

https://dspace.org/

An evaluation of the impact of the global financial crisis on working capital management practices of South African firms

Patel, Bhavik

2020
https://hdl.handle.net/10539/31471

Downloaded from a DSpace repository. https://dspace.org/

AN EVALUATION OF THE IMPACT OF THE GLOBAL FINANCIAL CRISIS ON WORKING CAPITAL MANAGEMENT PRACTICES OF SOUTH AFRICAN FIRMS

Research report submitted by: **Bhavik Patel**

Student Number: **1073806**

Email: **bhavikptl520@gmail.com**

Ethics Clearance Number: **CACCN/1201**

Date Submitted: **31 March 2020**

Supervisor: **Avani Sebastian CA(SA), MCom (WITS)**

In partial fulfilment of the requirements of the degree of:

Masters of Commerce

University of the Witwatersrand

Declaration

I hereby declare that this research report is my own original work and that all sources have been accurately reported and acknowledged. It is submitted for the degree of Masters of Commerce (in the field of Accounting) to the University of the Witwatersrand, Johannesburg. This research report has not been submitted for any degree or examination at this or any other university.



Bhavik Patel

Johannesburg, South Africa

31 March 2020

AN EVALUATION OF THE IMPACT OF THE GLOBAL FINANCIAL CRISIS ON WORKING CAPITAL MANAGEMENT PRACTICES OF SOUTH AFRICAN FIRMS

Bhavik Patel

University of the Witwatersrand

Abstract

This study evaluates the effect of the global financial crisis on the working capital practices of South African firms. Using data that represents a decade before and after the crisis, it examines the working capital practices of firms at a time when cash resources were scarce. The results of the panel data regressions show that the cash conversion cycle became increasingly important to the profitability of firms during and after the financial crisis as firms began to resort to long-term debt to ensure their sustained profitability after the financial crisis. Given the above findings, this study finds support for conservative working capital management practices during non-crisis periods so as to ensure liquidity during crisis periods and for extended periods post a crisis.

***Key Words**:* Working Capital, Working Capital Management, Inventories, Accounts Receivable, Accounts Payable, Cash Conversion Cycle, Profitability and Global Financial Crisis

Acknowledgements

I would like to thank my supervisor, Avani Sebastian for her great assistance in providing helpful comments and suggestions made in preparation and completion of this dissertation. Furthermore, she motivated and guided me throughout the preparation of this thesis. I would like to thank Prof Kurt Sartorius for his guidance during the research and design module. In addition to the above, I would like to thank the econometrician Prof Ilse Botha for the computation of the statistics used within this study.

Lastly, I am extremely grateful to my parents for supporting me throughout the year towards the completion of this dissertation. They have inspirited me and motivated me the entire year.

CONTENTS

CHAPTER I – Introduction 6

1.1.0.0 Introduction 6

1.1.1.0 The Global Financial Crisis 7

1.2.0.0 Statement of the problem 10

1.3.0.0 Purpose 11

1.4.0.0 Significance of the study 11

1.5.0.0 Research Question 13

1.6.0.0 Assumptions & Limitations 13

1.6.1.0 Assumptions 13

1.6.2.0 Limitations 14

CHAPTER II – Background & Literature Review 16

2.1.0.0 Working Capital 16

2.1.1.0 Accounts Payable 19

2.1.2.0 Inventory 20

2.1.3.0 Accounts Receivable 21

2.2.0.0 Review of Previous Literature 22

2.3.0.0 Liquidity, Profitability & Value Creation 27

2.4.0.0 Liquidity & Credit Risk 28

CHAPTER III – Methodology 31

3.1.0.0 Sample and Data 31

3.2.0.0 Model and Data Analysis 32

3.3.0.0 Data & Variables 35

3.3.1.0 Data 35

3.3.2.0 Variables 35

3.4.0.0 Validity and Reliability 40

CHAPTER IV – Results 41

4.1.0.0 Descriptive Statistics 43

4.2.0.0 Pearson's Correlation 46

4.2.1.0 Correlation Coefficients 'During' the financial crisis (2007-2009) 47

4.2.2.0 Correlation Coefficients After the financial crisis (2010-2018) 47

4.3.0.0 Regression Analysis 49

4.3.1.0 Entire Period 53

4.3.2.0 Before, During and After the Crisis 55

4.3.3.0 Summary of Key Findings 59

CHAPTER V – Conclusions, Recommendations & Areas of Future Focus 60

5.1.0.0 Conclusion 60

5.2.0.0 Recommendations & Areas of Future Focus 61

REFERENCES 62

APPENDICES 70

Appendix A – Descriptive statistics for the Entire period (1998 to 2018) 70

Appendix B – Correlation Coefficients for the Entire period (1998 to 2018) 71

Appendix C – Regression Results 73

1.1 Entire Period (1998 to 2018) 73

1.2 Before, During and After the Financial Crisis 75

Appendix D – Influential Observations 79

CHAPTER I – Introduction

1.1.0.0 Introduction

The objective of this study is to investigate how, if at all, working capital management practices changed after the global financial crisis. It aims to evaluate which aspects of working capital management became more or less important to profitability as a result of the financial crisis. There has been a large body of research around working capital management, however, there has been a lack of research around the impact of the financial crisis on the working capital management. This would be worthy of research as this research could be applied by firms during periods of economic distress in order to appropriately manage the individual components of working capital to ensure that firms have sufficient liquidity during these periods. The management and control of working capital is essential and important for the financial health of a firm (Ramiah, Zhao, & Moosa, 2014; Bhunia, 2013). Working capital management refers to the management of these individual components to an optimal level depending on the type of firm. Previous studies indicate that working capital management directly impacts a firms performance (Aktas, Croci, & Petmezas, 2015).

In practice, working capital management is seen as an important issue for firms, as many financial executives are finding it difficult to identify the fundamental drivers of working capital (Lamberson, 1995). This issue also impacts management's decision on the level of optimality of working capital to adopt (Nazir & Afza, 2009; Lamberson, 1995). Working capital management is a significant component of a firm as it impacts a firms value, risk appetite and financial performance (Sharma & Kumar, 2011; Nazir & Afza, 2009; Deloof, 2003; Smith, 1980). According to Kesimli and Günay (2011), working capital management is seen as one of the foundations on which business continuity is built. Firms need to manage their working capital in a way which brings a balance between profitablity and risk (Baños-Caballero, García-Teruel, & Martínez-Solano, 2012; Ricci & Vito, 2000). Firms faced financial constraints during the financial crisis due to their inability to access financial resources from capital markets. These financial constraints were driven by the restrictions imposed by banks on short-term loans (Baveld, 2012). This resulted in a higher cost debt for firms. Given the restriction of the external financing, firms had to resort to alternative sources of financing, such as the management of the individual components of the cash conversion cycle (Baveld, 2012).

Firms face the risk of adopting inappropraite working capital practices which in turn could impact its ability to continue as a going concern (Padachi, 2006). The success or failure of a firm can be contributed towards different internal and external factors. External factors include the availability of financing, competition, government regulations, economic conditions, environmental and technological factors. Internal factors include workforce, accounting

systems, financial management practices and managerial skills (Padachi, 2006). These factors have the ability to influence the continuity of a firm, which can result in business failure (Shin & Soenen, 1998; Altman, 1968). Accordingly, by gaining an understanding of the role and drivers of working capital, firms gain the ability to minimize their risk and improve firm performance as a whole (Nazir & Afza, 2009).

Therefore, the efficient management of working capital practices by firms, decreases the risk of firms being unable to meet its obligations in the short-term and these practices prevent over investment in current assets (Eljelly, 2004). To avoid any cash flow issues or shortages, firms need to manage their short-term assets and liabilities optimally (Kesimli & Günay, 2011; Charitou, Elfani, & Lois, 2010). Optimal working capital policies include aggressive, conservative and moderate working capital policies. Furthermore, the efficient management of working capital resources has the ability to create value for shareholders (Charitou et al., 2010; Deloof, 2003).

1.1.1.0 The Global Financial Crisis

The collapsing of two hedge funds belonging to American firm Bear Stearns ignited the commencement of the financial crisis (Foster & Magdoff, 2009). The use of deteriorating quality subprime mortgages within the market in the United States triggered the financial crisis. The sub-prime mortgages were associated with banks' lending funds to poorer households. According to Baxter (2009), banks were pressured by the Clinton Administration to lend to poorer households. This was to allow poorer households to expand into the housing market. Banks were taking on high levels of risk from lending to poorer households. This risk also influenced housing prices in the markets (Baxter, 2009). The sub-prime mortgages were untangled, and it became known that these mortgages had a high risk associated with them. Given the issues (default payments and reduction in the housing prices) associated with these subprime mortgages, these sub-prime mortgages caused interest rates to increase for refinancing and caused a reduction in the housing prices in the market. Rating agencies downgraded a number of securities associated with these mortgages (Frank & Hesse, 2009). It became highly probable that these types of loans would not be paid back to the banks. Due to the improbability of repayment receipts from the sub-prime mortgages, banks would not have any cash inflows to pay off their debt obligations. This led to collapse and bailing out of British bank Northern Rock, AIG and Freddy Mac and Fenny Mea. Approximately one year later, the bank known as Lehman Brothers also collapsed (Baveld, 2012).

These financial institutions had flawed practices in place. This caused the financial crises to have a severe impact on the United States economy, which had a domino impact on the global economy and almost led to the brink of global depression (Crotty, 2009). The global financial

crisis had a negative impact on both advanced and emerging market economies (Cornett, McNutt, Strahan, & Tehranian, 2011; Foster & Magdoff, 2009). This event also caused uncertainty in the global markets. According to Ivashina and Scharfstein (2008), banks who had greater line exposure and reduced access to deposit financing, had to reduce their lending in comparison to other banks. Given this volatility, banks reduced its interbank lending, thus resulting in illiquidity in the interbank funding market (Baveld, 2012). Furthermore, due to the reduction in the supply of debt during this period, the policies of financing companies were adversely affected (Dang, Kim, & Shin, 2014).

The crux of the global financial crisis was hidden within the credit boom in mid-2007 (Ivashina & Scharfstein, 2008). Many companies faced cash flow issues due to the unavailability of trade credit for their working capital requirements, this in effect forced companies to postpone their plans for capital expansion into a variety of capital markets (Kesimli & Günay, 2011). Firms faced financial constraints due to their inability to access financial resources from capital markets. The volatility and financial constraints on firms were driven by the restrictions imposed by banks on short-terms loans (Baveld, 2012). This resulted in a higher cost debt for firms. This is indicative that firms had to resort to other sources of financing, such as the management of the individual components of the cash conversion cycle. Given the reduction of sales during this period, firms had to reduce their production of inventories and cut back on purchasing materials and products on credit (Baveld, 2012).

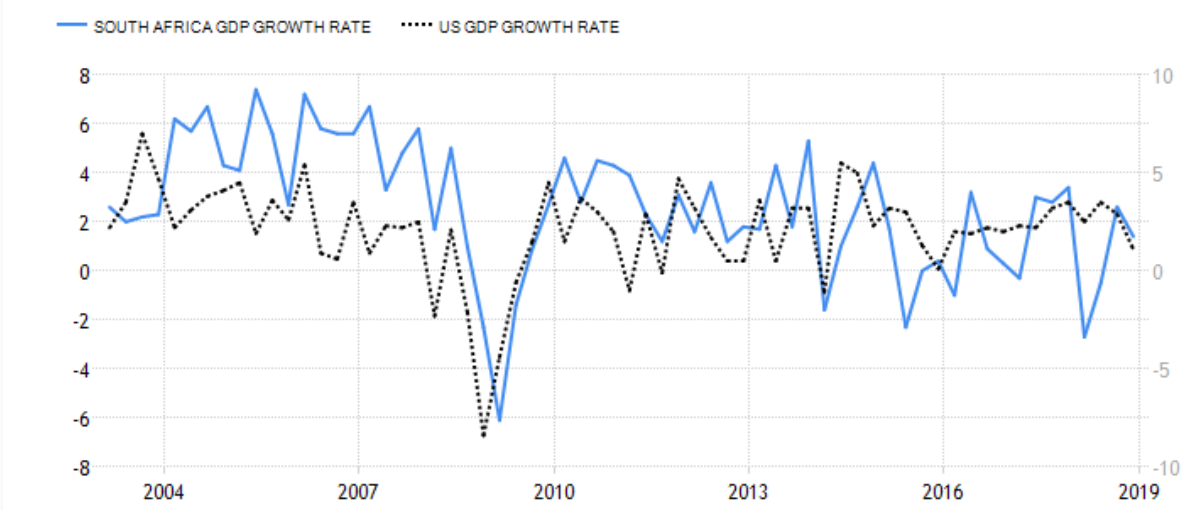
One of the major risks encountered by firms during the global financial crisis was liquidity risk. Liquidity is seen as an issue during times of crisis due to the firm's inability to collect cash from creditors given the increased level of default risk. Customers were exposed to financial and economic distress costs, which caused them to delay payments to firms. Given these financial constraints during the crisis, debtors defaulted on payments. Therefore, firms faced cash flow issues, which caused their liquidity positions to deteriorate. Furthermore, given the reduction in sales during the crisis, firms faced a buildup of inventory which further reduced their liquidity position, given that inventory was tied up in the current asset balance (Ramiah et al., 2014).

Emerging economies were impacted by worsened financing conditions and the depletion in demand for export sales within these countries (Coulibaly, Sapriza, & Zlate, 2013). The global financial crisis had a negative impact on the South African economy, which resulted in a negative impact on firms' financial performance (Te Velde et al., 2008). South Africa's foreign investments were negatively affected and approximately a million jobs were lost (Oseifuah, 2018; Te Velde et al., 2008). Furthermore, this crisis impacted South Africa in a variety of ways, namely: decrease in the overall capital inflow, by reducing the level of demand on the country's exports of goods and services, a reduction of capital inflow, household owners had

a greater level of credit liability and the country as a whole broadened their current account deficit (Danso & Adomako, 2014). The reduction in the exports suggests that there were high inventory build-ups during this period. Apart from the above, South Africa was also to exposed to the declining household prices along with reduced vehicle sales. In addition to the above manufacturing production also reduced. Firms faced high costs of financing given the increase in the lending rates.

