I also affirm that this work has not been submitted in this, or any other university for examination, or for any other purposes.

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Terminology and Abbreviations

WCM- Working Capital Management

JIBAR- Johannesburg Inter Bank Agreed Rate

ALTX- Alternative Exchange

JSE- Johannesburg Stock Exchange

ROAO- Return on assets from operations

UCT- University of Cape Town

DSO- Days Sales Outstanding

DPO- Days Payables Outstanding

DII- Days In Inventory

CCC- Cash Conversion Cycle

Abstract

This dissertation analyses the influence of liquidity on the profitability of South African listed firms between 2000 and 2009. The importance of this paper is to assess whether South African firms will improve profitability by managing liquidity efficiently. We used data from past published results of 120 JSE listed firms. The findings from the study suggest that there exists a negative relationship between profitability and liquidity as measured by the cash conversion cycle. Furthermore, efficient liquidity management improves return to shareholders by reducing time taken from the moment that creditors/suppliers are paid until the moment cash is collected from customers/debtors.

Chapter 1 - Introduction

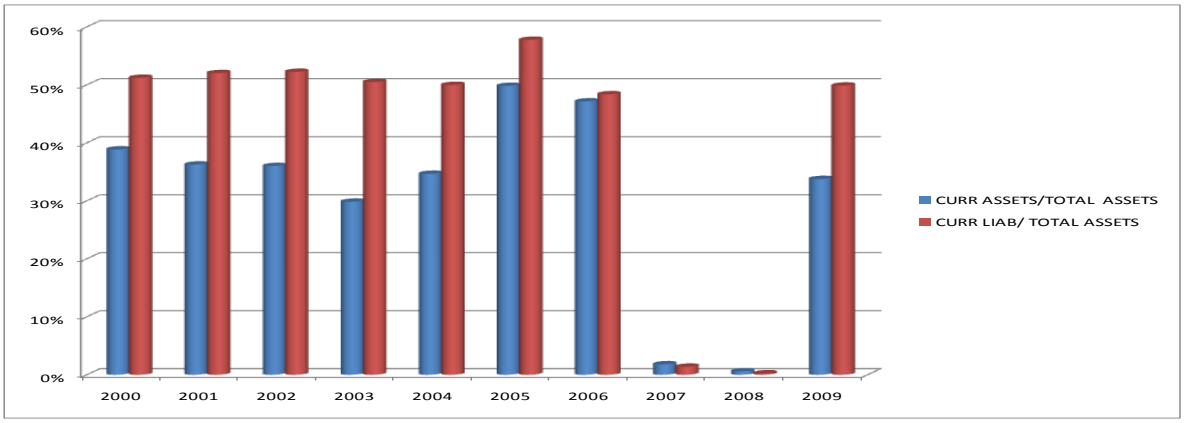
The introduction is intended to give the reader the background for this dissertation topic.

1.1 Background

Working capital management is concerned with the short-term aspects of corporate finance activities.The primary aim of effective working capital management is to ensure that the operations of the business are adequately funded. The short-term nature of these operations make current assets and current liabilities a very important aspect of working capital management (Eljelly, 2004).

The sheer size of current assets and current liabilities as a proportion of total assets of a firm justifies an efficient approach to their management. In South Africa for instance, JSE listed firms have kept their average current assets and current liabilities as a proportion of total assets at 38 percent and 51 percent respectively over the 10 year period ending in 2009. This is a significant portion of the average firms' total assets.The averages excluded the years 2007 and 2008 due to aberrations caused mostly by the recent global financial crisis. See figure 1 to appreciate the magnitude of the aberrations.

Figure 1
Size of Working Capital on South African Balance Sheets



Source: McGregor BFA, 2010. *Balance sheet data*

Firms need to strike a balance between holding too much in current assets and holding too little. On the one hand, holding an insufficient amount of current assets can lead to liquidity trouble and disturb the day-to-day operations of a business while holding too much in current assets can lead to poor returns on investment (Van Horne & Wachowicz, 2000).

For a business that is a going concern, liquidity is determined by the smooth management of its day-to-day operations and not by the liquidation values of its assets (Soenen, 1993). Therefore, managers, as has been widely reported in various surveys, spend a lot of time making working capital decisions. For instance, current liabilities must be settled in a timely manner. This usually involves great coordination between accounting functions and the existence of proper internal procedures to guide the process. Also, current assets easily change from one asset type to another, further complicating their management. A firm must then be able to monitor and manage these transitions.

The manager must ensure that long-term profitability is properly balanced with short-term liquidity management. In seeking to increase profitability, a firm can increase inventories held and relax credit terms to push sales and avoid stock-outs. They may also be liquidity focused and lengthen the time it takes to pay suppliers, effectively accessing cheap capital to finance operations. Care must be taken to ensure that worthwhile early payment discounts are not missed when capitalizing on supplier-financing. Care must also be taken to ensure that aggressive sales policies used to stimulate sales by providing customers with goods before they pay for them do not result in additional costs for the business (Deloof & Jegers, 1996). Late payment of invoices by customers may lead to the business borrowing short-term to cover finance gaps (e.g. through an overdraft facility).

A popular measure of Working Capital Management (WCM) is the cash conversion cycle, i.e. the time lag between the payment for the purchases of raw materials and

the collection of sales of finished goods (Raheman & Nasr, 2007). Longer time lags, as measured by the cash conversion cycle, require a higher investment in working capital (Deloof, 2003). A longer cash conversion cycle might increase profitability because it leads to higher sales. However, corporate profitability might also decrease with the cash conversion cycle, if the costs of higher investment in working capital rise faster than the benefits of holding more inventories and/or granting more trade credit to customers (Raheman & Nasr, 2007).

The principles above highlight the philosophy management must use in order to steer working capital levels in the desired direction. This dissertation covers the short-term financing aspects of working capital management. The other areas of the business that fall under the working capital management umbrella include cash management, inventory and debtors management. This dissertation also touches on the relative importance of working capital management across the spectrum of industries, as well as size of firms listed on the JSE.

1.2 Research Question

Working capital management involves the management of current assets and current liabilities of a firm. Its importance lies in the fact that it directly affects the liquidity and profitability of the firm (Eljelly, 2004). The problem statement to be analyzed in this study is:

"Does working capital management affect profitability of South African firms?"

This question is important because working capital items represent a significant portion of a firm's balance sheet value. If working capital management affects liquidity and therefore profitability, this should be investigated further because it directly impacts shareholder value.

1.3 Objectives

The main objectives of this paper are as follows:

- ***To determine whether there is a relationship between liquidity and profitability of South African firms listed on the Johannesburg Stock Exchange (JSE).***
- ***To describe the nature of the possible relationship between liquidity and profitability of South African firms listed on the Johannesburg Stock Exchange (JSE).***

To achieve these objectives, this study is organized as follows:

Chapter two reviews the literature for the relevant theoretical and empirical work on liquidity and its effect on profitability. Chapter three presents the methodology and framework which includes the sample and the variables used in the empirical analysis. Chapter four portrays and discusses the data analysis, discussion and statistical results. Chapter five presents the conclusion.

1.4 Limitations

It was not possible to get reliable cost of goods sold numbers for the firms listed in the study and turnover was used instead. This impacts the calculation of inventory turnover and 'number of days in payables'. "If cost of is not disclosed or the industry and comparative ratios are based on sales, then we will determine the inventory turnover ratio by dividing sales by inventory." (Correia, Flynn, Uliana, & Wormald, 2007). The use of sales in place of cost of sales to calculate inventory and payables ratios mentioned above is widely accepted and seen in various academic literature.

Since the ALT X was only established in 2003, ALT X companies could not be included in the study which covers data for the period 2000 to 2009. The 10 year

period was felt to be adequate to cover business cycles, therefore reducing the chances of biased data.

Because of the specific nature of their activities, banking firms were omitted. It would be difficult to calculate certain liquidity measures for banks.

Chapter 2 – Literature Review

2.1 Understanding the Relationship Between Liquidity and Profitability

Efficient working capital management is an important aspect of corporate strategy whose main aim is to create shareholder value (Shin & Soenen, 1998). An excessive investment in current assets would reduce the rate of return for shareholders (Vishnani, 2007). The literature in this chapter supports efficient working capital management, highlighting similar academic work that finds a significant negative relationship between measures of liquidity and those of profitability. This is consistent across different industries, company sizes and geographic regions. It therefore follows that management would do well to improve liquidity, as measured by the cash conversion cycle, in order to maximize shareholder returns.

2.1.1 Efficient Liquidity Management

Holmstrom & Tirole, 2000, list a number of decisions that corporations make which affect their funding ability.

First, the corporation's capital structure sets a time table for the reimbursement of investors. A decision to hold short-term debt, for instance, is different to holding long-term debt as its repayment falls due much sooner. Preference stock holders require a non-negotiable periodic payment compared to a subjective yet generous payment required by common stock holders.

Secondly, corporations do not invest all their resources in profitable long-term projects. They also invest in less profitable liquid assets that are held on their balance sheets. Also, rather than hoarding liquidity themselves, corporations may secure lines of credit from financial institutions.

Lastly, Corporations engage in risk management and can use derivatives to hedge specific risks. Foreign exchange swaps are a common tool to hedge against

unfavorable movements in exchange rates, especially for businesses involved in foreign trade.

There are a number of arguments that have been put forward for the value of liquidity management. Two of the main arguments are taxes and managerial incentives. Holmstrom and Tirole, 2000, however, not too convinced by the mentioned arguments suggest that liquidity management derives its rationale from the corporation's concern for refinancing. This is after they argue that, the Arrow-Debreu-McKenzie model ignores a fundamental need by firms to refinance their activities. Further the model downplays a lot of the reasons mentioned above as the key reasons for managing liquidity. For instance, capital structure is considered irrelevant (Miller & Modigliani, 1958), because firms need not hoard cash as they can issue claims against the full value of the new investments, and claimholders cannot gain by having firms engage in risk management since reshuffling state-contingent resources in a complete market does not affect the market portfolio.