The crisis resulted in a reduction in the commodity prices, which caused a decrease in capital inflows for emerging economies. South Africa is an open economy, which relies on foreign savings and foreign trade in order to encourage and attract local investment (Mnyande, 2012; Baxter, 2009). As illustrated in figure 1 below, the crisis caused the South African gross domestic product growth rate to reduce to minus 6% in 2009. When compared to South Africa, the US had a growth rate of negative 8% around 2009. According to Mnyande (2012), key export markets in South Africa were impacted and resulted in a recession in South Africa. As it can be seen from figure 1 below, South Africa still faced lingering effects of the global financial crisis through 2009. The study makes use of the ten-year data which is readily available.

Figure 1: South Africa's and the United States gross domestic product growth rate over time

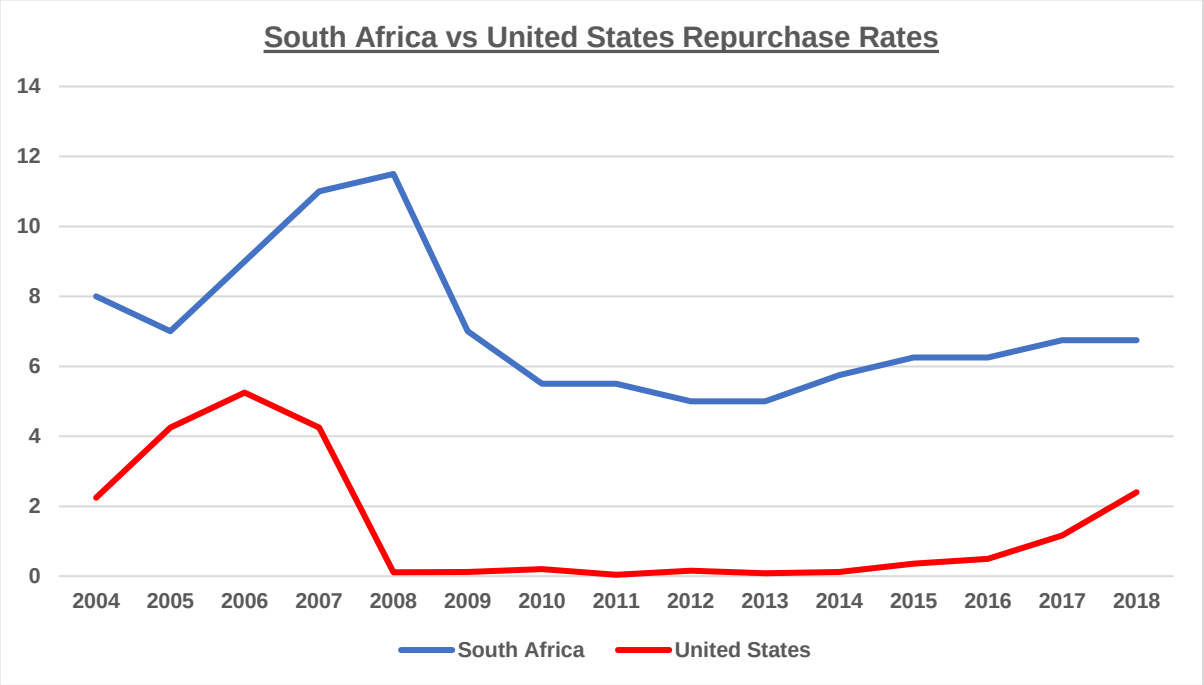


(Source: www.tradingeconomics.com)

Governments around the world enforced actions to aid the solvency and liquidity of the financial sector, however, market prices for commodities and assets dropped drastically which resulted in a higher cost of borrowing for firms (Ivashina & Scharfstein, 2008). Figure 2 below, shows the changes in the South African and United States repurchase rates over time. As

seen in figure 2, the South African Reserve Bank increased the interest rates from 7% to a maximum of 12% during the crisis period. South African banks became more stringent with their lending policies and practices which resulted in a reduction in domestic credit to firms in South Africa.

Figure 2: South Africa's and the United States Repurchase rates over time



(Source: www.tradingeconomics.com)

Given the impact of the global financial crisis on the global economy, firms tend to come out of recession periods stronger if they manage their working capital at optimal levels during such periods (Kesimli & Günay, 2011). Optimal working capital policies include aggressive, moderate and conservative working capital policies.

1.2.0.0 Statement of the problem

Generally, corporate finance literature focuses on the following areas of study: dividends, valuation methods, capital structure and long-term financial decision making (Nazir & Afza, 2009; Juan García-Teruel & Martinez-Solano, 2007). However, the short-term investment in assets and liabilities are seen as significant components of a firm and need to be assessed (Deloof, 2003). Finance theory indicates that, if firms manage their working capital efficiently, by adopting a short cash conversion cycle, firms will increase its liquidity and profitability positions. Whereas, a poorly managed working capital cycle will lower profitability and create liquidity issues for a firm (Damodaran, 2006). For example, if firms adopt an extensive debtor's collection period and a short creditor's payment period, the firm faces the risk of having liquidity

issues due to the availability of cash inflows to pay creditors. Furthermore, the firm faces a high risk of bad debts due to the inability to collect cash from debtors. These bad debts have a negative impact on profitability. Firms need to find the optimal balance between management of their cash inflows and cash outflows to ensure that they can meet liquidity requirements in the short run.

There has been a large body of research conducted surrounding the effects of the global financial crisis (Oseifuah, 2018; Haron & Nomran, 2016; Ramiah et al., 2014; Baveld, 2012). Most of the previous studies on working capital management and firm profitability relate to periods of economic stability (Oseifuah, 2018). There have been many studies on the relationship between working capital management and a firm's profitability, as evidenced by Deloof (2003), Raheman and Nasr (2007), Juan García-Teruel and Martinez-Solano (2007), Shin and Soenen (1998), Lazaridis and Tryfonidis (2006) and Mathuva (2010). However, there have been limited studies towards the evaluation of working capital management against profitability for the periods prior to, during and post the financial crisis periods (Ramiah et al., 2014). Furthermore, there has been a scarcity of research for emerging economies toward the topic on hand (Oseifuah, 2018; Haron & Nomran, 2016; Ramiah et al., 2014; Baveld, 2012).

The present study investigates how firms listed on the Johannesburg Stock Exchange managed their working capital practices for periods before, during and after the global financial crisis.

1.3.0.0 Purpose

The purpose of this study is to investigate how, if at all, working capital management practices changed after the global financial crisis. In order to do this, the contribution of each item of working capital to profit was examined in detail for periods before, during and after the financial crisis respectively.

1.4.0.0 Significance of the study

Working capital management is one of the most important decisions that firms need to manage, to ensure the short-term viability of the firm. Internal and external analysts often study the liquidity of firms as it is important for the day-to-day operations of a firm (Bhunia, 2013; Bhunia, 2010). Firms often face a trade-off between liquidity and profitability. For example, firms who have high liquidity, often have low profitability, whereas firms with low liquidity display a higher profitability. There is often a conflict between twin goals when it comes to a firms working capital policy (Correia, Flynn, Uliana, & Wormald, 2015). The first goal expresses that investment in current assets should only be done if it results in an increase in profitability. The second goal expresses that firms should hold an adequate amount of cash on hand in order to meeting short-term commitments as and when they fall due. The trade-off

noted above, can be expressed as the pursuance of higher returns resulting in lower liquidity and the pursuance of higher liquidity results in diluted returns (Smith & Begemann, 1997). According to Alavinasab and Davoudi (2013), working capital management and liquidity are seen to be the blood which circulates the firm. Similarly, Padachi (2006) describes working capital management as the heart which transport blood to vessels of a firm.

The evaluation of working capital management is important as firms are impacted by inflationary situations and the devaluation of currency which impact the purchasing power of the economy (Alavinasab & Davoudi, 2013). Empirical evidence has shown that firms face bankruptcy due to deficiencies contained within their working capital practices. To further reinforce the above statement, Berryman (1983) found that the main reason why small business failures occur in the United Kingdom and United States is due to the malpractices of working capital policies.

The global financial crisis resulted in an increase in the level of working capital requirements for firms. Firms faced a significant reduction in their sales, which resulted in the excessive buildup of inventories. Customers were exposed to financial and economic distress costs, which caused them to delay payments to firms for the acquisition of goods and services. These outstanding payments caused firms' accounts receivable balances to increase drastically. As a result, firms debtor balances would increase and consequently result in higher bad debts (Daisuke, 2017; Tsuruta & Uchida, 2013). Given the reduction in sales and lack of cash inflows from customers, firms had to cut back on the acquisition of goods, which caused their accounts payable balance to reduce (Tsuruta & Uchida, 2013). Firms offering trade credit had to have stringent policies in place given the high probability of default given the tough economic circumstances, which also resulted in the reduction of trade payables (Raddatz, 2008). Firms who required excessive working capital requirements faced a massive liability of repayment, given the expensive sources of credit financing (Daisuke, 2017).

Given the repercussions of the above, firms faced a reduction in profitability given the reductions in sales, increase in bad debts (given the higher probability of customer default) and the expensive source of trade credit financing resulted in high interest expenses. As a result of the above, firms should seek to adjust their working capital requirements to different optimal levels for periods during and after a crisis or economic downturn.

Majority of previous literature on working capital management is limited to the non-crisis period (Mathuva, 2010; Raheman & Nasr, 2007; Juan García-Teruel & Martinez-Solano, 2007; Lazaridis & Tryfonidis, 2006; Deloof, 2003; Shin & Soenen, 1998). From an academic perspective, this study will add to the body of knowledge for working capital management

practices. This study will provide insight on the working capital management practices before, during and after crisis periods, with the spotlight on working capital management practices during the global financial crisis. Limited studies have been performed on working capital management practices for emerging economies. Therefore, this study may reform working capital management practices in South Africa. Firms listed on the Johannesburg Stock Exchange, emerging economies and academics can use this literature to determine what working capital management practices should be during periods of financial crisis.

In addition to the above, South African firms could use the results of this study to provide guidance on methods of working capital management policies in times of crisis and financial distress. This research on the impact of the global financial crisis on the working capital management practices of firms would be useful to both policy makers and banks. These stakeholders can gain an understanding to create mechanisms and tools that may be used to aid firms during times of financial distress. Banks can evaluate the working capital practices of firms in order to evaluate a firms operating liquidity in order to determine if firms would qualify for financial assistance in the form of loans and whether these firms would meet short-term obligations to pay back these loans. Ramiah et al. (2014), also found that banks and legal advisers evaluate firms working capital management practices during periods of financial distress. This can further limit the economic damage of another crisis.

As evident from prior research, small inefficiencies in working capital management can go unnoticed. These small inefficiencies are amplified during times of crisis, which can impact a firm's ability to continue operating, which can result in bankruptcy of a firm. Firms need to pay attention to and manage these small inefficiencies, to ensure that a firm can remain profitable and survive during crisis periods.

1.5.0.0 Research Question

What was the impact, if any, of the global financial crisis on working capital management practices for South African listed firms?

1.6.0.0 Assumptions & Limitations

1.6.1.0 Assumptions

This study assumes that the financial crisis period in South Africa would have been the same as the financial crisis period in foreign countries. This is because South Africa is an open economy that is reliant on foreign trade and investment (Baxter, 2009). 2007 to 2009 represents the crisis period and this period is confirmed by a study conducted by Erkens, Hung, and Matos (2012). According to Padayachee (2016), South Africa still felt the effects

on the global financial crisis through 2009. As a result, this study incorporated 2009 as part of the crisis period. Oseifuah (2018), also makes use of the period 2007 to 2009 as the global financial crisis period. Frankel and Saravelos (2012), further states that the global financial crisis flowed into 2009. Furthermore, no prior research to the researcher's knowledge clearly illustrates the exact period when the global financial crisis occurred in South Africa.

1.6.2.0 Limitations

The study only focuses on firms listed on the Johannesburg Stock Exchange in South Africa; therefore, the findings cannot be generalized to all companies in South Africa. Only firms listed on the Johannesburg Stock Exchange are used due to the inability to obtain financial information for private and unlisted companies. The fact that only one crisis period is used (2007 to 2009), creates a limitation. By using only one crisis period, the results cannot be compared to other crisis periods to create some form of comparison. Therefore, the findings from the global financial crisis cannot be generalized to other crisis periods which occurred. The study did not incorporate a regression by sector, but there is an analysis of the composition of working capital components by sector within chapter IV which details the descriptive statistics. Further limitations include the use of data analysis based on annual data. Future research can be more precise if quarterly data is used for inventory, accounts payable and accounts receivable. Furthermore, this study excludes the study of segregated industries due to the delineation of company's results.

An unbalanced panel will be used in this study (further explanation in chapter III which details the methodology). The downside of using an unbalanced panel is that the independent variables forming part of this study will not be observed for each company for every period in question. However, the use of an unbalanced panel is better when compared to a balanced panel. This is because a balanced panel includes survivorship bias (Fitzgerald, Gottschalk, & Moffitt, 1998). Measurement proxies will be used for the estimation of explanatory variables. The findings and interpretations thereof may vary if alternative approximations are used.

1.7.0.0 Definition of terms

The following table contains the definitions of commonly used terms within the present study.

Table 1: Definitions

Term	Acronym	Definition	References
Working Capital	**WC**	Working capital is defined as a firm's current assets minus current liabilities.	(Ramiah et al., 2014; Baveld, 2012; Lamberg & Vålming, 2009)

Cash Conversion Cycle	**CCC**	The cash conversion cycle expresses the length of time it takes a firm to convert its investments in inventory to cash.	(Correia et al., 2015; Akoto, Awunyo-Vitor, & Angmor, 2013; Falope & Ajilore, 2009)
Liquidity		The term liquidity refers to ability to convert an asset into cash.	(Correia et al., 2015)
Return on Assets	**ROA**	Profit before interest and tax divided by total assets at the end of the financial year.	(Tauringana & Adjapong Afrifa, 2013; Sharma & Kumar, 2011; Falope & Ajilore, 2009; Juan García-Teruel & Martinez-Solano, 2007)
Accounts Receivable		Represents the outstanding payments from customers in respect of goods or services purchased on credit by the customer.	(Baveld, 2012; Falope & Ajilore, 2009; Mian & Smith Jr, 1992)
Inventory		This represents raw materials, finished goods and work in progress goods to be consumed in production or to be sold.	(IASB, 2017; Falope & Ajilore, 2009)
Accounts Payable		This represents the amount a firm owes suppliers in respect of goods received or services rendered, which have been invoiced to the firm, but the firm has not made any payment for such good or service.	(Baveld, 2012; Falope & Ajilore, 2009)

(Source: Authors Computation)

The balance of the paper is laid out as follows: the next segment contains the (II) “Literature Review", which will discuss evidence from prior studies on working capital; trailed by the (III) "Methodology" utilised which is similar to studies performed by Nazir and Afza (2009); Deloof (2003); Juan García-Teruel and Martinez-Solano (2007) and Oseifuah (2018); which is then followed by the (IV) “Results”, which will discuss the analysis of results from the study and finally the paper will (V) “Conclude” and provide recommendations together with areas of future focus.

CHAPTER II – Background & Literature Review

The objective of this study is to investigate the significance of working capital management, which is driven by the cash conversion cycle and its components (inventory, accounts receivable and accounts payable) on profitability (return on assets) before, during and after the global financial crisis period. The review aims to determine whether the management of working capital elements changed as a result of the financial crisis. The review will further discuss previous literature on the working capital components and its relationships with profitability. Furthermore, it will investigate whether any of the working capital elements became more or less important in the determination of a firm's profits.

The literature review is structured as follows: a discussion of working capital and its components in general, followed by a discussion on the impact of the global financial crisis on liquidity and credit risk, followed by a discussion of the trade-off between liquidity and profitability with the creation of value for shareholders, and finally a review into prior literature and the development of hypotheses for the present study.

2.1.0.0 Working Capital

The management of working capital is incorporated within a firms strategy and alludes to how the firm will utilize its current assets and current liabilities to operate the firm in an efficient manner (Correia et al., 2015; Sharma & Kumar, 2011). Working capital is the sum of accounts receivable and inventories (Hill, Kelly, & Highfield, 2010). Furthermore, to get to net working capital, the above working capital components are reduced by current liabilities, such as accounts payable.

Net Working Capital = Current Assets – Current Liabilities

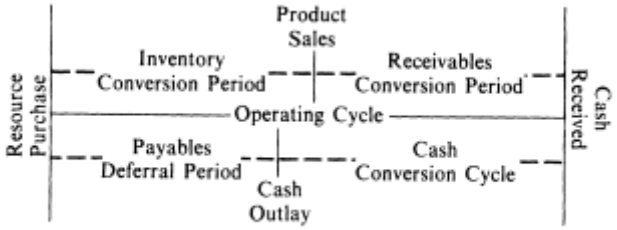
Both currents assets and current liabilities are found in the statement of financial position of various companies. Current assets generally comprise of accounts receivable, inventories, prepaid expenses, cash and cash equivalents and short-term investments (IASB, 2017). Current assets are expected to be converted into cash within a period of 12 months (IASB, 2017; Raheman & Nasr, 2007). Current liabilities generally comprise of accounts payable, short-term debt and accrued liabilities. Current liabilities are expected to be settled within 12 months (IASB, 2017).

With reference to table 7 in chapter IV which details the descriptive statistics, the various percentages within the table indicate the different levels of components of current assets and

current liabilities and what percentage of them form part of total assets and total liabilities. As evidenced from the percentages in table 7, working capital management is crucial for manufacturing, trading and distribution firms (within the Consumer Goods, Consumer Services, Technological and Telecommunications industries). These working capital components directly affect the profitability and liquidity of firms (Baveld, 2012). This is because these firms total asset balances comprise of almost a significant amount of working capital component balances (Raheman & Nasr, 2007).

Cash Conversion Cycle = Inventory Days + Accounts Receivable Days - Accounts Payable Days

Figure 3: The Cash Conversion Cycle



(Source: Richards and Laughlin (1980))

Figure 3 illustrates the process of the cash conversion cycle. The cycle commences where firms purchase raw materials on credit. Firms subsequently convert these raw materials to inventory in order to create finished products. Firms then sell this inventory to customers on credit or for cash. Where customers elect the credit alternative, firms provide customers with a trade credit policy to ensure that customers pay within a specific time frame. Firms generally negotiate credit terms with their suppliers of raw materials to ensure that they have time to collect cash from customers and then subsequently pay for such outstanding debts with suppliers. This is to ensure that there is good management of cash flows for firms.

Therefore, the cash conversion cycle indicates the period of time it takes a firm to convert its investment in inventory into cash (Correia et al., 2015; Akoto et al., 2013; Falope & Ajilore, 2009).

Firms who have a longer time lag within their cash conversion cycle require greater investments in working capital, which results in an increase in the financing needs required by these firms. Having a longer cash conversion cycle may have the ability to increase firm profitability given the increase in sales on credit. However, the lengthened cash conversion cycle may potentially impact corporate profitability in a negative manner (Deloof, 2003).

Mismanagement of a firms working capital can lead to financial distress and the firm may face bankruptcy (Ramiah et al., 2014). Given this greater investment, firms incur higher interest expenses which may result in firms facing risks such as default risk (Charitou et al., 2010). The higher interest expense also reduces a firm's profitability. According to Hill et al. (2010), working capital requirements of a firm depend on a number of factors: financial distress, internal and external financing costs, negotiating ability and capital market access. Financial distress costs include bankruptcy costs, costs of converting illiquid assets and having a higher cost of capital.

Maintaining current assets and current liabilities at optimal levels will ensure that firms will have sufficient cash flows to meet their short-term obligations (Akoto et al., 2013). Having an efficient working capital cycle means that firms reduce the risk of default payments of short-term obligations and they subsequently minimize the changes in the excessive levels of working capital (Eljelly, 2004). There are distinctive working capital approaches, in particular: moderate, aggressive and conservative. Firms opt a policy based on their respective risk appetites.

A conservative approach follows an investment and financing based on anticipated movements, which entails that it has lower risk associated with it when compared to an aggressive approach (Correia et al., 2015). The company seeks to finance all or a portion of temporary current assets with long-term funding (Salawu, 2007). The cost of capital is higher for a conservative policy due to long-term financing; however, this policy postpones the principal payment of the debt. The conservative policy positions a higher fraction of capital in liquid assets, however this policy also foregoes profitability (generate lower returns) (Weinraub & Visscher, 1998). This implies that there may be opportunity cost or explicit financing costs (Hill et al., 2010).

Firms are subject to both seasonal and cyclical fluctuations which requires different levels of permanent and temporary assets (Salawu, 2007). Aggressive policies ignore the matching concept and is far riskier, however, this strategy brings about higher yields (return) since some portion of permanent current assets are financed by the lower cost of short-term debt (Salawu, 2007). Aggressive policies minimize the capital invested in current assets in comparison to long-term investments. Even though the aggressive policy lowers the capital costs due to the short-term financing, the short-term liquidity risk is still created (Mansoori & Muhammad, 2012; Weinraub & Visscher, 1998). This policy aims to minimize current assets through firms management and active control procedures (Wanguu, 2015).

Where a firm adopts an aggressive policy and inventory levels are reduced to a low level, the firm faces the risk of losses in sales due to the inability to have sufficient inventory on hand to

meet customer demands (Wang, 2002). A constrictive trade credit policy may also impact sales (by reducing sales), due to customers requiring trade credit (Sharma & Kumar, 2011). The following authors Jose, Lancaster, and Stevens (1996); Shin and Soenen (1998); Deloof (2003), Wang (2002); Raheman and Nasr (2007) and Lazaridis and Tryfonidis (2006) found that aggressive working capital policies enhance profitability for firms within their studies. Therefore, by reducing the investment in working capital, a firm can increase their profits.

If we integrate the theory of risk and return to the above policies, generally, higher risk means higher expected returns. Firms who have a high liquidity position of working capital may face a lower risk and subsequently record a lower profit. On the contrary, firms who have a reduced liquidity position in working capital, face greater risks and therefore, record higher profits. Therefore, firms must balance the factors of risk and return in the determination and adoption of a working capital policy (Zariyawati, Annuar, Taufiq, & Rahim, 2009).

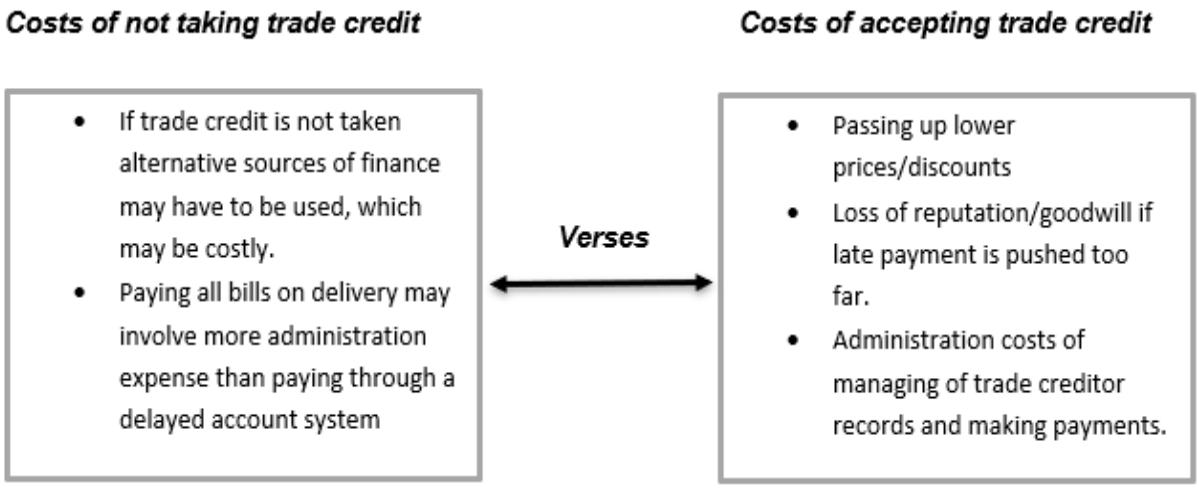
2.1.1.0 Accounts Payable

Banks and companies were adversely impacted by the global financial crisis. Firms faced financial constraints due to their inability to access external sources of financial resources from capital markets, such as short-term loans. The volatility and financial constraints on firms were driven by the restrictions imposed by banks on short-terms loans (Baveld, 2012). Given the external financing restrictions, firms relied more on trade credit from suppliers during the period of the crisis. According to Coulibaly et al. (2013), firms who relied more on trade credit, posted better sales during this period. Therefore, firms with more liquid assets and less exposure to external financing faced a smaller reduction in sales as opposed to the contrary. Coulibaly et al. (2013) also found that financially distressed firms received more credit during the financial crisis which relieved them from the credit crunch which resulted in the posting of better sales for these firms. This finding is consistent with the literature on trade credit and bank channels. Mainly large firms that had high cash reserves would extend credit to their customers (Baveld, 2012; Yang, 2011; Schwartz, 1974; Brechling & Lipsey, 1963; Meltzer, 1960). Therefore, these larger firms are seen as financial intermediaries during this period.

Current liabilities are seen as one of the crucial sources of external financing for firms (Petersen & Rajan, 1997). Account payables represents a form of short-term financing which the firm takes on for acquisition of goods on credit. Firms in both emerging and developed economies make use of accounts payable as an alternative source of financing as opposed to bank loans (Carbo-Valverde, Rodriguez-Fernandez, & Udell, 2016). Firms purchase goods on credit which results in a form of liability for them to pay for the purchases over a negotiated period of time (Hampton & Wagner, 1989). Firms can improve the manner in which it manages its working capital by extending the period taken to pay its creditors (Correia et al., 2015).

Postponing installments to creditors can be a flexible and economical tool of financing for the firm. However, the postponement of payments can be expensive if the firm is provided with a discount for early settlement (Raheman & Nasr, 2007; Deloof, 2003). In such a circumstance, firms are faced with a trade-off between the aforementioned benefits (Raheman & Nasr, 2007). The trade-off between trade credit is displayed within figure 4 below.

Figure 4: The Credit Trade-off



(Source: Arnold (2008): 549)

Therefore, the study hypothesizes as follows:

H_1: Accounts payable days was significantly impacted by the financial crisis.

Accounts payable days is expected to increase for periods post the financial crisis relative to periods before the crisis as economic conditions would have strengthened, making it more favorable for firms to access trade credit financing with lower costs of financing associated with these borrowings.

2.1.2.0 Inventory

According to Correia et al. (2015), firms focused on reducing their investment in inventory during the financial crisis period in order to ensure that working capital levels reflected economic reality. Given the reduction in the investment in inventory, firms managed to increase its cash flows. The financial crisis also caused sales to reduce given the cash flow constraints that some firms faced, which led to supplier firms facing a buildup of inventory. Furthermore, given the reduction of sales during this period, firms had to reduce its production of inventories and cut back on purchasing materials and products on credit.

Firms aim to hold and produce sufficient stock to ensure that they meet sales demands. Furthermore, they also aim to minimize the costs associated with storing and financing such inventory (Hampton & Wagner, 1989). Inventory conversion period can be efficiently managed where firms reduce the time between the acquisition of raw materials and the date the inventory is sold. Firms reduce the risk of having a stock-out where they hold inventory items in excess (Gill, Biger, & Mathur, 2010; Raheman & Nasr, 2007; Deloof, 2003). Firms can increase their profitability by minimizing inventory holding costs, which includes insurance and storage costs (Tauringana & Adjapong Afrifa, 2013). According to Carpenter, Fazzari, Petersen, Kashyap, and Friedman (1994), changes in inventory management can be a source of funding, due to the connection between internal financing and inventory.

Therefore, the study hypothesizes as follows:

H_2: Inventory days was significantly impacted by the financial crisis.

Inventory days would be expected to reduce for periods post the financial crisis as firms would want to adopt efficient inventory management processes, due to the strengthened economic conditions. Furthermore, inventory turnover is expected to increase. Customers would purchase more due to the favorable economic conditions post the financial crisis, thus increasing inventory turnover.