In trying to reduce the probability of running out of cash, companies try to manage liquidity efficiently by planning and controlling current assets and current liabilities (Eljelly, 2004). They do this in such a manner that eliminates the risk of the inability to meet due short-term obligations, on one hand, and avoid excessive investment in these assets, on the other. Also, from an operating point of view, working capital has increasingly been looked at as a restraint on financial performance, since the assets do not contribute to return on equity (Sanger, 2001).

2.1.2 Measures of Liquidity and Profitability

There are arguments for a cash conversion cycle approach to liquidity analysis. Some common approaches to liquidity analysis used by financial analysts and financial managers in the assessment of firm liquidity are static (Richard & Laughlin, 1980).

The various components of working capital investments do not enjoy the same life expectancy, nor are they transformed into usable liquidity flows at the same speed.

The current ratio, a static view, is used by financial analysts as a key indicator of a firm's liquidity position. The ratio is commonly used because of its simplicity, extensive scholarly reference and its intuitive appeal compared to other measures.

If it is the protection of firms against liquidity upsets when there are unanticipated discrepancies in the amount and timing of operating cash inflows and outflows, then the use of total current asset coverage of outstanding current liabilities can surely not be more reliable or superior to cash reserve investments in combination with unused borrowing capacity.

The acid test ratio was created in response to the current ratio's criticisms. More liquid assets are used in the numerator of the formula to take into consideration the qualitative differences in the liquidity attributes of current asset investments. For this reason inter-firm and inter-period comparisons of current ratio statistics are of questionable value to the financial analyst. For instance, increases in current assets of a lower liquidity standard in a period maybe a sign of a deteriorating liquidity position rather than an improving position.

In his 1968 work on the prediction of corporate bankruptcy, Altman picks a working-capital measure of liquidity over the current ratio and quick ratio. The working capital based ratio was a better measure of liquidity and therefore showed greater statistical significance.

Static measures of liquidity have the inherent potential of misinterpreting the firm's relative liquidity position (Richard & Laughlin, 1980). The usefulness of both static liquidity indicators is limited by their inability to provide adequate information about the cash flow attributes of the transformation process with a firm's working capital position. Rather than taking a going-concern approach to liquidity analysis, static liquidity indicators merely represent a liquidation position of the firm. Operating cash flow coverage, rather than asset liquidation value, is the crucial element in liquidity analysis.

Incorporating accounts receivable and inventory turnover measures into an operating cycle concept provides a more appropriate view of liquidity management than the static measures mentioned earlier. However, the operating cycle concept is deficient as a cash flow measure in that it fails to consider the liquidity requirements imposed on a firm by the time dimension of its current liability commitments.

The cash conversion cycle, establishes the time period required to convert a cash disbursement back into a cash inflow from a firms regular course of operations. It is this concept that this paper will use to measure the liquidity of firms listed on the Johannesburg stock exchange because it depicts the residual time interval over which additional, non-spontaneous financing must be negotiated to compensate for the non-instantaneous and unsynchronized nature of a firm's working capital investment flows.

In this paper, the efficiency of liquidity planning and control is measured as its effect on shareholder value and profits.

Most companies report a return on assets (ROA) and return on equity (ROE) in their financial statements. Non-operating items such as non-operating assets and capital structure, however, bias these measures- As financial leverage rises, net income will fall due to increased interest expenses. Return on equity also commingles operating performance with financial leverage. Specifically, ROE rises with leverage when return on invested capital (ROIC) is greater than the company's after-tax interest rate on debt, and it falls with leverage when ROIC is less than the company's after-tax interest rate. To properly assess the effects of liquidity on the operational profitability of a firm, we need to separate operating performance from non operating items and the financing obtained to support the business (McKinsey & Company, 2005). We use a return on assets used in operations (ROAO) as our measure of profitability in assessing the liquidity-profitability relationship for the reasons mentioned above. It is defined as Operating Income plus depreciation over total

assets less financial assets ([Operating Income + depreciation] / [total assets – financial assets).

2.2 Prior Research

2.2.1 Liquidity and Profitability

Working capital can be thought of as a measure of both a company's operational efficiency and its short-term financial health. Many firms use the management of working capital as a technique for managing their liquidity.

Working capital policy can be distinguished from working capital management, which involves the administration of current assets and current liabilities, and is informed by the former (Correia, Flynn, Uliana, & Wormald, 2007). Working capital policy is the basic policy decisions which ensure the optimal level of investments in, and the optimal financing of, current assets.

It follows therefore that, if there is value in effectively managing firm working capital then working capital management is important for shareholder value creation. Past studies have supported this view which links efficient liquidity management with firm profitability.

A look at different regions across the world confirms that the relationship is not biased towards any particular region. Current literature suggests that efficient working capital management is positive for profitability in both the emerging and developed world. This distinction is of importance to us because South African firms operate in what is commonly accepted as an emerging world, with qualitative factors that might influence the ability of firms to operate as efficiently as firms in the developed world.

2.2.2 Europe

Deloof, 2003, investigated the relationship between working capital management and corporate profitability for a sample of 1009 large Belgian non-financial firms for the 1992-1996 period. Using correlation and regression analysis, Deloof finds a

significant negative relation between gross operating income (which is defined as sales minus cash costs of goods sold, and is divided by total assets minus financial assets) and the number of days accounts receivable, inventories and accounts payable. Managers can therefore improve profitability by reducing the number of days accounts receivable and inventories or by increasing the number of days accounts payable.

Lazaridis & Tryfonidis, 2006, investigate the relationship of corporate profitability and working capital management. They used a sample of 131 companies listed in the Athens Stock Exchange (ASE) for the period of 2001-2004. The purpose of this paper was to establish a relationship that is statistically significant between profitability, the cash conversion cycle and its components for listed firms in the ASE. The results of the research showed that there is statistical significance between profitability, measured through gross operating profit, and the cash conversion cycle. They further stated that managers can create profits for their companies by handling correctly the cash conversion cycle and keeping each different component (accounts receivables, accounts payables, inventory) to an optimum level.

2.2.3 Africa

Mathuva, 2009, examined the influence of working capital management components on corporate profitability. A sample of 30 firms listed on the Nairobi Stock Exchange (NSE) for the periods 1993 to 2008 was used. Mathuva used both the pooled ordinary least squares (OLS) and the fixed effects regression models and noted the following findings;

i) There exists a significant negative relationship between the time it takes for a firm to collect cash from its customers and profitability.
ii) There exists a significant positive relationship between the period taken to convert inventory in sales and profitability.

iii) There exists a significant positive relationship between the time it takes for a firm to pay its creditors and profitability.

Smith and Begemann, 1997, emphasized that those who promoted working capital theory shared that profitability and liquidity comprised the salient goals of working capital management. The problem arose because the maximization of the firm's returns could seriously threaten its liquidity, and the pursuit of liquidity had a tendency to dilute returns. This article evaluated the association between traditional and alternative working capital measures and return on investment (ROI), specifically in industrial firms listed on the Johannesburg Stock Exchange (JSE). The problem under investigation was to establish whether the more recently developed alternative working capital concepts showed improved association with return on investment to that of traditional working capital ratios or not. Results indicated that there were no significant differences amongst the years with respect to the independent variables. The results of their stepwise regression corroborated that total current liabilities divided by funds flow accounted for most of the variability in Return on Investment (ROI). The statistical test results showed that a traditional working capital leverage ratio, current liabilities divided by funds flow, displayed the greatest associations with return on investment. Well known liquidity concepts such as the current and quick ratios registered insignificant associations whilst only one of the newer working capital concepts, the comprehensive liquidity index, indicated significant associations with return on investment (Raheman & Nasr, 2007).

2.2.4 Asia and the Middle East

Eljelly, 2004, used empirical analysis to examine the relationship between profitability and liquidity, as measured by current ratio and cash gap (cash conversion cycle) on a sample of 929 joint stock companies in Saudi Arabia. Using correlation and regression analysis, Eljelly found significant negative relationship between the firm's profitability and its liquidity level, as measured by current ratio. This relationship is more pronounced for firms with high current ratios and long cash conversion cycles. At the industry level, however, he found that the cash conversion

cycle or the cash gap is of more importance as a measure of liquidity than current ratio. The firm size variable was also found to have significant effect on profitability at the industry level.

Raheman & Nasr, 2007, selected a sample of 94 Pakistani firms listed on Karachi Stock Exchange for a period of 6 years from 1999 to 2004.They studied the effect of different variables of working capital management including the average collection period, inventory turnover in days, average payment period, cash conversion cycle and the current ratio on the profitability of Pakistani firms. Pearson's correlation, and regression analysis (Pooled least square and general least square with cross section weight models) were used for analysis. The results show, most importantly, that there is a strong negative relationship between cash conversion cycle and profitability of the firm. The results also show that there is a positive relationship between size of the firm and its profitability and that there is a significant negative relationship between debt used by the firm and its profitability. This last result is interpreted as the debt financing affecting the financial cost which leads to decreasing profitability.

2.2.5 Other

Shin & Soenen, 1998, investigated the relation between the firm's net-trade cycle and its profitability. In their study, Shin and Soenen opted for the net-trade cycle over the cash conversion cycle. Equal to the cash conversion cycle, the net-trade cycle expresses all three components of the cash conversion cycle as a percentage of sales. Expressed this way it is easy to use it as a proxy for additional working capital needs of a firm as a function of projected sales growth. Using a Compustat sample of 58,985 firm years covering the period 1975-1994, they used correlation and regression analysis, to find a strong negative relation between the length of the firm's net-trade cycle and its profitability. In addition to these finding they also concluded that shorter net-trade cycles are associated with risk-adjusted stock returns.