2.1.3.0 Accounts Receivable

According to Correia et al. (2015), firms focused on reducing their investment in accounts receivable during the financial crisis period in order to ensure that working capital levels reflected economic reality for the tough economic conditions associated with the high costs of trade credit. Given the reduction in the investment in both accounts receivable and inventory as mentioned above, firms managed to increase its cash flows. According to Ramiah et al. (2014), Australian firms evaluated the default risk surrounding their debtors before making any further sales on credit during the financial crisis. Furthermore, firms underwent regular credit worthiness assessments. To avoid bad debts, firms followed up late-paying customers more promptly and hired collection agencies to reduce outstanding sales. Greater cash discounts and the management of receivable days were shortened which resulted in a reduction of the cash conversion cycle and accounts receivable collection period (Ramiah et al., 2014).

Accounts receivables is a form of short-term finance given to customers. Customers are given a period to pay off their debts for the acquisition of goods or services. Where a firm accounts receivable balance continues to increase, the firm's profitability increases, however they also face the risk of customer default. This represents an opportunity cost between high profitability and reduced liquidity (given the lack of cash inflows). Firms need to follow some form of credit

administration process for the granting of credit to customers, this includes: assessment of the debtors credit risk, the drawing up and assessment of credit terms, the trade credit must be financed until maturity, the receivable must be collected and the probability of default risk must be evaluated (Mian & Smith Jr, 1992).

When a firm sets a trade credit policy, they need to consider the following factors:

- the policy should consider the trade-off between sales, profits and liquidity,
- administrative costs associated with the debtors,
- risk of default associated with the debtor, and
- the total investment required in total debt collection management (Berry & Jarvis, 2005).

Reducing the period it takes to collect cash from a debtor has the ability to increase profitability (Oseifuah, 2018). The creation and implementation of a firm's credit collection policy has an impact on the firms accounts receivable balance. The use of a liberal credit policy, increases a firm's profitability, however, firms forego liquidity due to the lengthened passage of time to collect cash from customers (Falope & Ajilore, 2009). The granting of trade credit financing to customers allows the customer to verify product and service quality before paying for such good or service (Smith, 1987). Therefore, the information asymmetry is reduced between the seller and the buyer (Baños-Caballero et al., 2012).

Therefore, the study hypothesizes as follows:

H_3: Accounts receivable days was significantly impacted by the financial crisis.

Accounts receivable days would be expected to decrease for the period post the financial crisis as economic conditions strengthened post the financial crisis. Customers faced lower costs of financial distress and the probability of default is expected to reduce given the favorable economic conditions. Given the lower risk, customers would be expected to make timely payments within the negotiated trade credit policy terms.

2.2.0.0 Review of Previous Literature

Shin and Soenen (1998), studied the impact of the net-trade cycle on profitability for 58,985 firm years for the period 1975-1994. The net-trade cycle represented the cash conversion cycle, but the three components that made up the cash conversion cycle were all expressed as a percentage of sales. The authors substantiated this reasoning by stating that the net-trade cycle is an easy device to estimate for additional financing needs with regard to working capital expressed as a function of the projected sales growth (Shin & Soenen, 1998). Findings indicated that there was a strong negative relationship between the length of a firm's net-trade

cycle and its profitability. Shin and Soenen (1998) further suggested that firm managers can create shareholder value by reducing a firm's net-trade cycle.

Deloof (2003) used the cash conversion cycle as a measure of working capital management to investigate the relationship between working capital management and profitability for a sample of 1009 Belgian non-financial firms for the period 1992-1996. He found a significant negative relationship between gross operating income (profitability) and accounts receivable days, inventory days and accounts payable days. He further suggested that managers can create value for their shareholders by reducing accounts receivable days and inventory days to a reasonable minimum (Deloof, 2003).

Lazaridis and Tryfonidis (2006), studied the impact of profitability on the cash conversion cycle for 131 firms listed on the Athens Stock Exchange for the period 2001-2004. Findings indicated that there was a negative relationship between profitability and the cash conversion cycle (Lazaridis & Tryfonidis, 2006). Therefore, this suggests that by reducing the cash conversion cycle, firms can increase its profitability.

Padachi (2006), analyzed working capital management practices and its impact on profitability for a sample of 58 small manufacturing companies in Mauritius for the period 1998-2003. The regression results show that an increased investment in inventories and receivables reduces a firm's profitability.

Raheman and Nasr (2007), examined the impact of working capital management on profitability and liquidity of 94 firms listed on the Karachi Stock Exchange for a period of 6 years from 1999–2004. The results of the study show that there was a strong negative relationship between components of the working capital management and profitability of a firm. Therefore, as the cash conversion cycle increases firms have a reduction in profitability. Furthermore, the study found that size has a positive relationship with firm profitability, and debt had a significant negative relationship with profitability.

Juan García-Teruel and Martinez-Solano (2007), examined the effect of working capital management on profitability for small and medium sized Spanish firms for a panel of 8872 small medium-sized enterprises for the period 1996-2002. By employment of panel data regression methodology, the authors revealed that managers can create value by reducing the firm's inventory and accounts receivable days. Therefore, by shortening the cash conversion cycle, a firm can increase its profitability.

Samiloglu and Demirgunes (2008), studied the impact of working capital management on firm profitability for firms listed on the Istanbul Stock Exchange for the period 1998-2007. The findings suggest that accounts receivables days, inventory days and leverage all have a

negative relationship with profitability. Whereas, growth in sales has a positive relationship with firm profitability. However, the cash conversion cycle has no significant relationship with firm profitability.

Zariyawati et al. (2009), investigated the relationship between the cash conversion cycle and profitability for Malaysian firms for the period 1996-2006. The study used panel data for 1628 firm-years for the period of 1996-2006. The Results of this study found that the cash conversion cycle has a significant negative relationship firm profitability. This is consistent with previous studies by Deloof (2003); Shin and Soenen (1998) and Raheman and Nasr (2007).

Nazir and Afza (2009) investigated the relationship between the aggressive and conservative working capital management and financing polices and its impact on profitability for 204 Pakistani firms on the Karachi Stock Exchange for the period 1998-2005 with the use of panel data regression models. The study found a negative relationship between the profitability and degree of aggressiveness of working capital investment and financing policies. Firms who followed aggressive working capital policies, reported negative returns.

Charitou et al. (2010) investigated the effect of working capital management on firm's financial performance for firms listed on the Cyprus Stock Exchange for the period 1998-2007. The results indicated that the cash conversion cycle and all its components have a relationship with firm profitability. Inventory days, accounts payable days, accounts receivable days and the cash conversion cycle as a whole all have inverse relationships with firm profitability.

Karaduman, Akbas, Ozsozgun, and Durer (2010), studied the effects of working capital management on the profitability for companies selected on the Istanbul Stock Exchange for the period 2005-2008 by using panel data. Findings suggested that firms can increase profitability (return on assets) by reducing the number of days in inventory, accounts receivable and accounts payable. Therefore, by reducing the cash conversion cycle, firms can increase profitability.

Gill et al. (2010) investigate the impact of the cash conversion cycle on profitability for a sample of 88 American firms listed on New York Stock Exchange for a period of 3 years from 2005 to 2007. Findings indicated that there was a significant relationship between the cash conversion cycle and profitability of a firm. They suggest that managers can create profits for their companies by efficiently managing the cash conversion cycle and by keeping accounts receivables at an optimal level, by reducing the credit period granted to their customers. Therefore, accounts receivable days has an inverse relationship with profitability. Furthermore, both accounts payable days and inventory days has no relationship with profitability.

Sharma and Kumar (2011) investigated the relationship between profitability and the effects of working capital management for a sample of 263 non-financial firms listed on the Bombay Stock Exchange for the period 2000-2008. Their findings differ from various international studies on working capital management. Results indicate that Indian firms exhibit a positive relationship between profitability and working capital management. The study further reveals that inventory days and accounts payable days have negative relationships with firm profitability, whereas accounts receivable days and the cash conversion cycle both show positive relationships with firm profitability. These findings deviate from finance literature and from the above findings.

Napompech (2012), investigated the impact of working capital management on profitability for a sample of 255 companies listed on the Thailand Stock Exchange for the period 2007-2009. The findings indicated that there was a negative relationship for both inventory days and accounts receivable days against profitability of a firm. Therefore, firm profitability can increase where the cash conversion cycle, inventory days and accounts receivable days are reduced. This suggests that, firms should diminish the period it takes to produce inventory and diminish the time it takes to source the funds back from debtors. This study also found an inverse relationship between accounts payable days and profitability, which indicates taking longer to pay their suppliers may result in reduced profitability.

Alavinasab and Davoudi (2013), examined the relationship between working capital management and profitability for 147 firms listed on the Tehran stock exchange for the period 2005-2009. Multivariate regression and Pearson correlation were used to test the studies relevant hypothesis. The findings suggested that there was a significant negative relationship between a firm's cash conversion cycle and its profitability (return on assets) and there was also significant negative relationship between a firm's cash conversion cycle and return on equity.

Tauringana and Adjapong Afrifa (2013) investigated working capital management and impact on profitability for 133 SME firms listed on the London Stock Exchange for a period of 5 years from 2005-2009. The results from the panel data regression analysis indicated that accounts payable days and accounts receivable days are important for the profitability, whereas, inventory days and the cash conversion cycle have no relationship with profitability.

Oseifuah and Gyekye (2017), studied the impact of working capital management components and its impact of profitability for 75 non-financial firms listed on the Johannesburg Stock Exchange for a 10-year period from 2003-2012. The study made use of panel data methodology. The study exhibited that the cash conversion cycle had a negative relationship with firm profitability. Furthermore, both accounts receivable days and inventory days had a

negative relationship with firm profitability, whereas, accounts payable days had a positive relationship with firm profitability.

Baveld (2012), studied the impact of the financial crisis on profitability and accounts receivable for firms listed in Netherlands. The study used two periods to assess the aforementioned relationship: crisis and non-crisis periods. The outcomes of the study revealed that there was a significant relationship between accounts receivables and profitability for non-crisis periods. The results further indicate that during crisis periods, firms do not need to change its working capital management policy with regards to inventory and accounts payable if their goal is to increase profits.

Lamberg and Vålming (2009) evaluated the impact of the financial crisis on the liquidity practices for firms listed on Stockholm's NASDAQ OMX stock exchange. Results suggested that the use of liquidity forecasting and short-term financing during crisis had a positive impact on the financial performance of firms. The outcomes of the study also showed that the working capital ratio is commonly used as a measure of liquidity during crisis periods. Lastly, results suggested that deferral metrics increased for both working capital and accounts payable during periods of crisis.

de Rozari, Sudarma, Indiastuti, and Febrian (2015), evaluated the relationship between the cash conversion cycle and its components on both profitability and value of a firm value for both crisis and non-crisis periods for firms listed on the Indonesia Stock Exchange for the period 2005-2013. The results suggest that there are noticeable differences between the relationship of the cash conversion cycle and its components on firm profitability during periods of a crisis. Lastly, the study found relationships between the cash conversion cycle and its components on firm value for the aforementioned periods of the study.

Haron and Nomran (2016), investigated the determinants of working capital management for a sample of 57 Malaysian firms in three different periods. Before the financial crisis (2002-2006), during the financial crisis (2007- 2008) and after the financial crisis (2009-2012). The variables investigated were as follows: profitability, debt, sales growth, free cash flow, firm size and liquidity. Findings indicated that four out of the six explanatory variables have significant relationships with working capital management before the crisis. These variables were: profitability, debt; sales growth and firm size. Furthermore, these same variables have significant relationships with working capital management for periods after the global financial crisis. Therefore, firms should pay attention to profitability, debt; sales growth and firm size during non-crisis periods. On the contrary, further investigation indicated that profitability, firm size and free cash flow significantly impacted working capital management during the global financial crisis.

Daisuke (2017), explored the relationship between firm profitability and the working capital components for both non-crisis and crisis periods. The study found that working capital levels increased during the financial crisis. However, the level of working capital requirements reduced toward the end of 2009. The level then smoothened to reach its pre-crisis level requirements. The study further reported that, the adjustment speed in working capital requirements slowed down in late 2008 and early 2009 which was slower than other periods. This means that firms faced some form of financial constraints when adjusting their working capital requirements during the crisis period. Finally, the study found a negative relationship between working capital requirements and profitability of a firm, and it was larger during the crisis. This suggests that firms struggled to reduce its working capital requirements during the crisis period.

Oseifuah (2018), used panel data regression methods to analyze the effect of the global financial crisis on working capital management and profitability for a sample of 75 non-financial firms listed on the Johannesburg Stock Exchange for a ten-year period from 2003-2012. Findings suggested that there was only a significant negative relationship between firm profitability and accounts receivable days during the period of the crisis. During this crisis period, the relationships between profitability and both the cash conversion cycle and inventory days were negative but insignificant. The relationship between accounts payable days and profitability was positive but also insignificant.

Therefore, the study hypothesizes as follows:

H_4: The cash conversion cycle was significantly impacted by the financial crisis.

Firms can obtain a sustainable competitive advantage by using firm resources efficiently to reduce the cash conversion cycle to an optimal level (Mathuva, 2010). Therefore, the three components of the cash conversion cycle must be managed in ways which maximize profitability and increase firm growth (Lazaridis & Tryfonidis, 2006). The cash conversion cycle would be expected to reduce, given the strengthen economic conditions post the financial crisis. With the increased accounts payable days, coupled with both inventory days and accounts receivable days being reduced post the crisis, the net effect on the cash conversion cycle is expected to decrease.

2.3.0.0 Liquidity, Profitability & Value Creation

The management of working capital influences both liquidity and profitability of a firm (Deloof, 2003; Shin & Soenen, 1998). Therefore, the pursuance of either liquidity or profitability will negatively impact each other. As mentioned earlier, there is a trade-off between both liquidity and profitability. This trade-off was expressed by Smith and Begemann (1997) as the

pursuance of high yield returns results in an adverse impact on a firms liquidity. Whereas, the pursuance of a higher liquidity position results diluted returns (Smith & Begemann, 1997).