Chapter 3 – Data & Method

We aim to establish the relationship between working capital management practices and the profitability of the firms listed on the Johannesburg Stock Exchange (JSE) for a period of 10 years from 2000-2009. This section discusses the firms and variables included in the study, the distribution patterns of data and applied statistical techniques in investigating the relationship between working capital management and profitability.

3.1 Major Hypotheses

The study assumes that there may be a relationship between profitability of a company and its liquidity profile, since the latter affects the former in a direct way, as a result of external financing costs or savings thereof. Due to these elements of cost and cost savings this relationship is most likely to be negative. There is a possible negative relation between liquidity of a company and its profitability. Companies with relatively high levels of liquidity are expected to post low levels of profitability and vice versa.

H0 : There is no relationship or a positive relationship between liquidity and profitability of South African firms.

H1 : There is a possible negative relationship between liquidity and profitability of South African firms.

Profitability may also be a function of the size of companies. The company size may affect liquidity, cash gaps and, hence, profitability in different ways. On the one hand, large companies may be able to buy inventory in large quantities in order to get discounts. Further, because of their size, large companies may qualify for discounts from suppliers with relatively small inventory levels. Large companies may be able to get favorable credit terms from their suppliers in terms of longer credit periods. Moreover, large companies may have more success in their receivables collection efforts relative to small companies. All these factors may push liquidity

levels and cash gaps of large companies to levels lower than that of small companies. On the contrary, small companies are usually not able to obtain as much inventory to qualify for quantity discounts. Additionally, small companies make efforts to pay within discount periods in order to benefit from cash discounts and to avoid severing their relations with their suppliers. These factors may force small companies to have higher liquidity levels and larger cash gaps. Accordingly, this study states the following hypothesis:

H0 : There is no relationship between size and the profitability of South African firms.

H1 : There is a possible positive relationship between size and profitability of South African firms.

Liquidity and cash gaps may differ among industries and among countries and may depend on the prevailing economic conditions. Sometimes traditions and the nature of business set the typical working capital requirements and the cash gap in a given industry. Some industries have inherently high levels of working capital requirements and larger cash gaps than others, while some may require low levels of working capital and shorter or even negative cash gaps, which indicate their ability to obtain cost-free capital from their customers. The ability to operate with low levels of working capital and obtaining cost-free capital may have direct positive bearing on profitability. Thus, this study states the following hypothesis:

H0 : There is no relationship between the working capital intensity of the industry to which a firm belongs and the profitability of the firm.

H1 : There is a possible negative relationship between the working capital intensity of the industry to which the firm belongs and the profitability of the firm.

3.2 Variables

The variables that influence working capital management are highlighted below. From the literature review, it became apparent which variables to choose for inclusion in the study.

Dependent

- Profitability is defined as Operating Income plus depreciation over total assets less financial assets ([Operating Income + depreciation] / [total assets – financial assets]).

Independent

- Revenue represents total sales made for the period.
- The Cash Conversion Cycle is used as a comprehensive measure of working capital management and is measured by adding days sales outstanding to days in inventory and deducting days payables outstanding:

✓ Days sales outstanding - This is used as a proxy for credit management and is calculated by dividing accounts receivable by sales and multiplying the result by 365 days. The result is a measure in days.

✓ Days in inventory - This is used as a proxy for inventory management and is calculated by dividing inventory by cost of goods sold and multiplying the result by 365 days. The result is a measure in days.

✓ Days payables outstanding - This is used as a proxy for creditors' management and is calculated by dividing accounts payable by purchases and multiplying the result by 365 days. The result is a measure in days.

- Current Ratio which is a traditional measure of liquidity is calculated by dividing current assets by current liabilities.
- Total Assets are a measure of the firm's balance sheet size.
- Leverage is obtained by dividing the firm's total assets by its equity.

- GDP growth is the real annual growth in gross domestic product for each from 2000-2009 and is used to explain growth that is common to all companies and industries.

It is expected that there is a negative relationship between profitability and the measure of Working Capital Management (cash conversion cycle). This is consistent with the view that the time between the payment for the purchases of raw materials and the collection of cash from the sale of finished goods can be too long, and that decreasing this time increases profitability (Deloof, 2003).

3.3 Method

This section discusses the method adopted, the type of data collected and the stages of analysis.

Data Processing

- The study first estimates the cash gap/CCC for each company and for each year of the sample period as follows:

  Cash gap or CCC= Days In Inventory+ Days Sales Outstanding – Days Payables Outstanding

  The components of the cash gap or CCC are calculated as follows:

  - Inventory Turnover= Turnover for year/ average inventory
  - Number of days inventory= 365/ Inventory turnover
  - Number of days in receivables= Average receivables/ Turnover for year X 365
  - Number of days in payables= Average payables/ Turnover for year X 365

- Correlation analysis to identify the association between profitability and liquidity indicators and other related variables.
- Regression analysis to estimate the causal relationship between profitability variable, liquidity and other chosen variables.

3.4 Dataset & Sample

The information used in this study was obtained from the McGregor BFA electronic databank available at the UCT libraries as well as from the JSE website. We used data of firms listed on the JSE main board for the past 10 years. Firms listed on the JSE's smaller and more recent Alternative Exchange (ALT X) were excluded because they did not satisfy the 10 year criteria since the ALT X was only established in 2003. The study period starts from 2000 to 2009. The 10 year period was felt to be adequate to cover business cycles, therefore reducing the chances of biased data. The sample of the 120 JSE listed companies is based on their respective financial statements and includes firms from different sectors of the South African economy. Because of the specific nature of their activities, banking firms were omitted. The definition of working capital for these firms differs from the definition adopted for this study.

Of the 165 firms in the original sample, 120 were used in the final sample. Observations of firms with anomalies such as negative values in their total assets, equity, or depreciation were removed to avoid distorting the sample. Further, observations with financial statements values that were evidently lacking other criteria of reasonability were also removed. A total of 1200 firm-year observations were used in the sample for the period 2000-2009.

Chapter 4 – Results & Analysis

4.1 Summary statistics

The following notations are used throughout this study:

Return on assets used in operations	ROAO
Revenue	REV
Cash conversion cycle	CCC
Total assets	ToA
Leverage	LEV
Real GDP growth	GDP
Current ratio	CR
Days in inventory	DII
Days sales outstanding	DSO
Days purchases outstanding	DPO

Table 1 - Summary Statistics									
Mean									
Variable	**Main Sample**	**CR > 2**	**CR< 2**	**CCC < 90**	**CCC > 90**	**Consumer**	**Industrial**	**Resources**	**Services**
ROAO	28.4%	29.4%	28.1%	28.7%	25.9%	30.9%	24.4%	23.9%	35.1%
REV ('000)	7 744 381	3 577 251	8 954 192	8 299 997	2 966 075	7 559 702	4 471 774	16 044 236	7 058 426
CCC (days)	45	66	38	35	126	48	50	52	27
ToA('000)	6 931 200	3 836 189	7 829 751	7 345 532	3 367 941	4 110 458	3 373 882	23 082 856	6 248 106
LEV	2.50	1.59	2.77	2.57	1.93	2.63	2.60	2.15	2.30
GDP	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%
CR	1.73	3.15	1.32	1.63	2.58	1.83	1.77	1.47	1.58
DII (days)	39	47	37	35	80	41	50	50	18
DSO (days)	50	58	47	45	91	46	49	42	53
DPO (days)	44	39	46	44	45	39	50	40	44
Standard Deviation									
Variable	**Main Sample**	**CR > 2**	**CR< 2**	**CCC < 90**	**CCC > 90**	**Consumer**	**Industrial**	**Resources**	**Services**
ROAO	20.7%	16.5%	21.8%	21.3%	14.7%	23.5%	12.6%	18.0%	23.4%
REV ('000)	14 726 824	10 151 099	15 606 489	15 429 405	3 070 384	10 102 546	8 378 923	21 540 004	15 250 321
CCC (days)	40	48	34	27	36	41	38	39	24
ToA('000)	15 044 514	12 146 719	15 678 151	15 787 630	3 927 969	5 841 035	5 999 556	27 182 423	15 972 278
LEV	2.57	0.47	2.86	2.69	0.89	3.28	1.40	1.16	2.54
GDP	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
CR	1.12	1.61	0.35	1.05	1.37	1.01	0.91	0.76	0.72
DII (days)	30	36	28	23	46	24	30	28	20
DSO (days)	30	41	25	22	50	34	22	25	23
DPO (days)	25	21	26	24	27	20	22	34	26

Source- 2000-2009 data, authors computation

Table 1 summarizes the mean and standard deviation of the various samples as the main measures of central tendency and dispersion for the basic variables used in

this study. The Appendix includes detailed summary statistics for the individual samples.

4.1.1 Main sample

The mean and median profitability were 28.4% and 27% respectively. The mean and median cash conversion cycle were 45 and 40 days respectively, with the first and third quartile at 20 and 64 days respectively. On average, firms took 39, 50 and 44 days to hold stock, collect debt from customers and then to pay suppliers respectively. Average firm revenue and size according to total assets on the balance sheet averaged 7.744 and 6.931 billion South African rand respectively. The typical firm was levered 2.5 times, while the median firm leverage was about 2 times. All variables share a common sample size of 1200 firm years.

4.1.2 Sub-samples

The description below pertains to the CR > 2 sub-sample.