The movement in the cash conversion cycle impacts a firms liquidity, therefore, an increase in the cash conversion cycle means that a firms liquidity position would decrease (Moss & Stine, 1993). Where working capital is managed efficiently, firms can increase corporate profitability (Gill et al., 2010). Managers need to differentiate between the shortening of the cash conversion cycle and the efficient management of working capital. Cash conversion cycles which are too short, can adversely impact profitability. For example, where a firm reduces the payment period for debtors, this new policy may have an adverse impact on the firm as customers would not be attracted by the shortened payment period. This change may consequently have an impact on firm sales which can cause a reduction in firm profitability (Deloof, 2003).

Value is created for the firm and its shareholders when working capital is managed effectively and efficiently (Gill et al., 2010; Charitou et al., 2010; Shin & Soenen, 1998). Managers can maximize profitability by managing the firms' cash conversion cycle at an optimal level (Deloof, 2003). Reducing the cash conversion cycle has the ability to create value for a firm (Ramiah et al., 2014).

2.4.0.0 Liquidity & Credit Risk

Liquidity risk refers to the inability of a firm to convert a current asset to cash within a short-term period (Correia et al., 2015). Working capital is indicative of a firms liquidity position, which is defined as the adequacy of cash resources for meeting a firm's obligations (Alavinasab & Davoudi, 2013). According to Ramiah et al. (2014), firms faced liquidity issues during the period of the crisis. Customers were exposed to financial and economic distress costs, which caused them to delay payments to firms. Given these financial constraints during the crisis, debtors defaulted on payments. This resulted in firms facing cash flow issues, which deteriorated its liquidity positions. Furthermore, given the reduction in sales during the crisis, firms faced a buildup of inventory which further reduced their liquidity position, given that inventory was tied up in the current asset balance.

Interest rates, economic growth, foreign exchange rate and the inflation rate are the four key exogenous (external) factors influencing working capital requirements of a sample of Johannesburg Stock Exchange listed firms in South Africa (Oseifuah, 2016). During periods of crisis firms should transact with firms with high credit ratings (Ramiah et al., 2014). As mentioned before, the global financial crisis resulted in the downgrading of firm's credit ratings, which lead to firms becoming insolvent or facing financial distress.

Banks would only provide loans to firms if they gained comfort over a firm's credit risk. Australian firms would enhance their credit control policies by: performing regular credit worthiness evaluations and using bank guarantees (Ramiah et al., 2014). Working capital management can act as a hedging mechanism against harsh credit conditions (Kesimli & Günay, 2011). Where firms find the optimal balance in setting their working capital policies, they can offset the effects of financial distress, especially the impact of trade credit restrictions (Ramiah et al., 2014).

The harsh financial conditions imposed by financial institutions during the global financial crisis contributed towards the reduction in sales for all firms (Coulibaly et al., 2013). However, firms who had a greater amount of liquid assets and less subjection to external finance, never faced high sales reductions (Coulibaly et al., 2013). Financially vulnerable firms had better sales as they substituted all other forms of financing with used trade credit financing from suppliers (Coulibaly et al., 2013). According to Kesimli and Günay (2011), firms come out stronger after a recession period when these firms adopted optimal working capital management practices during these times of recession. Firms can soften the blow of credit crunch and reduced access to external financing when working capital is managed to an optimal level (Kesimli & Günay, 2011). Liquidity is seen as an issue during times of crisis due to the firm's inability to collect cash from creditors given the increased level of default risk. Customers were exposed to financial and economic distress costs, which caused them to delay payments to firms. Given these financial constraints during the crisis, debtors defaulted on payment.

Table 2: Findings by various authors and the significant relationship (positive or negative) between the independent variables and profitability

	Independent Variables			
Authors	**INVD**	**ARD**	**APD**	**CCC**
Shin and Soenen (1998)	**N**	**N**	**N**	**N**
Deloof (2003)	**N**	**N**	**N**	**N**
Lazaridis and Tryfonidis (2006)	**N**	**N**	**N**	**N**
Padachi (2006)	**N**	**N**	**-**	**-**
Raheman and Nasr (2007)	**N**	**N**	**N**	**N**
Juan García-Teruel and Martinez-Solano (2007)	**N**	**N**	**N**	**N**
Samiloglu and Demirgunes (2008)	**N**	**N**	**-**	**-**
Zariyawati et al. (2009)	**N**	**N**	**N**	**N**
Falope and Ajilore (2009)	**N**	**N**	**N**	**-**
Gill et al. (2010)	**-**	**N**	**-**	**P**
Charitou et al. (2010)	**N**	**N**	**N**	**N**
Karaduman, Akbas, Caliskan, and Durer (2011)	**N**	**N**	**N**	**N**
Sharma and Kumar (2011)	**N**	**P**	**N**	**P**

Napompech (2012)	**N**	**N**	**N**	**-**
Alavinasab and Davoudi (2013)	**-**	**-**	**-**	**N**
Tauringana and Adjapong Afrifa (2013)	**-**	**N**	**N**	**-**
Mathuva (2010)	**P**	**N**	**P**	**-**
Oseifuah and Gyekye (2017)	**N**	**N**	**P**	**N**

(Source: Author's Computation)

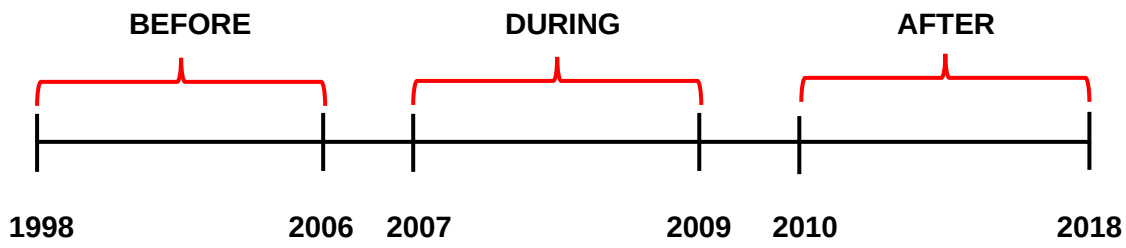
INVD: Inventory Days, **ARD**: Accounts Receivable Days, **APD**: Accounts Payable Days, **CCC**: Cash Conversion Cycle, **P**: Positive Relationship, **N**: Negative Relationship

CHAPTER III – Methodology

The aim of quantitative research is to establish, confirm, or validate relationships (Leedy & Ormrod, 2015). This study aims to investigate how, if at all, working capital management practices changed after the global financial crisis by evaluating the impact of firm profitability on the components of the cash conversion cycle. Therefore, this study follows a quantitative research methodology with the use of a panel regression analysis.

3.1.0.0 Sample and Data

The purpose of this study is to examine the effects of the financial crisis on the management of working capital. This study will make use of panel data over a twenty-one-year period, grouped as follows in the timeline below.



For the purposes of this study, the population are the firms in South Africa. The sample are the non-financial firms listed on the Johannesburg Stock Exchange in South Africa. If firms are missing data for any year over the twenty-one-year period, those respective firms will be excluded for that respective year. Therefore, an unbalanced panel is used to carry out this study. The use of a unbalanced panel eliminates survivorship biasness (Fitzgerald, Gottschalk, & Moffitt, 1998).

The data required for this study was obtained from the IRESS Expert database. The data collected was used to calculate certain financial ratios for the years 1998 to 2018 for the firms forming part of the sample. These ratios were used for the respective regression formulae. The data obtained from IRESS Expert was stored in a Microsoft Excel 2010 spreadsheet and were used to calculate the required ratios. In addition to this, the statistical analysis was completed by an econometrician in EViews 10.

Table 3 on the next page splits the firms into various industries, and it shows that the total sample size for the study is 384 firms.

Table 3: Firms listed and delisted on the Johannesburg Stock Exchange

No.	Industry	No. of firms	Percentage Population
1	Industrials	117	30.47%
2	Consumer Services	82	21.35%
3	Basic Materials	59	15.36%
4	Consumer Goods	53	13.80%
5	Technology	44	11.46%
6	Health care	15	3.91%
7	Telecommunications	9	2.34%
8	Oil and Gas	5	1.30%
	Total	**384**	**100%**

(Source: Authors Computation)

3.2.0.0 Model and Data Analysis

This study makes use of a variety of years (twenty-one-year period) and many firms (384 firms). Therefore, this is a mixture of both time series and cross-sectional data. Panel data accounts for the combination of both time series and cross-sectional data. It considers a larger number of data points whilst increasing the degrees of freedom and in effect it also reduces the collinearity among explanatory variables. This improves the efficiency of econometric estimates. Panel data makes use of information relating to intertemporal dynamics and the individuality of the entities being investigated, therefore, the study can control for the effects of missing or unobserved variables (Hsiao, 2014, 2007, 1985).

This study evaluates the effects of the financial crisis on key working capital management variables for South African listed firms.

The sample will be made up of panel data and therefore, a panel regression model will be used to perform this study. This model can concurrently account for cross-sectional data and time-series data (Baltagi, 2005). Panel regression models are commonly used in previous working capital management studies (Oseifuah, 2018; Oseifuah & Gyekye, 2017; Daisuke, 2017; de Rozari et al., 2015; Tauringana & Adjapong Afrifa, 2013; Mathuva, 2010; Karaduman et al., 2010; Zariyawati et al., 2009; Nazir & Afza, 2009; Lamberg & Vålming, 2009). The

present differs from Oseifuah (2018) as it expands and updates the sample of firms as well as uses panel data regression techniques, which add to the validity and reliability of the study. Furthermore, given the current economic climate that the world is facing due to the Covid-19 pandemic, the increase in both the study period and the number of firms within the current study will provide a better comparison for firms facing working capital management issues given this economic crisis.

Heteroscedasticity refers to the unequal variance observed across the independent variable and is generally associated with cross-sectional data (Gujarati & Porter, 2010). Where heteroscedasticity is detected, the study will make use of robust estimators of the covariance matrix allow for heteroscedasticity (Croissant & Millo, 2008). This study analyzed the panel data following three different approaches, which were: independently pooled panels, fixed effect and random effects. For the analysis, pooled panels, random effects and fixed effects models were used together with clusters in order to create standard error estimates that will consider disturbances that exhibit heteroscedasticity. The following tests can be used to test for the presence of heteroscedasticity: Breusch-Pagan, Park test, Glejser test, White's general heteroscedasticity test and Spearman's rank correlation test. Autocorrelation is generally associated with time series data and refers to correlation between members of series of observations ordered in time or space; however, it can occur in cross sectional data (this can be referred to as spatial correlation). The following tests can be used for the detection of autocorrelation: the Hausman test, Durbin-Watson *d* test, Cochrane-Orcutt iterative procedure, and the Cochrane-Orcutt two-step method (Gujarati & Porter, 2010). The current study made use of both the Hausman and Durbin-Watson *d* test.

The results have been presented from panel data estimation of the effects of alternative measures of working capital management: number of inventory days, number of accounts receivable days, number of accounts payable days and the cash conversion cycle respectively on profitability for listed firms in South Africa. The use of estimation models from panel data requires the user to determine if there is a correlation between the unobservable heterogeneity of each firm and the explanatory variables of the model. The null hypothesis of this test is that there is no autocorrelation. If correlation exists, consistent estimation by means of the within-group estimator will be used. Otherwise, random effects (a more efficient estimator) can be achieved by estimation. The Hausman test was used to determine if the effects are fixed or random (Hausman, 1978). Where the null hypothesis is rejected, this means that autocorrelation is present, and the effects are fixed. Therefore, fixed effects will be used for statistical inference in this case. The model is then estimated by employing the use of the Hausman test. If the null hypothesis is accepted, the study will employ the use of random

effects (Hausman, 1978). Both fixed effects and random effects models were used in this study. The tables and results will be discussed in the next section of this report.

The present study used a lagged dependent variable in order to correct autocorrelation, as the lagged dependent variable within the panel data serves as a catch up mechanism which accounts for the effects of omitted variables varying over time (Vural, Sökmen, & Çetenak, 2012). Lagged dependent variables provide robust estimates of the effects of independent variables (Wilkins, 2018). The lagged dependent variable also accounts for potential endogeneity problems. Endogeneity refers to correlation between the explanatory variables and the error term of a function (Roberts & Whited, 2013). Other working capital studies that have had endogeneity issues include: Juan García-Teruel and Martinez-Solano (2007), Baños-Caballero et al. (2012) and Pais and Gama (2015).

The Johannesburg Stock Exchange has divided the non-financial firms into various industrial sectors based on each firm's nature of business. Firms who were missing data due to delisting or becoming insolvent during a period, were also included in the sample. Firms that had a negative profitability measure (negative return on assets) during the study period were not removed, as the author can gain an understanding of the struggles those firms encountered during the study period. Financial firms such as firms in the financial sector, banking, finance, insurance, leasing, renting and business services were excluded from the sample given the nature of their business activities (Raheman & Nasr, 2007). To ensure accuracy of data to be collected, filters were applied. Items within the balance sheet and statement of profit or loss and other comprehensive income that indicated signs contrary to reasonable expectation were removed (Mathuva, 2010).

Influential observations whether together or individually, can evidently impact calculated values of various estimates. The removal of such observation from dataset would notably alter the estimate calculation (Chatterjee & Hadi, 1986). Cook (1977), recommends the following approaches for identifying the aforementioned observations: plots of the residuals and examination of standardized residuals. This study detected the influential observations by employing the use of the following techniques: residuals, studentized residuals, difference in Fits (DFFITS), Cook's distances, COVRATIO and Hat Matrix. The influential statistics can be found in Appendix E of the appendices.

Influential observations generally distort data and relationships of tests. The panel data software accounts for the effects of outliers by employing the use of a Lagrange Multiplier test. Significant outliers can distort results and relationships; however, the employment of the Lagrange Multiplier test can effectively identify such outliers. The Lagrange Multiplier test is based on the parameters' estimation under the null hypothesis. The computation of the

Lagrange Multiplier only requires residuals. The Lagrange Multiplier can calculate both general and individual types of outliers for the test statistics. The Lagrange Multiplier test can be used for both random effects and fixed effects models. These outliers help to amend the approach of model modification and optimization (Lyu, 2015).