As a rule of thumb the current ratio should be in the region of 2:1 (Correia et al, 2007). The standard current ratio of 2:1 was used to split this sub-sample into two. The mean and median profitability for observations with a current ratio above 2 was 29.4% and 27.6% respectively. The mean and median cash conversion cycle was 66 and 57 days respectively, with the first and third quartile at 33 and 91 days respectively. On average, firms took 47, 58 and 39 days to hold stock, collect debt from customers and then to pay suppliers respectively. The average firm revenue and size according to total assets on the balance sheet averaged 3.577 and 3.836 billion South African rand respectively. The typical firm was levered 1.59 times, while the median firm leverage was about 1.49 times.

The description below pertains to the CR < 2 sub-sample**.**

The mean and median profitability for observations with a current ratio below 2 were 28.1% and 26.9% respectively. In addition to having lower profitability when compared to the CR > 2 sample, the CR < 2 sample also had a higher standard

deviation indicating a higher likelihood of deviating from average profitability. Interestingly, the CR < 2 sample had a mean CCC of 38 days compared to 66 days for the CR > 2 sample. Given that the CR < 2 sample had a lower mean operating profit, this could be interpreted as evidence that CCC is not the only important determinant of profitability. It is also worth mentioning that the CCC standard deviation for the CR > 2 sample was much higher than its counter's standard deviation, suggesting a bigger skew in the CCC profile of the CR > 2 sample. The average CR < 2 company was also much larger than the average CR >2 company in terms of both revenue and total assets.

The mean and median cash conversion cycle were 38 and 38 days respectively, with the first and third quartile at 17 and 57 days respectively. On average, firms took 37, 47 and 46 days to hold stock, collect debt from customers and then to pay suppliers respectively. The average firm revenue and size according to total assets on the balance sheet averaged 8.954 and 7.830 billion South African rand respectively. The typical firm was levered 2.77 times, while the median firm leverage was about 2.23 times.

The description below pertains to the CCC < 90 sub-sample.

In order to assess the impact of the level of CCC on company statistics, a CCC level of 90 days was used to split the sample. This level assumes a combined DII and DSO of 120 days and a DPO of 30 days. It is not unusual for firms to give 60 day credit terms and to receive only 30 day credit terms. The mean and median profitability for observations with a cash conversion cycle below 90 were 28.7% and 27.5% respectively. The mean and median cash conversion cycle were 35 and 37 days respectively, with the first and third quartile at 18 and 55 days respectively. On average, firms took 35, 45 and 44 days to hold stock, collect debt from customers and then to pay suppliers respectively. The average firm revenue and size according to total assets on the balance sheet averaged 8.300 and 7.346 billion South African

rand respectively. The typical firm was levered 2.57 times, while the median firm leverage was about 2.03 times.

The description below pertains to the CCC > 90 sub-sample**.**

The mean and median profitability for observations with a cash conversion cycle above 90 were 25.9% and 25.1% respectively. The mean profitability of the CCC > 90 sample was much lower than that of the CCC < 90 sample. The sample with the higher mean CCC had lower profitability. This is consistent with the theory highlighted in this paper.

The mean and median cash conversion cycle were 126 and 116 days respectively, with the first and third quartile at 102 and 138 days respectively. On average, firms took 80, 91 and 45 days to hold stock, collect debt from customers and then to pay suppliers respectively. The average firm revenue and size according to total assets on the balance sheet averaged 2.966 and 3.368 billion South African rand respectively. The typical firm was levered 1.93 times, while the median firm leverage was about 1.69 times.

4.1.3 Industry break-down

The standard deviation for ROAO in consumer and service industries was much higher compared to that of industrials and resources indicating that ROAO is much more stable for the latter industry groups which are also much bigger in size. Despite this, the consumer and service industries had higher profitability. Ranking the industries from most profitable to least profitable and separately ranking them again from industry with the least CCC to industry with the highest CCC gives a consistent list. The services industry with the highest mean profitability also has the lowest mean CCC, followed by the consumers, industrials and then resources industry. The resources industry has the lowest mean ROAO and highest mean CCC. These ROAO and CCC rankings are consistent with the theory in this paper that suggests that longer CCC's reduce profitability.

The description below pertains to the consumer goods sub-sample**.**

The mean and median profitability for observations of firms from the consumer goods industry were 30.9% and 29.4% respectively. The mean and median cash conversion cycle were 48 and 40 days respectively, with the first and third quartile at 20 and 68 days respectively. On average, firms took 41, 46 and 39 days to hold stock, collect debt from customers and then to pay suppliers respectively. The average firm revenue and size according to total assets on the balance sheet averaged 7.560 and 4.110 billion South African rand respectively. The typical firm was levered 2.63 times, while the median firm leverage was about 1.89 times.

The description below pertains to the industrials sub-sample**.**

The mean and median profitability for observations of firms from the industrials industry were 24.4% and 23.3% respectively. The mean and median cash conversion cycle were 50 and 48 days respectively, with the first and third quartile at 29 and 71 days respectively. On average, firms took 50, 49 and 50 days to hold stock, collect debt from customers and then to pay suppliers respectively. The average firm revenue and size according to total assets on the balance sheet averaged 4.471 and 3.374 billion South African rand respectively. The typical firm was levered 2.6 times, while the median firm leverage was about 2.27 times.

The description below pertains to the resources sub-sample**.**

The mean and median profitability for observations of firms from the resources industry were 23.9% and 24.14% respectively. The mean and median cash conversion cycle were 52 and 53 days respectively, with the first and third quartile at 30 and 71 days respectively. On average, firms took 50, 42 and 40 days to hold stock, collect debt from customers and then to pay suppliers respectively. The average firm revenue and size according to total assets on the balance sheet averaged 16.044 and 23.083 billion South African rand respectively. The typical firm was levered 2.15 times, while the median firm leverage was about 1.92 times.

The description below pertains to the services sub-sample**.**

The mean and median profitability for observations of firms from the services industry were 35.1% and 31.8% respectively. The mean and median cash conversion cycle were 27 and 25 days respectively, with the first and third quartile at 14 and 40 days respectively. On average, firms took 18, 53 and 44 days to hold stock, collect debt from customers and then to pay suppliers respectively. The average firm revenue and size according to total assets on the balance sheet averaged 7.058 and 6.248 billion South African rand respectively. The typical firm was levered 2.30 times, while the median firm leverage was about 1.89 times.

4.2 Pearson's Correlation Coefficient Analysis

The study first examines the relationship that exists between the variables of profitability and liquidity.

4.2.1 Main Sample

Table 2 shows the Pearson correlation coefficients between ROAO, REV, CCC, ToA, LEV and GDP for the whole sample of 1200 company-year observations. Pearson's Correlation analysis is used for data to see the relationship between variables such as those between working capital management/ liquidity and profitability. If efficient working capital management increases profitability, one should expect a negative relationship between the measures of working capital management/ liquidity and the profitability variable.

Table 2[1]
Pearson Correlation Coefficients Matrix

	ROAO	REV	CCC	ToA	LEV	GDP
ROAO	1.000					
REV	0.0799	1.000				
CCC	-0.0648	-0.1109	1.000			
ToA	0.0304	0.8432	-0.0256	1.000		
LEV	-0.1887	0.0195	-0.0914	-0.0070	1.000	
GDP	0.0475	-0.0553	-0.0077	-0.0523	-0.0033	1.000

Source- Stata

In Table 2, the correlation coefficient indicates a weak negative relationship between CCC and ROAO. The negative relationship between ROAO and CCC is consistent with the view that the shorter the cash conversion cycle the higher the profitability.

A negative relationship exists between REV and CCC, although weak, it probably indicates that large firms are more likely to borrow more from suppliers and collect faster from debtors. Finally, the strong and significantly positive relationship that exists between REV and ToA shows that they are substitute measures of size.

[1] The correlation matrix was derived from Stata, the data/ statistics analysis tool licensed to the commerce faculty, University of Cape Town.

4.2.2 Sub-samples

Figure 14 shows the Pearson correlation coefficients between ROAO, REV, CCC, ToA, LEV and GDP for the whole sample of 276 company-year observations.

Table 3
Pearson Correlation Coefficients Matrix, CR > 2

	ROAO	REV	CCC	ToA	LEV	GDP
ROAO	1.000					
REV	0.0038	1.000				
CCC	-0.0759	0.0570	1.000			
ToA	-0.0304	0.9513	0.0396	1.000		
LEV	-0.1485	0.0684	0.0797	0.0559	1.000	
GDP	0.0173	-0.0324	0.0115	-0.0533	0.0035	1.000

Source- Stata

In Table 3, the correlation coefficient indicates a weak negative relationship between CCC and ROAO. The negative relationship between ROAO and CCC is consistent with the view that the shorter the cash conversion cycle the higher the profitability. A positive relationship exists between REV and CCC, although weak, it probably indicates that firms with a high level of current assets relative to current liabilities will push sales and lengthen debtor days.

Table 4 shows the Pearson correlation coefficients between ROAO, REV, CCC, ToA, LEV and GDP for the whole sample of 924 company-year observations.

Table 4
Pearson Correlation Coefficients Matrix, CR < 2

	ROAO	REV	CCC	ToA	LEV	GDP
ROAO	1.000					
REV	0.0971	1.000				
CCC	-0.0801	-0.1077	1.000			
ToA	0.0449	0.8266	-0.0012	1.000		
LEV	-0.1975	-0.0139	-0.0521	-0.0346	1.000	
GDP	0.0548	-0.0620	-0.0152	-0.0533	-0.0046	1.000

Source- Stata

In Table 4, the correlation coefficient indicates a weak negative relationship between CCC and ROAO. The negative relationship between ROAO and CCC is consistent with the view that the shorter the cash conversion cycle the higher the profitability. A

negative relationship exists between REV and CCC, although weak, it probably indicates that firms with a low level of current assets relative to current liabilities will be cautious about pushing sales and lengthening debtor days.

Table 5 shows the Pearson correlation coefficients between ROAO, REV, CCC, ToA, LEV and GDP for the whole sample of 125 company-year observations.

Table 5
Pearson Correlation Coefficients Matrix, CCC > 90

	ROAO	REV	CCC	ToA	LEV	GDP
ROAO	1.000					
REV	0.0089	1.000				
CCC	-0.1628	0.0552	1.000			
ToA	-0.0220	0.7668	0.0456	1.000		
LEV	-0.2898	0.2635	0.0466	0.2537	1.000	
GDP	0.0705	-0.0299	0.0776	0.0598	-0.0481	1.000

Source- Stata

In Table 5, the correlation coefficient indicates a weak negative relationship between CCC and ROAO. The negative relationship between ROAO and CCC is consistent with the view that the shorter the cash conversion cycle the higher the profitability. A positive relationship exists between REV and CCC, although weak, it probably indicates that above a certain CCC threshold, it is not possible to increase sales without increasing debtors days and therefore the cash conversion cycle.

Table 6 shows the Pearson correlation coefficients between ROAO, REV, CCC, ToA, LEV and GDP for the whole sample of 1075 company-year observations.

Table 6
Pearson Correlation Coefficients Matrix, CCC < 90

	ROAO	REV	CCC	ToA	LEV	GDP
ROAO	1.000					
REV	0.0779	1.000				
CCC	-0.0399	-0.0532	1.000			
ToA	0.0285	0.8427	0.0463	1.000		
LEV	-0.1914	0.0092	-0.0606	-0.0158	1.000	
GDP	0.0449	-0.0614	0.0023	-0.0599	-0.0035	1.000

Source- Stata

In Table 6, the correlation coefficient indicates a weak negative relationship between CCC and ROAO. The negative relationship between ROAO and CCC is consistent with the view that the shorter the cash conversion cycle the higher the profitability. A negative relationship exists between REV and CCC, although weak, it probably indicates that below a certain threshold, it is possible to increase revenue without lengthening debtors days and, ultimately, the cash conversion cycle.

4.2.3 Industry break-down

Table 7 shows the Pearson correlation coefficients between ROAO, REV, CCC, ToA, LEV and GDP for the whole sample of 280 company-year observations.

Table 7
Pearson Correlation Coefficients Matrix, Consumer goods

	ROAO	REV	CCC	ToA	LEV	GDP
ROAO	1.000					
REV	0.1725	1.000				
CCC	0.0265	-0.4148	1.000			
ToA	0.1303	0.5878	-0.1161	1.000		
LEV	-0.1924	0.2008	-0.1390	0.2424	1.000	
GDP	0.0387	-0.0658	-0.0003	-0.1050	-0.0067	1.000

Source- Stata

In Table 7, the correlation coefficient indicates a weak positive relationship between CCC and ROAO. The positive relationship between ROAO and CCC is inconsistent with the view that the shorter the cash conversion cycle the higher the profitability. Firms in the consumer goods industry trade mostly in fast moving goods which are usually paid for in cash by customers. These firms, probably because they cash flash, will probably not incur short-term financing costs due to illiquidity. This probably explains the positive relationship of CCC and ROAO. A negative relationship exists between REV and CCC, although weak, it probably indicates that firms in the industry will have to hold more stock for longer periods to make higher levels of sales. This behavior is probably adopted to avoid stock-outs and to enhance the customer experience.

Table 8 shows the Pearson correlation coefficients between ROAO, REV, CCC, ToA, LEV and GDP for the whole sample of 390 company-year observations.

Table 8
Pearson Correlation Coefficients Matrix, Industrials

	ROAO	REV	CCC	ToA	LEV	GDP
ROAO	1.000					
REV	0.0303	1.000				
CCC	-0.0924	-0.1719	1.000			
ToA	0.0158	0.9579	-0.1413	1.000		
LEV	-0.2824	-0.0008	-0.2297	0.0389	1.000	
GDP	0.0441	-0.0504	-0.0164	-0.0614	-0.0284	1.000

Source- Stata

In Table 8, the correlation coefficient indicates a weak negative relationship between CCC and ROAO. The negative relationship between ROAO and CCC is consistent with the view that the shorter the cash conversion cycle the higher the profitability. A negative relationship exists between REV and CCC, although weak, it probably indicates that increasing revenue probably involves extending credit to customers for longer periods of time.

Table 9 shows the Pearson correlation coefficients between ROAO, REV, CCC, ToA, LEV and GDP for the whole sample of 160 company-year observations.

Table 9

Pearson Correlation Coefficients Matrix, Resources

	ROAO	REV	CCC	ToA	LEV	GDP
ROAO	1.000					
REV	0.2013	1.000				
CCC	0.2137	0.0472	1.000			
ToA	0.0964	0.9321	-0.0024	1.000		
LEV	-0.3578	-0.0977	-0.3087	-0.0802	1.000	
GDP	-0.0650	-0.0987	0.0255	-0.0852	0.0598	1.000

Source- Stata

In Table 9, the correlation coefficient indicates a weak positive relationship between CCC and ROAO. The positive relationship between ROAO and CCC is inconsistent with the view that the shorter the cash conversion cycle the higher the profitability. A weak positive relationship exists between REV and CCC.

Table 10 shows the Pearson correlation coefficients between ROAO, REV, CCC, ToA, LEV and GDP for the whole sample of 300 company-year observations.

Table 10

Pearson Correlation Coefficients Matrix, Services

	ROAO	**REV**	**CCC**	**ToA**	**LEV**	**GDP**
ROAO	1.000					
REV	0.0278	1.000				
CCC	-0.0779	-0.0261	1.000			
ToA	0.0446	0.9504	-0.0493	1.000		
LEV	-0.1716	0.0258	-0.0525	0.0067	1.000	
GDP	0.0443	-0.0487	-0.0472	-0.0492	0.0081	1.000

In Table 10, the correlation coefficient indicates a weak negative relationship between CCC and ROAO. The negative relationship between ROAO and CCC is consistent with the view that the shorter the cash conversion cycle the higher the profitability. A weak negative relationship exists between REV and CCC.

4.3 Regression Analysis

To investigate the association between profitability and liquidity further, the study estimates the following regression equation for the whole sample and for eight sub-samples. The Stata outputs are available in the appendix for each sample. The sub-samples are by products of dividing the sample into eight sub-samples, based on CR, CCC and industry. The first two sub-samples are created by dividing the sample into two sub-samples, one with CR equal to or less than two and the other with CR greater than two. The reason for this split is to examine whether the effect on

profitability is a function of the level of liquidity. The second set of sub-samples are created by dividing the sample into two sub-samples, one with CCC equal to or less than 90 days and the other with CG greater than 90 days. The purpose in this case is to examine whether the relationship between profitability, liquidity level and the cash conversion cycle is a function of the efficiency of managing the cash cycle. The final four sub-samples are as a result of grouping the companies in the main sample into one of four industry categories. The firms are split into consumer goods, industrials, resources or services industries to ascertain whether there is a relationship between industry categorization, the efficiency of managing the cash conversion cycle and profitability. For the sample and each of the sub-samples the following regression equation is estimated:

$$ROAO = \beta_0 + \beta_1 CCC + \beta_2 REV + \beta_3 ToA + \beta_4 LEV + \beta_5 GDP + \varepsilon$$

Where: β_0, β_1, β_2, β_3, β_4, β_5, the coefficients of the regression equation; and the other variables are as defined before.

The determinants of corporate profitability are estimated using the fixed effects model. The hausman test was used to determine between using a fixed effects or random effects model. Estimating models from panel data requires the researchers to first determine whether there is a correlation between unobservable heterogeneity of each firm and the explanatory variables of the model. Because the hausman test found a correlation, the fixed effects model was used to get a consistent estimation. The fixed effects model removes all variables that are time invariant from the model. The model does not have any time invariant variables anyway. Table 11 below highlights the results of the hausman test.

Table 11, Hausman test

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
rev	4.03e-09	3.12e-09	9.03e-10	7.96e-10
ccc	-.0011434	-.0007504	-.0003929	.0001355
toa	-3.31e-09	-2.36e-09	-9.46e-10	7.92e-10
lev	-.0086941	-.0105646	.0018705	.0004433
gdp	.5030921	.5086695	-.0055774	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 24.19
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)

4.3.1 Main sample

In the main model, the relationship between the cash conversion cycle and profitability is negative. The findings are significant with the coefficient being within the 95% confidence interval. Shin and Soenen (1998) argued that the negative relations between profits and the cash conversion cycle could be explained by the market power or market share of a firm. This means that the firm has a shorter CCC because of bargaining power with suppliers and higher profitability because of market dominance. The negative relationship between the firm's cash conversion cycle and profitability can also be explained by the fact that minimizing the investment in current assets can help in boosting profitability. This ensures that cash is not maintained in the business for too long and that it is used to generate profits for the firm. The other variables in the model are also statistically significant. The models adjusted R^2 is 34.85% with an F-value of 10.99.

4.3.2 Sub-samples

For firms with a current ratio greater than two, there exists a negative relationship between the cash conversion cycle and profitability. The findings are significant with the coefficient being within the 95% confidence interval. The other variables in the model are also statistically significant. The models adjusted R^2 is 59.70% with an F-value of 5.52.

For firms with a current ratio less than two, there exists a negative relationship between the cash conversion cycle and profitability. The findings are significant with the coefficient being within the 95% confidence interval. The other variables in the model are also statistically significant. The models adjusted R^2 is 40.13% with an F-value of 7.93.

For firms with a cash conversion cycle greater than 90 days, there exists a negative relationship between the cash conversion cycle and profitability. The findings are significant with the coefficient being within the 95% confidence interval. The other variables in the model are also statistically significant. The models adjusted R^2 is 44.29% with an F-value of 1.44.