To examine the effects of working capital management practices on profitability of listed firms on the Johannesburg Stock Exchange, this study employed a model that was used by prior studies (Oseifuah, 2018; Oseifuah & Gyekye, 2017; Daisuke, 2017; de Rozari et al., 2015; Tauringana & Adjapong Afrifa, 2013; Mathuva, 2010; Karaduman et al., 2010; Zariyawati et al., 2009; Nazir & Afza, 2009; Lamberg & Vålming, 2009). The model is based on the below specification:

$$Y_{it} = \alpha_1 Y_{t-1}\, \beta_0 + \beta_k X_{it} + v_{it} + \varepsilon_{it}$$

- $\mathbf{Y_{it}}$: profitability of a firm (return on assets);
- $\boldsymbol{\alpha}$: intercept;
- $\mathbf{Y_{t-1}}$: lagged dependent variable;
- $\boldsymbol{\beta_0 \beta_1}$: the regression co-efficient;
- $\mathbf{X_{it}}$: the independent variables;
- $\mathbf{v_{it}}$: the individual error component;
- $\boldsymbol{\varepsilon_{it}}$: error term;
- $\mathbf{i}$: represents firms;
- $\mathbf{t}$: represents time;
- **k**: 1, 2, 3,., n

3.3.0.0 Data & Variables

3.3.1.0 Data

The data was collected from IRESS Expert database and the data was used to calculate certain financial ratios for the years 1998 to 2018 for the firms forming part of the sample. The data collected was for 384 firms across a 21-year period. Ratios were calculated using the data from IRESS. Microsoft Excel was used to store the data and calculate the ratios. Refer to table 5 on page 37 for the precedence used for the selection of variables for the purposes of this study.

3.3.2.0 Variables

Profitability

The aim of this study is to study the impact of the financial crisis on working capital management practices. In order to do this, a regression model is run for periods before, during and after the financial crisis respectively. Return on assets is used as a dependent variable even though there are numerous studies which confirm the relationship between the components of working capital and profitability (Oseifuah, 2018; Sharma & Kumar, 2011; Gill et al., 2010; Falope & Ajilore, 2009). Return on assets was selected as the dependent variable so that the components of working capital may be analyzed in the context of their relationships with profitability.

Return on assets is a better measure when compared to gross operating profit, net operating profit and return on investment, as return on assets relates a firm's profitability to its asset base (Padachi, 2006). Return on assets is argued to be a good measure of management efficiency that is not affected by the financing structure and debt of the firm (Jose et al., 1996).

According to Opler and Titman (1994), financially distressed firms may manipulate their accounting policies, to manipulate earnings before interest and tax (EBIT) values. Therefore, return on assets can be calculated by taking a firms earnings before interest, tax, depreciation and amortization (EBITDA) recorded in the previous year and dividing it by total assets in that current year, to take into account such endogeneity issues which were mentioned before (Juan García-Teruel & Martinez-Solano, 2007). This creates a dependent variable for return on assets that is time-lagged. According to Keele and Kelly (2006), lagged dependent variables are also utilized for capturing the dynamics of politics. In a study of public opinion, for example, there are theories in which an attitude at time t is a function of that same attitude at $t-1$ as modified by new information. The lagged dependent variable captures a theory of dynamics. This therefore provides for a straightforward statistical representation of such a theory (Keele & Kelly, 2006).

Working Capital Components and Control Variables

Failure to control for certain variables could result in distorted results which could lead to the incorrect rejection and/or acceptance of hypotheses (Tauringana & Adjapong Afrifa, 2013; Bartov, Gul, & Tsui, 2000). This study draws from prior literature on working capital management to control for certain variables that are likely to have an impact on profitability. The following control variables are used within the present study: growth in sales, leverage and firm size (Charitou et al., 2010; Nazir & Afza, 2009; Deloof, 2003). Refer to table 5 on page 37 for precedents used for selection of various variables used within the study.

Table 4 on the next page outlines the various variables used within the study.

Table 4: Formulae and Precedents of variables included in the panel data regression formulae

	Variable	Acronym	Formula	Precedent
Profitability Measure	Return on Assets	**ROA**	$ROA_t = \frac{\text{EBITDA}_{t+1}}{\text{Total Assets}_t}$	(Juan García-Teruel & Martinez-Solano, 2007)
Working Capital Components	Cash Conversion Cycle	**CCC**	$\text{CCC}_t = \text{INVD}_t + \text{ARD}_t - \text{APD}_t$	(Sharma & Kumar, 2011; Raheman & Nasr, 2007; Deloof, 2003)
	Inventory Days	**INVD**	$\text{INVD}_t = \frac{\text{Inventory}_t}{\text{Cost of Sales}_t} \text{ x } 365$	
	Accounts Receivable Days	**ARD**	$\text{ARD}_t = \frac{\text{Accounts Receivable}_t}{\text{Total Sales}_t} \text{ x } 365$	
	Accounts Payable Days	**APD**	$\text{APD}_t = \frac{\text{Accounts Payable}_t}{\text{Cost of Sales}_t} \text{ x } 365$	
Control Variables	Leverage	**LEV**	$\text{LEV}_t = \frac{\text{Total Debt}_t}{\text{Total Assets}_t}$	(Sharma & Kumar, 2011; Charitou et al., 2010; Nazir & Afza, 2009; Juan García-Teruel & Martinez-Solano, 2007; Deloof, 2003)
	Size	**SZ**	$\text{SZ}_t = \text{Ln}(\text{Sales}_t)$	
	Growth in Sales	**ΔGS**	$\Delta\text{GS} = \frac{(\text{Sales}_t - \text{Sales}_{t-1})}{\text{Sales}_{t-1}}$	

(Source: Authors Computation)

Table 5: Precedence for the use of variables within the current study *(Source: Authors Computation)*

		Dependent Variables						**Independent Variables**					**Control Variables**				
Author	**Cite No.**	**ROA**	**GOP**	**NOP**	**ROI**	**ROE**	**TQ**	**ARD**	**APD**	**INVD**	**CCC**	**CR**	**SZ**	**ΔGS**	**LEV**	**CR**	**FATA**
Baveld (2012)	**27**	✓	✓					✓	✓	✓	✓		✓	✓	✓	✓	✓
Oseifuah (2018)	**1**	✓						✓	✓	✓	✓		✓		✓		
Deloof (2003)	**1787**		✓	✓				✓	✓	✓	✓		✓	✓	✓		✓
Karaduman et al. (2010)	**76**	✓						✓	✓	✓	✓		✓		✓		
Gill et al. (2010)	**609**		✓					✓	✓	✓	✓		✓				✓
Sharma and Kumar (2011)	**240**	✓						✓	✓	✓	✓		✓	✓	✓	✓	
Juan García-Teruel and Martinez-Solano (2007)	**1026**	✓						✓	✓	✓	✓		✓	✓	✓		✓
Mathuva (2010)	**458**			✓				✓	✓	✓	✓		✓		✓		✓
Napompech (2012)	**122**		✓					✓	✓	✓	✓		✓		✓		✓
Raheman and Nasr (2007)	**991**		✓					✓	✓	✓	✓	✓	✓		✓		✓
Charitou et al. (2010)	**143**	✓						✓	✓	✓	✓		✓	✓	✓		
Tauringana and Adjapong Afrifa (2013)	**111**	✓						✓	✓	✓	✓		✓		✓		
Samiloglu and Demirgunes (2008)	**322**	✓						✓	✓	✓	✓		✓	✓	✓		✓
Lazaridis and Tryfonidis (2006)	**1005**		✓					✓	✓	✓	✓		✓				✓
Akoto et al. (2013)	**112**					✓		✓	✓		✓		✓				
Mohamad and Saad (2010)	**276**	✓			✓		✓				✓	✓					
Falope and Ajilore (2009)	**308**	✓						✓	✓	✓	✓		✓	✓	✓		
Lamberg and Vålming (2009)	**17**	✓						✓	✓								
Oseifuah and Gyekye (2017)	**4**	✓						✓	✓	✓	✓		✓		✓		
Total		**11**	**6**	**2**	**1**	**1**	**1**	**17**	**17**	**15**	**17**	**2**	**16**	**7**	**13**	**2**	**9**

ROA: Return on Assets, **GOP**: Gross Operating Profit, **NOP**: Net Operating Profit, **ROI**: Return on Invested Capital, **ROE**: Return on Equity, **TQ**: Tobins Q, **ARD**: Accounts Receivable Days, **APD**: Accounts Payable Days, **INVD**: Inventory Days, **CCC**: Cash Conversion Cycle, **CR**: Current Ratio, **SZ**: Size, **LEV**: Leverage, **ΔGS**: Growth in Sales and **FATA**: Fixed Assets to Total Assets Ratio

The following authors followed similar regression approaches: Oseifuah (2018); Oseifuah and Gyekye (2017); Makori and Jagongo (2013); Juan García-Teruel and Martinez-Solano (2007) and Raheman and Nasr (2007).

Regression Formulae

The following panel data regression formulae will be used for periods before, during and after the global financial crisis to pursue the objectives of this study. Therefore, each regression will be run three times. The formulae contain the control variables and various independent variables where applicable.

Table 6: Regression formulae

Return on Assets vs the Individual components	**Model Number**
$ROA_{it} = \beta_0 + \beta_{Ai} INVD_{it} + \beta_{Ai} LEV_{it} + \beta_{Ai} SZ_{it} + \beta_{Ai} \Delta GS_{it} + v_{it} + \varepsilon_{it}$	**(A)**
$ROA_{it} = \beta_0 + \beta_{Bi} ARD_{it} + \beta_{Bi} LEV_{it} + \beta_{Bi} SZ_{it} + \beta_{Bi} \Delta GS_{it} + v_{it} + \varepsilon_{it}$	**(B)**
$ROA_{it} = \beta_0 + \beta_{Ci} APD_{it} + \beta_{Ci} LEV_{it} + \beta_{Ci} SZ_{it} + \beta_{Ci} \Delta GS_{it} + v_{it} + \varepsilon_{it}$	**(C)**
Return on Assets vs the CCC	
$ROA_{it} = \beta_0 + \beta_{Di} CCC_{it} + \beta_{Di} LEV_{it} + \beta_{Di} SZ_{it} + \beta_{Di} \Delta GS_{it} + v_{it} + \varepsilon_{it}$	**(D)**

(Source: Authors Computation)

The variables above are denoted as follows:

- $\boldsymbol{i}$: represents firms
- $\boldsymbol{t}$: represents time
- $\boldsymbol{\varepsilon_{it}}$: represents the error term which varies overtime and affects profitability
- $\boldsymbol{v_{it}}$: represents the individual error component (a particular characteristic of a firm)
- $\boldsymbol{ROA_{it}}$: Return on Assets
- $\boldsymbol{\beta_0}, \boldsymbol{\beta_A}, \boldsymbol{\beta_B}, \boldsymbol{\beta_C}, \boldsymbol{\beta_D}$: the regression co-efficient
- $\boldsymbol{INVD_{it}}$: inventory days
- $\boldsymbol{ARD_{it}}$: accounts receivable days
- $\boldsymbol{APD_{it}}$: accounts payable days
- $\boldsymbol{CCC_{it}}$: the cash conversion cycle

- $\boldsymbol{LEV_{it}}$: leverage
- $\boldsymbol{SZ_{it}}$: size
- $\Delta\boldsymbol{GS_{it}}$: growth in sales

Model (A) evaluates the impact of inventory days, on profitability before (1998-2006), during (2007-2009) and after (2010-2018) the financial crisis. Model (B) evaluates the impact of accounts receivable days on profitability for all three periods as mentioned in model (A) above. Model (C) evaluates the impact of accounts payable days, on profitability for all the three periods as mentioned in model (A). Finally, model (D) evaluates the impact of the cash conversion cycle, on profitability for all three periods as mentioned in model (A). All models have control variables as detailed in section 3.3 of chapter III which contains the methodology.

3.4.0.0 Validity and Reliability

Panel data consists of data over a period of time and thus, provides multiple observations for the same individuals included in the sample (Hsiao, 2007). Panel data has distinct advantages over cross-sectional data as cross-sectional data limits observations to a single point in time. Panel data are better able to identify and measure effects that are not apparent in pure cross sections or pure time series data. The data is more informative, provides for greater variability, collinearity among the variables are less and there is more degrees of freedom and efficiency (Baltagi, 2008). Panel data also has a more accurate inference of model parameters due to the increased sample variability and higher degrees of freedom, which is absent in cross-sectional data (Hsiao, 2007). Panel data displays its superiority over aggregate time series data as the underlying dynamics of the data are not obscured by aggregation bias (Bond, 2002).

Employing the use of a linear regression model relies on certain assumptions in order to validate results from the respective models. Results are often distorted and will be misleading due to the presence and violation of multicollinearity, autocorrelation, heteroscedasticity or model residuals which are not normally distributed (Gujarati & Porter, 2010). Therefore, the dataset needs to be evaluated for multicollinearity, heteroscedasticity, normality and autocorrelation. In order to evaluate and validate results, both diagnostic and robustness tests were carried out. These tests were considered in the regression results which were performed in section 4.3 which contains the regression analysis. By controlling for size, leverage and growth in sales, internal validity is being addressed. The use of audited financial statements increases the degree of reliability and validity on the financial statements. To strengthen the degree of reliability for this study, an econometrist performed the statistical analysis in a widely used statistical analysis software named Eviews 10.

CHAPTER IV – Results

This section primarily focuses on the results obtained from this study. Firstly, this study interprets the ratios which were computed for the various industries on the Johannesburg Stock Exchange. Next, this chapter discusses the descriptive statistics pertaining to the period before, during and after the crisis. This section is then followed by the interpretation of Pearson's correlation for the periods before, during and after the crisis. Finally, this section interprets the results obtained from the regression analyses for the periods before, during and after the crisis.

Table 7 on the next page displays the respective percentages of the ratios calculated for the composition of working capital components in various industries and the Johannesburg Stock Exchange in its entirety. This was done to illustrate the importance of working capital management for firms. The average total assets of firms on the Johannesburg Stock Exchange are made up of 44% of current assets of which inventory and accounts receivable make up 66% of the balance on current assets. Therefore, both inventory and accounts receivable make up 24% of the balance of total assets. Keeping in mind that inventories are the primary source of sales for majority of firms, we can see that both inventory and accounts receivable make up a significant portion of a firm's assets. South African listed firms average total liabilities are made up of 50% of current liabilities. Of which, accounts payable makes up 59% of these current liabilities. Furthermore, the accounts payable balance makes up 28% of the total liabilities balance.