For firms with a cash conversion cycle less than 90 days, there exists a negative relationship between the cash conversion cycle and profitability. The findings are significant with the coefficient being within the 95% confidence interval. The other variables in the model are also statistically significant. The models adjusted R^2 is 34.85% with an F-value of 8.70.

4.3.3 Industry break-down

For firms in the consumer goods industry, there exists a negative relationship between the cash conversion cycle and profitability. The findings are significant with the coefficient being within the 95% confidence interval. The other variables in the model are also statistically significant. The models adjusted R^2 is 36.14% with an F-value of 2.93.

For industrial firms, there exists a negative relationship between the cash conversion cycle and profitability. The findings are significant with the coefficient being within the 95% confidence interval. The other variables in the model are also statistically significant. The models adjusted R^2 is 42.83% with an F-value of 11.81.

For firms in the resources industry, there exists a negative relationship between the cash conversion cycle and profitability. The findings are significant with the coefficient being within the 95% confidence interval. The other variables in the model are also statistically significant. The models adjusted R^2 is 48.76% with an F-value of 4.38.

For firms in the resources industry, there exists a negative relationship between the cash conversion cycle and profitability. The findings are significant with the coefficient being within the 95% confidence interval. The other variables in the model are also statistically significant. The models adjusted R^2 is 46.02% with an F-value of 2.74.

4.3.4 Jacque Bera Test

The Jacque Bera was used to test whether sample data have the skewness and kurtosis matching a normal distribution. The null hypothesis that skewness and excess kurtosis are zero could not be rejected and therefore the sample data is from a normal distribution. Since the chi-squared approximation is overly sensitive to small samples, it is worth mentioning that our 1200 observations are more than adequate to ensure that the risk of committing a type 1 error is minimized.

Table 12, Jacque Bera Test

Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	joint adj chi2(2)	joint Prob>chi2
yr	1.2e+03	1.0000	0.0000	.	0.0000

```
sktest nop rev ccc toa lev gdp
```

Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	joint adj chi2(2)	joint Prob>chi2
nop	1.2e+03	0.0000	0.0000	.	0.0000
rev	1.2e+03	0.0000	0.0000	.	0.0000
ccc	1.2e+03	0.0000	0.0000	.	0.0000
toa	1.2e+03	0.0000	0.0000	.	0.0000
lev	1.2e+03	0.0000	0.0000	.	.
gdp	1.2e+03	0.0000	0.0000	.	0.0000

Chapter 5 – Summary & Conclusion

The concept of maximizing shareholder return ranks highly amongst investors. In the introduction of this paper it was highlighted that most JSE listed firms invest a lot in working capital. The way this working capital is managed will have an impact on profitability. We found a significant negative relationship between operating profitability and the cash conversion cycle of the firm. It follows that firms can improve profitability by employing appropriate liquidity management strategies. Management can create value for shareholders by reducing the length of the cash conversion cycle.

The objective of this paper was to determine whether there is a relationship between liquidity and profitability and to further describe the nature of the possible relationship between liquidity and profitability of South African firms listed on the Johannesburg Stock Exchange (JSE).

A number of limitations were faced in trying to achieve these objectives. These limitations include the exclusion of banking and finance firms due to the nature of the business. Liquidity measures in this industry would have been inconsistent with those outside this industry. Firms listed on the Alternative exchange (Alt X) were omitted because their historical data did not satisfy the 10 year criteria used for the study. It was also not possible to a get reliable cost of goods sold numbers (COGS) for most firms and so turnover was used instead.

The results of this study show that liquidity management has implications on the profitability of firms. By rejecting all of our three null hypotheses, we adopted the alternatives and established that a negative relationship exists between liquidity and profitability and that this varies across industries as well as size of firms. The average profitability of firms in the industrials and resources industries were much lower than those in the services and consumer industries which have lower market capitalizations. The larger, more mature industries also had much higher CCC's. The observations are consistent with the findings of this paper which are also in line

with (Eljelly, 2004), (Deloof, 2003) and (Raheman & Nasr, 2007) who found a strong negative relationship between measures of working capital management and operating profitability.

The scope for further research can be extended to the main components of the cash conversion cycle. Testing the relationship between profitability and inventory turnover, or debtors days or creditor days as opposed to just the cash conversion cycle which is a combination of the three. Further research can also be extended to test the relationship between profitability and liquidity on firms listed on the alternative exchange (Alt X), which have much smaller market capitalizations than JSE listed firms. Altering the time horizon under observation can also help get some insight on what has been happening to the profitability and liquidity relationship over time.

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APPENDIX A

List of Companies in Sample

Ticker	Company	Economic Sector	ROAO
AFR	AFGRI LIMITED	Consumer goods	517,956.61
APK	ASTRAPAK LIMITED	Consumer goods	287,178.15
APN	ASPEN PHARMACARE HOLDINGS LIMITED	Consumer goods	977,920.62
AVI	AVI LIMITED	Consumer goods	1,061,662.84
BEG	Beige Holdings Limited	Consumer goods	6,492.91
CKS	CROOKES BROTHERS LIMITED	Consumer goods	56,718.25
CLS	CLICKS GROUP LIMITED	Consumer goods	819,816.31
CMH	COMBINED MOTOR HOLDINGS LIMITED	Consumer goods	235,410.10
CNL	CONTROL INSTRUMENTS GROUP LIMITED	Consumer goods	61,761.53
DGC	DIGICORE HOLDINGS LIMITED	Consumer goods	94,750.63
ILV	ILLOVO SUGAR LIMITED	Consumer goods	1,094,285.74
ITR	INTERTRADING LIMITED	Consumer goods	9,954.80
MDC	MEDI-CLINIC CORPORATION LIMITED	Consumer goods	1,176,778.53
MPC	MR PRICE GROUP LIMITED	Consumer goods	921,788.72
MSM	MASSMART HOLDINGS LIMITED	Consumer goods	1,757,133.21
MTA	METAIR INVESTMENTS LIMITED	Consumer goods	264,933.12
NTC	NETCARE LIMITED	Consumer goods	2,365,050.54
OCE	OCEANA GROUP LIMITED	Consumer goods	329,829.82
PIK	PICK N PAY STORES LIMITED	Consumer goods	1,878,535.51
RBW	RAINBOW CHICKEN LIMITED	Consumer goods	469,639.62
RTO	REX TRUEFORM CLOTHING COMPANY LTD	Consumer goods	59,441.63
SAB	SABMiller plc (S. Africa)	Consumer goods	8,283,465.24
SHP	SHOPRITE HOLDINGS LIMITED	Consumer goods	2,516,654.61
SOV	SOVEREIGN FOOD INVESTMENTS LIMITED	Consumer goods	59,433.52
TBS	Tiger Brands Limited	Consumer goods	2,818,149.91
TFG	THE FOSCHINI GROUP LIMITED	Consumer goods	1,240,362.53
TRU	TRUWORTHS INTERNATIONAL LIMITED	Consumer goods	1,121,205.72
WHL	Woolworths Holdings Limited	Consumer goods	1,430,035.92

AEG	AVENG LIMITED	Industries	2,120,155.23
AFX	AFRICAN OXYGEN LIMITED	Industries	1,343,513.85
AGI	AG INDUSTRIES LIMITED	Industries	108,321.22
AMA	AMALGAMATED APPLIANCE HOLDINGS LD	Industries	102,906.31
AOO	AFRICAN AND OVERSEAS ENTERPRISES LD	Industries	58,241.73
BAW	BARLOWORLD LIMITED	Industries	4,879,969.24
BDM	BUILDMAX LIMITED	Industries	58,914.43
CMG	Cenmag Holdings Limited	Industries	3,281.11
CRM	CERAMIC INDUSTRIES LIMITED	Industries	267,449.28
CSB	CASHBUILD LIMITED	Industries	188,423.41
DAW	DISTRIB. AND WAREHOUSING NETWORK LD	Industries	205,394.21
DLV	DORBYL LIMITED	Industries	188,768.72
DTA	DELTA EMD LIMITED	Industries	308,804.85
ELR	ELB GROUP LIMITED	Industries	78,806.61
GRF	GROUP FIVE LIMITED	Industries	450,127.22
HDC	HUDACO INDUSTRIES LIMITED	Industries	253,074.71
HWN	HOWDEN AFRICA HOLDINGS LIMITED	Industries	64,696.61
ILA	ILIAD AFRICA LIMITED	Industries	262,376.81
ITE	ITALTILE LIMITED	Industries	284,818.82
IVT	INVICTA HOLDINGS LIMITED	Industries	272,697.81
JSC	JASCO ELECTRONICS HOLDINGS LIMITED	Industries	50,438.83
KIR	KAIROS INDUSTRIAL HOLDINGS LIMITED	Industries	11,304.94
LAB	Labat Africa Limited	Industries	34,341.47
MAS	MASONITE (AFRICA) LIMITED	Industries	50,583.43
MST	MUSTEK LIMITED	Industries	184,152.61
MUR	MURRAY & ROBERTS HOLDINGS LIMITED	Industries	1,429,839.42
NPK	NAMPAK LIMITED	Industries	2,074,463.04
NWL	NU-WORLD HOLDINGS LIMITED	Industries	92,413.00
PNC	PINNACLE TECHNOLOGY HOLDINGS LTD	Industries	68,970.20
PPC	PRETORIA PORTLAND CEMENT COMPANY LD	Industries	1,591,514.95
RLO	REUNERT LIMITED	Industries	1,003,463.71
SAP	Sappi Limited	Industries	671,755.48
SER	SEARDEL INVESTMENT CORPORATION LTD	Industries	196,488.52
SHF	STEINHOFF INTERNATIONAL HOLDINGS LD	Industries	3,493,604.32
SPA	SPANJAARD LIMITED	Industries	8,222.02
TPC	TRANSPACO LIMITED	Industries	61,943.53
TRE	TRENCOR LIMITED	Industries	1,219,021.70
WBO	WILSON BAYLY HOLMES-OVCON LIMITED	Industries	414,669.62
WNH	WINHOLD LIMITED	Industries	61,312.31