Table 7 on the next page displays the percentages of certain working capital components for the various industries listed on the Johannesburg Stock Exchange.

Table 7: Percentages of certain ratios for Industries on the Johannesburg Stock Exchange

	Industries								
Ratio	**Basic Materials**	**Consumer Goods**	**Consumer Services**	**Health Care**	**Industrials**	**Oil & Gas**	**Technology**	**Telecoms**	**Entire JSE**
Current Assets/Total Assets	2%	49%	58%	35%	91%	30%	51%	35%	**44%**
(Inventory + Accounts Receivable)/Current Assets	95%	72%	80%	72%	10%	84%	57%	61%	**66%**
(Inventory + Accounts Receivable)/Total Assets	2%	35%	46%	25%	9%	25%	29%	21%	**24%**
Current Liabilities/Total Liabilities	7%	33%	67%	30%	89%	60%	61%	54%	**50%**
Accounts Payable/Current Liabilities	59%	65%	81%	57%	15%	43%	80%	71%	**59%**
Accounts Payable/Total Liabilities	4%	22%	54%	17%	13%	26%	49%	39%	**28%**

(Source: Authors Computation)

The composition of working capital components to total assets and total liabilities percentages vary across different industries (Charitou et al., 2010). With reference to the above, the various South African industries have different compositions of inventory, accounts receivable and accounts payable balances. In addition to the above, the industrials sector has a high investment in current assets (91% of total assets) and current liabilities (89% of total liabilities) when compared to the other sectors. This indicates that firms within the industrial sector place higher reliance on both short-term financing and investments. Furthermore, firms within the consumer services sector have high investments within the components of working capital management. Both inventory and accounts receivable make up a large portion of the current asset balance and accounts payable also makes up a large portion of current liabilities for firms in the consumer services industry. The high composition percentages would make sense due to the nature of business and operations of firms within the consumer services industry. Financial services were excluded from the table above due to the nature of its operations.

4.1.0.0 Descriptive Statistics

This section includes an analysis of the descriptive statistics before, during and after the financial crisis. Further statistics for the entire period (1998 to 2018) can be found in Appendix A of the appendices.

Table 8: Descriptive statistics for the period 'Prior to, During & Post' the financial crisis

	Mean		
Variables	**Before**	**During**	**After**
Return on Assets	0.206	0.185	0.151
Inventory Days	76.239	70.371	74.060
Accounts Receivable Days	71.532	78.449	83.375
Accounts Payable Days	127.005	128.379	127.808
Cash Conversion Cycle	20.766	20.441	29.627
Leverage	0.570	0.623	0.570
Size	13.908	14.430	14.968
Growth in Sales	1.338	0.285	0.133

(Source: Authors Computation)

By analyzing table 8**,** several observations can be drawn. Firstly, the average profitability for the sample decreased from 20.6% (before the crisis) to 18.5% (during the crisis) and decreased further to 15.1% (after the crisis). The decrease from the non-crisis to the crisis period is expected, as it is very likely that profits were negatively impacted by the harsh economic conditions of the financial crisis. Therefore, firms listed on the Johannesburg Stock Exchange were negatively impacted by the global financial crisis. This finding is consistent

with Baveld (2012) and Oseifuah (2018). In addition to the above, profitability for the period post the global financial crisis was negatively impacted. This suggests that the financial crisis had a lingering effect on the profitability of firms post the crisis, even when the period under observation extends to a decade post the crisis. Furthermore, this reduction could be due to the increased investment in assets post the crisis which could have outweighed the increased EBITDA, causing a reduction in the mean return on assets post the crisis.

The average inventory days for the sample decreased from 76 days (before the financial crisis) to 70 days (during the financial crisis). This means that inventory days improved during the crisis period, however, the average worsened after the crisis to 74 days. This could mean that firms adopted efficient inventory management policies during the period of the crisis. Given the reduction of sales during this period, firms had to reduce its production of inventories. The results indicate that firms responded to the financial crisis by adopting efficient inventory management processes to account for the economic downturn which impacted the level of demand. This finding is consistent with Baveld (2012), Correia et al. (2015) and Oseifuah (2018), as firms focused on reducing their investment in inventory during the financial crisis period in order to ensure that working capital levels reflected economic reality. This means that firms managed to increase its cash flows during the crisis period.

The average accounts receivable days increased from 72 days (prior to the crisis) to 78 days (during the crisis). This means that the average accounts receivable days worsened during the crisis period and worsened further to 83 days post the financial crisis. It is possible that the effectiveness of a firm's credit and collection policies were negatively impacted during the crisis period, given the high probability of default customers. Customers were exposed to financial and economic distress costs, which caused them to delay payments to firms. The delayed payments and increased receivable days impacted the cash flows of a firm. The findings above suggest that inefficient policies were adopted for the management of accounts receivable. For example, lenient credit terms were provided to customers during the period of the crisis, which filtered into the period after the crisis. Therefore, firms responded to the financial crisis by providing more relaxed payment terms to debtors. This finding contradicts both Baveld (2012) and Oseifuah (2018) who found that accounts receivable days reduced during the crisis period.

Accounts payable days remained relatively stable for periods before and after the financial crisis at 127 days and increased to 128 days (during the financial crisis). This means that the average accounts payable days improved by one day during the crisis period. This finding is consistent with both Baveld (2012) and Oseifuah (2018) for the crisis period. Furthermore, the average remained at 128 days after the global financial crisis. The results indicate that

firms managed its accounts payable days well during the crisis period. Firms managed to extend their credit terms with their debtors to display favorable terms. Given the external financing restrictions, firms had to rely more on trade credit from suppliers during the period of the crisis. According to Coulibaly et al. (2013), firms who relied more on trade credit, posted better sales during this period. Furthermore, Baxter (2009) found that during the initial period of the financial crisis, South Africa managed to weather away the financial crisis relatively well. The country had low levels of external debt, suitable monetary and fiscal policies together with a flexible exchange rate which eased the impact of the financial crisis on South Africa (Baxter, 2009).

The average cash conversion cycle for the sample decreased from 21 days (before the financial crisis) to 20 days (during the financial crisis). This means that the average cash conversion cycle improved by one day during the crisis period, however the average worsened after the global financial crisis to 30 days. The shorter average cash conversion cycle during the crisis displays that firms listed on the Johannesburg Stock Exchange managed their working capital efficiently which was driven by both the extension of credit terms with suppliers and by the reduction in the number of days in the inventory production process. Therefore, firms relied more on short-term debt in comparison to long term debt during the period of the crisis which led to the improvement in the accounts payable collection period. Furthermore, firms managed to reduce its investment in inventory which led to efficient inventory processes. The reduction in the cash conversion cycle is consistent with Baveld (2012) and Oseifuah (2018).

The total debt to total asset ratio is an indicator of financial leverage of a firm. It expresses the amount of assets that were financed by debt. The mean leverage increased from 57% (before the crisis) to 62% (during the crisis). This means that firms financed more of their assets with debt during the financial crisis (given the increase by 5%). The increase in the current liability balance can be linked to the increased accounts payable days during the period of the crisis. Baveld (2012) also found an increase in leverage for the period of the crisis. Mean leverage reduced back to 57% after the financial crisis. This indicates that firms went back to their normal debt financing practices after the global financial crisis as their leverage reduced to 57%. This indicates that South African firms weathered the global financial crisis relatively well, which is consistent with Baxter (2009). Furthermore, the leverage percentages indicate that firms relied more on equity financing after the crisis.

The tables further display that the mean firm size increased for the period during the financial crisis. This means that sales increased from the period before the financial crisis to the period during the financial crisis. This finding is consistent with Baveld (2012). Sales increased further

after the financial crisis. The increase after the crisis is due to the improved economic conditions. The increase in sales during the period of the crisis interestingly indicates that firms posted increased sales (by an insignificant amount) despite the harsh conditions of the financial crisis. The increase in sales during this period is driven by the following industries: industrials, mining, oil and gas. The increase in sales during the crisis period is possibly due to the more flexible terms given to customers to purchase on credit (refer to paragraph on page 43 for explanation on accounts receivable). Customers were faced with harsh economic conditions; therefore, it is possible that customers took advantage of the flexible credit terms due to cash flow constraints they faced, which gave rise to the increase in sales.

The average growth in sales for the sample decreased from the period before the financial crisis to the period of the crisis. This is possibly due to consumers experiencing financial difficulties during the crisis period. This finding is consistent with Baveld (2012). It is possible that customers had to be stricter with their disposal income given the economic contractions during this period. The sales growth rate worsened further to 13% after the financial crisis. Therefore, sales increased at a decreasing rate after the financial crisis.

4.2.0.0 Pearson's Correlation

Pearson's correlation analysis measures the linear association between variables (Lee Rodgers & Nicewander, 1988). The analysis was performed for working capital management and profitability. The correlation coefficients for each dependent, independent and control variable is evaluated in this section. The evaluation is for the periods prior to, during and post the global financial crisis.

Table 9: Correlation Matrix for the period 'Before' the crisis

	INVD	**ARD**	**APD**	**CCC**	**ROA**	**LEV**	**GS**	**SZ**
INVD	**1**							
ARD	0.220******	**1**						
APD	0.352******	0.377******	**1**					
CCC	0.352******	0.161******	-0.674******	**1**				
ROA	-0.158******	-0.048	-0.019	-0.099******	**1**			
LEV	-0.132******	-0.029	0.169******	-0.274******	0.027	**1**		
GS	-0.022	0.008	0.012	-0.023	0.050	0.051	**1**	
SZ	-0.179******	-0.058	-0.135******	0.004	0.257******	-0.067*****	-0.026	**1**

***** Significant at the 0.05 level; ****** Significant at the 0.01 level

ROA: Return on Assets; **INVD**: Inventory Days; **ARD**: Accounts Receivable Days; **APD**: Accounts Payable Days; **CCC**: Cash Conversion Cycle; **LEV**: Leverage; **SZ**: Size; **GS**: Growth in Sales

4.2.1.0 Correlation Coefficients 'During' the financial crisis (2007-2009)

Table 10: Correlation Matrix for the period 'During' the crisis

	INVD	**ARD**	**APD**	**CCC**	**ROA**	**LEV**	**GS**	**SZ**
INVD	**1**							
ARD	-0.017	**1**						
APD	0.133******	0.390******	**1**					
CCC	0.315******	0.044	-0.801******	**1**				
ROA	-0.018	-0.135******	-0.008	-0.061	**1**			
LEV	-0.064	-0.001	0.238******	-0.278******	0.257******	**1**		
GS	-0.022	0.017	0.043	-0.048	0.144******	0.051	**1**	
SZ	-0.059	-0.187******	-0.216******	0.111******	0.138******	-0.099*****	-0.008	**1**

* Significant at the 0.05 level; ****** Significant at the 0.01 level

ROA: Return on Assets; **INVD**: Inventory Days; **ARD**: Accounts Receivable Days; **APD**: Accounts Payable Days; **CCC**: Cash Conversion Cycle; **LEV**: Leverage; **SZ**: Size; **GS**: Growth in Sales

4.2.2.0 Correlation Coefficients After the financial crisis (2010-2018)

Table 11: Correlation Matrix for the period 'After' the crisis

	INVD	**ARD**	**APD**	**CCC**	**ROA**	**LEV**	**GS**	**SZ**
INVD	**1**							
ARD	0.007	**1**						
APD	0.166******	0.342******	**1**					
CCC	0.288******	0.240******	-0.729******	**1**				
ROA	-0.038	-0.107******	-0.080******	0.001	**1**			
LEV	-0.067*****	0.033	0.263******	-0.275******	-0.049	**1**		
GS	-0.008	-0.013	-0.017	0.006	0.037	0.040	**1**	
SZ	-0.061*****	-0.146******	-0.155******	0.043	0.143******	0.120******	-0.037	**1**

***** Significant at the 0.05 level; ****** Significant at the 0.01 level

ROA: Return on Assets; **INVD**: Inventory Days; **ARD**: Accounts Receivable Days; **APD**: Accounts Payable Days; **CCC**: Cash Conversion Cycle; **LEV**: Leverage; **SZ**: Size; **GS**: Growth in Sales

The correlation matrix in table 10 exhibits that leverage, growth in sales and size all have a significant positive correlation with firm profitability. The leverage correlation suggests that by increasing the amount of debt in a firm's capital structure, firms managed to increase profitability during the crisis. This is interesting as firms faced high borrowing costs during the financial crisis. It is possible that firms managed to make use of the tax advantage from the high interest costs during this period, which led to a low taxable income and in effect a lower tax expense (Miller, 1988). Furthermore, it is possible that firms were able to maintain their levels of profitability by relying on increased levels of debt. The matrix also suggests that firms increased profitability during the crisis by increasing sales. This relationship makes sense as sales drives profitability. Furthermore, by increasing sales, firm size increases which in turn increase profitability for firms during crisis periods. This suggests that larger corporates have the ability to exploit economies of scale, therefore, larger corporates report higher profits when compared to smaller corporates (Makori & Jagongo, 2013).

In addition to the findings in table 10, leverage and accounts payable days has a significant positive correlation, which indicates that firms increased its investment in accounts payable during the period of the crisis by negotiating extended credit terms with creditors which in effect caused an increase in leverage due to the increased investment in short-term liabilities. This would tie into the increased mean accounts payable days during the crisis period, in section 4.1 which details the descriptive statistics.

The matrix of table 11 suggests that firms increased its profitability by reducing the time it takes to pay creditors during periods after a crisis, as evidenced by the negative correlation between return on assets and accounts payable days. It means that the less profitable firms wait longer to pay their bills, therefore funds are not retained for a prolonged period. Firms who negotiate early payment terms with creditors look to make use of early settlement discounts or have short-term credit arrangements with creditors. The accounts payable days correlation with the profitability of a firm is consistent with previous literature and its significant impact on firm profitability. The following authors found the same correlation as above: Napompech (2012); Sharma and Kumar (2011); Karaduman et al. (2011); Charitou et al. (2010); Falope and Ajilore (2009); Raheman and Nasr (2007); Juan García-Teruel and Martinez-Solano (2007); Lazaridis and Tryfonidis (2006); Deloof (2003); Shin and Soenen (1998) and Tauringana and Adjapong Afrifa (2013).