BVT	The BIDVest Group Limited	Financial services	4,788,401.51
CAP	CAPE EMPOWERMENT LIMITED	Financial services	15,205.52
IDQ	Indequity Group Limited	Financial services	1,382.52
JDG	JD GROUP LIMITED	Financial services	1,558,287.81
MTE	MARSHALL MONTEAGLE HLDGS SOC ANON	Financial services	5,674.21
SBL	SABLE HOLDINGS LIMITED	Financial services	37,781.94
SKJ	SEKUNJALO INVESTMENTS LIMITED	Financial services	54,913.03

ALT	ALLIED TECHNOLOGIES LIMITED	Info Tech Services	665,115.71
ATN	ALLIED ELECTRONICS CORPORATION LTD	Info Tech Services	1,559,832.91
DCT	DATACENTRIX HOLDINGS LIMITED	Info Tech Services	99,805.81
DDT	Dimension Data Holdings plc (S. Africa)	Info Tech Services	189,419.92
DTC	DATATEC LIMITED	Info Tech Services	473,744.91
EOH	EOH HOLDINGS LIMITED	Info Tech Services	61,521.81
FRT	FARITEC HOLDINGS LIMITED	Info Tech Services	12,795.71
FWX	Foneworx Holdings Limited	Info Tech Services	9,177.03
GIJ	GIJIMA GROUP LIMITED	Info Tech Services	176,622.22
MTN	MTN GROUP LIMITED	Info Tech Services	19,535,184.79
SDH	SECUREDATA HOLDINGS LIMITED	Info Tech Services	30,762.91
SPS	SPESCOM LIMITED	Info Tech Services	42,868.43
TKG	TELKOM SA LIMITED	Info Tech Services	15,382,768.63
UCS	UCS GROUP LIMITED	Info Tech Services	140,937.24
ACL	ARCELORMITTAL SOUTH AFRICA LIMITED	Resources	6,123,512.55
AFE	AECI LIMITED	Resources	1,039,334.93
AGL	ANGLO AMERICAN PLC	Resources	6,880,603.25
AMS	Anglo Platinum Limited	Resources	11,022,709.33
ANG	AngloGold Ashanti Limited	Resources	2,103,986.95
ARI	African Rainbow Minerals Limited	Resources	2,590,201.35
ART	ARGENT INDUSTRIAL LIMITED	Resources	146,700.72
ASR	ASSORE LIMITED	Resources	1,468,422.12
BIL	BHP Billiton plc	Resources	10,714,567.28
DRD	DRDGOLD Ltd.	Resources	(157,301.84)
EHS	EVRAZ HIGHVELD STEEL & VANADIUM LTD	Resources	1,415,904.94
HAR	Harmony Gold Mining Company Ltd	Resources	989,730.38
IMP	Impala Platinum Holdings Limited	Resources	7,640,363.40
MRF	MERAFE RESOURCES LIMITED	Resources	226,451.34
SNU	SENTULA MINING LIMITED	Resources	282,168.45
SOL	SASOL LIMITED	Resources	22,432,959.45

CAT	CAXTON CTP PUBLISHERS & PRINTERS LD	Services	588,645.43
COM	COMAIR LIMITED	Services	258,808.83
CRG	CARGO CARRIERS LIMITED	Services	55,786.86
EXL	EXCELLERATE HOLDINGS LIMITED	Services	51,913.71
FBR	FAMOUS BRANDS LIMITED	Services	120,306.12
GND	GRINDROD LIMITED	Services	2,500,049.22
IPL	IMPERIAL HOLDINGS LIMITED	Services	4,927,882.74
KGM	KAGISO MEDIA LIMITED	Services	209,154.62
LON	LonminPlc (S. Africa)	Services	517,379.45
MMG	MICROMEGA HOLDINGS LIMITED	services	45,165.61
NPN	NASPERS LIMITED	Services	3,702,839.25
PMV	PRIMESERV GROUP LIMITED	services	51,181.61
SPG	SUPER GROUP LIMITED	Services	1,022,741.63
SUR	SPUR CORPORATION LIMITED	Services	105,884.12
TSX	TRANS HEX GROUP LIMITED	services	179,228.73
VLE	VALUE GROUP LIMITED	Services	162,445.77

APPENDIX B

Summary statistics

Summary Statistics					
Variable	**Mean**	**25%**	**Median**	**75%**	**StdDev**
ROAO	28.4%	18.5%	27.0%	36.0%	20.7%
REV ('000)	7,744,381	452,974	2,080,212	7,673,817	14,726,824
CCC (days)	45	20	40	64	40
ToA ('000)	6,931,200	275,137	1,434,923	5,828,325	15,044,514
LEV	2.50	1.57	2.00	2.79	2.57
GDP	3.3%	3.1%	3.4%	4.0%	2.0%
CR	1.73	1.13	1.45	1.93	1.12
DII (days)	39	18	36	54	30
DSO (days)	50	33	48	62	30
DPO (days)	44	28	42	56	25

Summary Statistics, CR > 2					
Variable	**Mean**	**25%**	**Median**	**75%**	**StdDev**
ROAO	29.4%	19.8%	27.6%	39.5%	16.5%
REV ('000)	3,577,251	283,126	1,017,200	2,997,930	10,151,099
CCC (days)	66	33	57	91	48
ToA ('000)	3,836,189	194,874	728,437	2,714,917	12,146,719
LEV	1.59	1.33	1.49	1.72	0.47
GDP	3.3%	3.1%	3.4%	4.0%	2.0%
CR	3.15	2.26	2.69	3.40	1.61
DII (days)	47	24	41	62	36
DSO (days)	58	35	51	69	41
DPO (days)	39	26	35	49	21

Summary Statistics, CR < 2					
Variable	**Mean**	**25%**	**Median**	**75%**	**StdDev**
ROAO	28.1%	18.1%	26.9%	35.1%	21.8%
REV ('000)	8,954,192	551,856	2,673,398	9,888,210	15,606,489
CCC (days)	38	17	38	57	34
ToA ('000)	7,829,751	323,622	1,746,955	7,222,000	15,678,151
LEV	2.77	1.76	2.23	3.02	2.86
GDP	3.3%	3.1%	3.4%	4.0%	2.0%
CR	1.32	1.06	1.32	1.57	0.35
DII (days)	37	17	35	52	28
DSO (days)	47	33	47	61	25
DPO (days)	46	30	44	57	26

Summary Statistics, CCC > 90					
Variable	**Mean**	**25%**	**Median**	**75%**	**StdDev**
ROAO	28.7%	18.6%	27.5%	35.4%	21.3%
REV ('000)	8,299,997	445,652	2,097,820	8,665,419	15,429,405
CCC (days)	35	18	37	55	27
ToA ('000)	7,345,532	267,717	1,389,189	5,955,434	15,787,630
LEV	2.57	1.59	2.03	2.86	2.69
GDP	3.4%	3.1%	3.4%	4.0%	2.0%
CR	1.63	1.11	1.41	1.84	1.05
DII (days)	35	17	35	50	23
DSO (days)	45	31	46	59	22
DPO (days)	44	28	42	56	24

Summary Statistics, CCC < 90					
Variable	**Mean**	**25%**	**Median**	**75%**	**StdDev**
ROAO	25.9%	18.4%	25.1%	31.8%	14.7%
REV ('000)	2,966,075	486,083	1,971,200	4,083,000	3,070,384
CCC (days)	126	102	116	138	36
ToA ('000)	3,367,941	563,635	2,135,734	4,692,200	3,927,969
LEV	1.93	1.43	1.69	2.11	0.89
GDP	3.2%	3.1%	3.4%	4.0%	2.1%
CR	2.58	1.48	2.27	3.34	1.37
DII (days)	80	53	76	101	46
DSO (days)	91	61	76	116	50
DPO (days)	45	29	40	55	27

Summary Statistics, Consumers					
Variable	**Mean**	**25%**	**Median**	**75%**	**StdDev**
ROAO	30.9%	23.0%	29.4%	37.7%	23.5%
REV	7,559,702	840,321	3,823,016	8,626,695	10,102,546
CCC	48	20	40	68	41
ToA	4,110,458	516,346	2,394,855	5,275,475	5,841,035
LEV	2.63	1.48	1.89	3.13	3.28
GDP	3.3%	3.1%	3.4%	4.0%	2.0%
CR	1.83	1.13	1.48	2.12	1.01
DII	41	23	38	54	24
DSO	46	21	41	59	34
DPO	39	26	36	48	20

Summary Statistics, Industrials					
Variable	**Mean**	**25%**	**Median**	**75%**	**StdDev**
ROAO	24.4%	17.2%	23.3%	31.2%	12.6%
REV	4,471,774	498,674	1,449,821	4,183,089	8,378,923
CCC	50	29	48	71	38
ToA	3,373,882	276,990	874,881	3,691,277	5,999,556
LEV	2.60	1.70	2.27	2.99	1.40
GDP	3.3%	3.1%	3.4%	4.0%	2.0%
CR	1.77	1.24	1.51	1.91	0.91
DII	50	33	45	62	30
DSO	49	38	50	61	22
DPO	50	36	48	60	22

Summary Statistics, Resources					
Variable	**Mean**	**25%**	**Median**	**75%**	**StdDev**
ROAO	23.9%	14.6%	24.1%	34.1%	18.0%
REV	16,044,236	2,363,471	8,906,828	20,865,000	21,540,004
CCC	52	30	53	71	39
ToA	23,082,856	2,913,999	11,735,550	33,042,300	27,182,423
LEV	2.15	1.62	1.92	2.36	1.16
GDP	3.3%	3.1%	3.4%	4.0%	2.0%
CR	1.47	1.02	1.34	1.70	0.76
DII	50	30	47	62	28
DSO	42	24	42	56	25
DPO	40	22	33	46	34

Summary Statistics, Services					
Variable	**Mean**	**25%**	**Median**	**75%**	**StdDev**
ROAO	35.1%	23.6%	31.8%	44.1%	23.4%
REV	7,058,426	358,472	1,031,993	4,229,436	15,250,321
CCC	27	14	25	40	24
ToA	6,248,106	191,399	704,839	3,117,660	15,972,278
LEV	2.30	1.43	1.89	2.52	2.54
GDP	3.3%	3.1%	3.4%	4.0%	2.0%
CR	1.58	1.12	1.39	1.84	0.72
DII	18	4	10	30	20
DSO	53	40	52	65	23
DPO	44	27	40	56	26

APPENDIX C

Regression Outputs

Fixed-effects (within) regression

```
Fixed-effects (within) regression               Number of obs      =      1200
Group variable: com                             Number of groups   =       120

R-sq:  within  = 0.0486                         Obs per group: min =        10
       between = 0.0217                                        avg =      10.0
       overall = 0.0303                                        max =        10

                                                F(5,1075)          =     10.99
corr(u_i, Xb)  = -0.2006                        Prob > F           =    0.0000
```

nop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rev	4.03e-09	1.28e-09	3.13	0.002	1.50e-09	6.55e-09
ccc	-.0011434	.0002362	-4.84	0.000	-.0016068	-.0006799
toa	-3.31e-09	1.27e-09	-2.61	0.009	-5.79e-09	-8.21e-10
lev	-.0086941	.0021479	-4.05	0.000	-.0129086	-.0044795
gdp	.5030921	.2420884	2.08	0.038	.0280726	.9781116
_cons	.3315951	.0165472	20.04	0.000	.2991267	.3640635

Current ratio greater than 2

```
Fixed-effects (within) regression               Number of obs      =       276
Group variable: com                             Number of groups   =        71

R-sq:  within  = 0.1212                         Obs per group: min =         1
       between = 0.0077                                        avg =       3.9
       overall = 0.0063                                        max =        10

                                                F(5,200)           =      5.52
corr(u_i, Xb)  = -0.4433                        Prob > F           =    0.0001
```

nop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rev	1.39e-08	7.19e-09	1.93	0.055	-3.04e-10	2.81e-08
ccc	-.0013461	.000346	-3.89	0.000	-.0020283	-.0006639
toa	-8.58e-09	5.55e-09	-1.55	0.124	-1.95e-08	2.36e-09
lev	.0311166	.0241378	1.29	0.199	-.0164806	.0787138
gdp	.0917696	.353058	0.26	0.795	-.6044241	.7879634
_cons	.3136027	.0506647	6.19	0.000	.2136971	.4135083

Current ratio less than 2

```
Fixed-effects (within) regression               Number of obs      =       924
Group variable: com                             Number of groups   =       112

R-sq:  within  = 0.0469                         Obs per group: min =         1
       between = 0.0313                                        avg =       8.3
       overall = 0.0377                                        max =        10

                                                F(5,807)           =      7.93
corr(u_i, Xb)  = -0.1261                        Prob > F           =    0.0000
```

nop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rev	3.82e-09	1.36e-09	2.81	0.005	1.15e-09	6.49e-09
ccc	-.0011566	.0002976	-3.89	0.000	-.0017407	-.0005726
toa	-3.10e-09	1.37e-09	-2.26	0.024	-5.80e-09	-4.07e-10
lev	-.0076885	.0022006	-3.49	0.001	-.012008	-.003369
gdp	.5882239	.282542	2.08	0.038	.0336201	1.142828
_cons	.3167409	.0187407	16.90	0.000	.2799548	.3535271

Cash conversion cycle greater than 90 days

```
Fixed-effects (within) regression               Number of obs      =       125
Group variable: com                             Number of groups   =        34

R-sq:  within  = 0.0775                         Obs per group: min =         1
       between = 0.0256                                        avg =       3.7
       overall = 0.0280                                        max =        10

                                                F(5,86)            =      1.44
corr(u_i, Xb)  = -0.1688                        Prob > F           =    0.2167
```

nop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rev	-1.23e-08	1.12e-08	-1.11	0.272	-3.45e-08	9.85e-09
ccc	-.0008915	.000392	-2.27	0.025	-.0016708	-.0001122
toa	1.05e-08	8.32e-09	1.26	0.212	-6.08e-09	2.70e-08
lev	-.0130067	.0185835	-0.70	0.486	-.0499496	.0239361
gdp	.0327007	.5192706	0.06	0.950	-.999575	1.064977
_cons	.3966592	.0655803	6.05	0.000	.2662899	.5270285

Cash conversion cycle less than 90 days

```
Fixed-effects (within) regression               Number of obs      =      1075
Group variable: com                             Number of groups   =       116

R-sq:  within  = 0.0436                         Obs per group: min =         1
       between = 0.0071                                        avg =       9.3
       overall = 0.0260                                        max =        10

                                                F(5,954)           =      8.70
corr(u_i, Xb)  = -0.2014                        Prob > F           =    0.0000
```

nop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rev	4.13e-09	1.33e-09	3.11	0.002	1.52e-09	6.74e-09
ccc	-.0015056	.0003987	-3.78	0.000	-.0022881	-.0007232
toa	-3.49e-09	1.31e-09	-2.66	0.008	-6.06e-09	-9.11e-10
lev	-.0085281	.0022261	-3.83	0.000	-.0128967	-.0041594
gdp	.5957154	.2664929	2.24	0.026	.0727353	1.118695
_cons	.3329706	.01964	16.95	0.000	.2944279	.3715133

Consumer goods

```
Fixed-effects (within) regression               Number of obs      =       280
Group variable: com                             Number of groups   =        28

R-sq:  within  = 0.0561                         Obs per group: min =        10
       between = 0.0386                                        avg =      10.0
       overall = 0.0374                                        max =        10

                                                F(5,247)           =      2.93
corr(u_i, Xb)  = -0.3327                        Prob > F           =    0.0136
```

nop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rev	7.12e-09	3.20e-09	2.23	0.027	8.25e-10	1.34e-08
ccc	-.0008629	.0006164	-1.40	0.163	-.002077	.0003512
toa	5.89e-10	3.68e-09	0.16	0.873	-6.66e-09	7.83e-09
lev	-.0087015	.0041615	-2.09	0.038	-.0168979	-.000505
gdp	.696231	.6034956	1.15	0.250	-.4924228	1.884885
_cons	.2940267	.0460685	6.38	0.000	.2032895	.384764

Industrials

```
Fixed-effects (within) regression               Number of obs      =       390
Group variable: com                             Number of groups   =        39

R-sq:  within  = 0.1458                         Obs per group: min =        10
       between = 0.0151                                        avg =      10.0
       overall = 0.0542                                        max =        10

                                                F(5,346)           =     11.81
corr(u_i, Xb)  = -0.3922                        Prob > F           =    0.0000
```

nop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rev	9.98e-09	4.06e-09	2.46	0.014	2.00e-09	1.80e-08
ccc	-.0012332	.0002359	-5.23	0.000	-.0016971	-.0007693
toa	-1.00e-08	5.74e-09	-1.74	0.082	-2.13e-08	1.29e-09
lev	-.0227986	.0043474	-5.24	0.000	-.0313493	-.0142479
gdp	.2196122	.2431301	0.90	0.367	-.2585867	.6978112
_cons	.3464448	.0216043	16.04	0.000	.3039525	.3889371

Resources

```
Fixed-effects (within) regression               Number of obs      =       160
Group variable: com                             Number of groups   =        16

R-sq:  within  = 0.1361                         Obs per group: min =        10
       between = 0.1095                                        avg =      10.0
       overall = 0.1219                                        max =        10

                                                F(5,139)           =      4.38
corr(u_i, Xb)  = -0.1002                        Prob > F           =    0.0010
```

nop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rev	8.36e-09	2.45e-09	3.41	0.001	3.52e-09	1.32e-08
ccc	-.0005702	.0005805	-0.98	0.328	-.001718	.0005777
toa	-6.72e-09	1.87e-09	-3.59	0.000	-1.04e-08	-3.02e-09
lev	-.0275901	.0118765	-2.32	0.022	-.0510722	-.0041081
gdp	-.3485231	.5563759	-0.63	0.532	-1.448577	.751531
_cons	.3606329	.0486305	7.42	0.000	.2644818	.456784

Services

```
Fixed-effects (within) regression               Number of obs      =       300
Group variable: com                             Number of groups   =        30

R-sq:  within  = 0.0492                         Obs per group: min =        10
       between = 0.0011                                        avg =      10.0
       overall = 0.0159                                        max =        10

                                                F(5,265)           =      2.74
corr(u_i, Xb)  = -0.1895                        Prob > F           =    0.0195
```

nop	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rev	1.60e-09	3.58e-09	0.45	0.656	-5.46e-09	8.65e-09
ccc	-.0023107	.0007428	-3.11	0.002	-.0037732	-.0008482
toa	-1.90e-09	3.48e-09	-0.55	0.585	-8.75e-09	4.95e-09
lev	-.0079697	.0047454	-1.68	0.094	-.0173132	.0013737
gdp	.3770072	.5300638	0.71	0.478	-.6666652	1.42068
_cons	.4205926	.0334006	12.59	0.000	.3548284	.4863569