With reference to both table's 9 and 11, firm size is significant positive correlation with profitability for both non-crisis periods (pre and after the crisis). Therefore, by increasing firm sales, the measurement proxy for firm size increases for periods before and after the global financial crisis.

In summary, the following table shows the significant correlation found by Pearson's correlation for the following periods: before, during and after the global financial crisis.

Table 12: Summary of significant findings for the present study according to Pearson's correlation coefficients

	INVD	ARD	APD	CCC	LEV	SZ	ΔGS
ROA (Before)	**N**			**N**		**P**	
ROA (During)		**N**			**P**	**P**	**P**
ROA (After)		**N**	**N**			**P**	

(Source: Authors Computation)

P: Positive correlation; **N**: Negative correlation

Therefore, as it can be seen from table 12, size is the only variable that is consistently significant during all three periods. It seems that large firms were able to exploit economies of scales to remain profitable. Therefore, firms that produce higher sales means that those firms would produce higher profits. Larger firms have the ability to reduce the productions costs per unit and increase levels of production due to access to more capital, specialized technology or specialization of its workforce. The finding is consistent with Mathuva (2010) for non-crisis periods.

4.3.0.0 Regression Analysis

The following part will discuss the regression analyses to investigate the impact of working capital management on firm profitability for periods before, during and after the global financial crisis. This part also evaluates a regression analyses for the entire period of study. Each regression equation (which were provided in chapter III which details the methodology for the present study), and its corresponding table(s) will be discussed in detail. To identify which variables are of importance and have an impact on the dependent variable (return on assets), regression analyses was used to investigate the impact of working capital management on corporate profitability. With the use of panel data, the following regression models will be applied to determine which is best suited for the regression formulae: 'Pooled Regression', 'Fixed Effects' and 'Random Effects'. As mentioned earlier, panel data allows for both cross-sectional and time series data to be observed over a period of time (Baltagi, 2005). Therefore, the determinants of corporate profitability were estimated using pooled regression, fixed effects and random effects. Both the Durbin-Watson and Hausman tests were performed to evaluate which model is best suited for the regression models.

The period before, during and after the global financial crisis will be discussed and analyzed separately. In addition to this, these three periods will then be compared to the entire period (1998-2018) of the study. The following will be discussed for each time period: the sign and the impact of the different parts of working capital management on profitability of firms, the R^2 and Probability of the F-Statistic. In addition to this, the study will compare the results obtained from this study to previous literature on crisis and non-crisis periods of study.

The regression analysis made use of the following models: 'Pooled Regression', 'Fixed Effects' and 'Random Effects', in order to determine which panel regression model was best suited for the regression formulae models provided for each period of this study. All the regression models (A, B, C and D) were run three times each for each time period. Based on these tests, table 13 on the next page shows which panel regression test model is best suited for the regression formulae models for each period.

Table 13: Models used for the analysis of results for each period (before, during and after the global financial crisis)

Period	**Regression Model: Before, During and After**	**Which model is best for the analysis?**
Full Period	$ROA_{it} = \beta_0 + \beta_{Ai}INVD_{it} + \beta_{Ai}LEV_{it} + \beta_{Ai}SZ_{it} + \beta_{Ai}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Pooled Regression
	$ROA_{it} = \beta_0 + \beta_{Bi}ARD_{it} + \beta_{Bi}LEV_{it} + \beta_{Bi}SZ_{it} + \beta_{Bi}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Pooled Regression
	$ROA_{it} = \beta_0 + \beta_{Ci}APD_{it} + \beta_{Ci}LEV_{it} + \beta_{Ci}SZ_{it} + \beta_{Ci}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Pooled Regression
	$ROA_{it} = \beta_0 + \beta_{Di}CCC_{it} + \beta_{Di}LEV_{it} + \beta_{Di}SZ_{it} + \beta_{Di}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Pooled Regression
Before the Global Financial Crisis	$ROA_{it} = \beta_0 + \beta_{Ai}INVD_{it} + \beta_{Ai}LEV_{it} + \beta_{Ai}SZ_{it} + \beta_{Ai}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Pooled Regression
	$ROA_{it} = \beta_0 + \beta_{Bi}ARD_{it} + \beta_{Bi}LEV_{it} + \beta_{Bi}SZ_{it} + \beta_{Bi}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Random Effects
	$ROA_{it} = \beta_0 + \beta_{Ci}APD_{it} + \beta_{Ci}LEV_{it} + \beta_{Ci}SZ_{it} + \beta_{Ci}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Pooled Regression
	$ROA_{it} = \beta_0 + \beta_{Di}CCC_{it} + \beta_{Di}LEV_{it} + \beta_{Di}SZ_{it} + \beta_{Di}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Random Effects
During the Global Financial Crisis	$ROA_{it} = \beta_0 + \beta_{Ai}INVD_{it} + \beta_{Ai}LEV_{it} + \beta_{Ai}SZ_{it} + \beta_{Ai}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Fixed Effects
	$ROA_{it} = \beta_0 + \beta_{Bi}ARD_{it} + \beta_{Bi}LEV_{it} + \beta_{Bi}SZ_{it} + \beta_{Bi}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Fixed Effects
	$ROA_{it} = \beta_0 + \beta_{Ci}APD_{it} + \beta_{Ci}LEV_{it} + \beta_{Ci}SZ_{it} + \beta_{Ci}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Fixed Effects
	$ROA_{it} = \beta_0 + \beta_{Di}CCC_{it} + \beta_{Di}LEV_{it} + \beta_{Di}SZ_{it} + \beta_{Di}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Fixed Effects
After the Global Financial Crisis	$ROA_{it} = \beta_0 + \beta_{Ai}INVD_{it} + \beta_{Ai}LEV_{it} + \beta_{Ai}SZ_{it} + \beta_{Ai}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Fixed Effects
	$ROA_{it} = \beta_0 + \beta_{Bi}ARD_{it} + \beta_{Bi}LEV_{it} + \beta_{Bi}SZ_{it} + \beta_{Bi}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Fixed Effects
	$ROA_{it} = \beta_0 + \beta_{Ci}APD_{it} + \beta_{Ci}LEV_{it} + \beta_{Ci}SZ_{it} + \beta_{Ci}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Fixed Effects
	$ROA_{it} = \beta_0 + \beta_{Di}CCC_{it} + \beta_{Di}LEV_{it} + \beta_{Di}SZ_{it} + \beta_{Di}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	Fixed Effects

(Source: Authors Computation)

Table 14 on the next page shows the regression formulae and models which go hand in hand with which panel data regression model was used.

Table 14: Regression models (A, B, C & D) used for each period of the study

Return on Assets vs the Individual components	**Model Number**
$ROA_{it} = \beta_0 + \beta_{Ai}INVD_{it} + \beta_{Ai}LEV_{it} + \beta_{Ai}SZ_{it} + \beta_{Ai}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	**(A)**
$ROA_{it} = \beta_0 + \beta_{Bi}ARD_{it} + \beta_{Bi}LEV_{it} + \beta_{Bi}SZ_{it} + \beta_{Bi}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	**(B)**
$ROA_{it} = \beta_0 + \beta_{Ci}APD_{it} + \beta_{Ci}LEV_{it} + \beta_{Ci}SZ_{it} + \beta_{Ci}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	**(C)**
Return on Assets vs the CCC	
$ROA_{it} = \beta_0 + \beta_{Di}CCC_{it} + \beta_{Di}LEV_{it} + \beta_{Di}SZ_{it} + \beta_{Di}\Delta GS_{it} + v_{it} + \varepsilon_{it}$	**(D)**

(Source: Authors Computation)

The variables above are denoted as follows:

- $\boldsymbol{i}$*:* represents firms
- $\boldsymbol{t}$: represents time
- $\boldsymbol{\varepsilon_{it}}$: represents the error term which varies overtime and affects profitability
- $\boldsymbol{v_{it}}$: represents the individual error component (a particular characteristic of a firm)
- $\boldsymbol{ROA_{it}}$: Return on Assets
- $\boldsymbol{\beta_0}, \boldsymbol{\beta_A}, \boldsymbol{\beta_B}, \boldsymbol{\beta_C}, \boldsymbol{\beta_D}$: the regression co-efficient
- $\boldsymbol{INVD_{it}}$: inventory days
- $\boldsymbol{ARD_{it}}$: accounts receivable days
- $\boldsymbol{APD_{it}}$: accounts payable days
- $\boldsymbol{CCC_{it}}$: the cash conversion cycle
- $\boldsymbol{LEV_{it}}$: leverage
- $\boldsymbol{SZ_{it}}$: size
- $\Delta\boldsymbol{GS_{it}}$: growth in sales

Model (A) evaluates the impact of inventory days, on profitability before (1998-2006), during (2007-2009) and after (2010-2018) the financial crisis. Model (B) evaluates the impact of accounts receivable days on profitability for all three periods as mentioned in model (A) above. Model (C) evaluates the impact of accounts payable days, on profitability for all the three periods as mentioned in model (A). Finally, model (D) evaluates the impact of the cash conversion cycle, on profitability for all three periods as mentioned in model (A). All models have control variables as detailed in section 3.3 of chapter III which details the methodology.

With reference to table 13 and table 14 above, the full period regression formulae have been assessed using all three models (pooled regression, fixed effects and random effects). The study identified that pooled regression is the best model used for the analysis of the full period.

When the period before the global financial crisis is evaluated, the regression formulae have been assessed using all three models (pooled regression, fixed effects and random effects). The best model used for this period is random effects for models A, B and D. Whereas, pooled regression is the best model used for model C. With reference to the period during and after the global financial crisis, regression formulae have been assessed using all three models (pooled regression, fixed effects and random effects). The best model to be used for these two time periods are fixed effects for models A, B, C and D. Please note that the other models (pooled regression, fixed effects and random effects) for each of the time periods can be found in Appendix D of the appendices.

4.3.1.0 Entire Period

Model A: $ROA_{it} = \beta_0 + \beta_{Ai} INVD_{it} + \beta_{Ai} LEV_{it} + \beta_{Ai} SZ_{it} + \beta_{Ai} \Delta GS_{it} + v_{it} + \varepsilon_{it}$

Table 15: Pooled Regression Results of Equation Inventory Days with Dependent Variable Return on Assets

Independent Variables	**Coefficient for the Entire Period**
Inventory Days	2.18E-09
Leverage	-0.024176
Firm Size	**0.064044*** **
Growth in Sales	0.000526
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1	

Model B: $ROA_{it} = \beta_0 + \beta_{Bi} ARD_{it} + \beta_{Bi} LEV_{it} + \beta_{Bi} SZ_{it} + \beta_{Bi} \Delta GS_{it} + v_{it} + \varepsilon_{it}$

Table 16: Regression Results of Equation Accounts Receivable Days with Dependent Variable Return on Assets

Independent Variables	**Coefficient for the Entire Period**
Accounts Receivable Days	7.81E-07
Leverage	**-0.231912*** **
Firm Size	**0.059121*** **
Growth in Sales	-0.000140
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1	

Model C: $ROA_{it} = \beta_0 + \beta_{Ci}APD_{it} + \beta_{Ci}LEV_{it} + \beta_{Ci}SZ_{it} + \beta_{Ci}\Delta GS_{it} + v_{it} + \varepsilon_{it}$

Table 17: Regression Results of Equation Accounts Payable Days with Dependent Variable Return on Assets

Independent Variables	**Coefficient for the Entire Period**
Accounts Payable Days	7.19E-10
Leverage	-0.024177
Firm Size	**0.064045*** **
Growth in Sales	0.000526
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1	

Model D: $ROA_{it} = \beta_0 + \beta_{Di}CCC_{it} + \beta_{Di}LEV_{it} + \beta_{Di}SZ_{it} + \beta_{Di}\Delta GS_{it} + v_{it} + \varepsilon_{it}$

Table 18: Regression Results of Equation Cash Conversion Cycle with Dependent Variable Return on Assets

Independent Variables	**Coefficient for the Entire Period**
Cash Conversion Cycle	-1.19E-09
Leverage	**-0.232016*** **
Firm Size	**0.059074*** **
Growth in Sales	-0.000140
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1	

The tables above show that inventory days, accounts receivable days and accounts payable days all have positive relationships with profitability. However, the net relationship of all three components (cash conversion cycle) has a negative relationship with profitability. This indicates that firms managed to negotiate extended payment terms with creditors which offset the working capital cycle (sum of accounts receivable days and inventory days) for the entire period. This further indicates that the cash conversions cycle as a whole is insignificant to profitability for the entire period of the study.

Furthermore, table's 16 and 18, show that leverage has a significant (at the 99% confidence level) negative relationship with return on assets. When it comes to leverage, the higher the total debt to total asset ratio, the lower the firm profitability. This means that firms need to reduce their debt in their capital structure in order to increase firm profitability. This further means that less assets will be financed by debt. Therefore, firms increased their profitability

during the entire period of study by reducing debt. Possible reasons for the increase in profitability could be due to the lower interest expense that would be incurred for the reduction of debt. This relationship is contrary to what Abor (2005) and Gill, Biger, and Mathur (2011) found, as their results indicated that return on equity (profitability measure) had a negative relationship with leverage. Both Abor (2005) and Gill et al. (2011) studied the effects of certain capital structure components on profitability. The findings from the aforementioned authors suggest that profitable firms depend more on debt financing due to the tax advantage (tax deductibility of debt) obtained from taking on debt. Possible reasons for the differences in the relationship for leverage could be due to the economic differences between South Africa and Ghana. Furthermore, the profitability measure for the current study is return on assts whereas for the studies of Abor (2005) and Gill et al. (2011), it was return on equity.

In addition to the above, table's 15, 16, 17 and 18 all show that firm size has a significant (at the 99% confidence level) positive relationship with return on assets. Larger corporates have the ability to exploit economies of scale, therefore, larger corporates report higher profits when compared to smaller corporates (Makori & Jagongo, 2013).

4.3.2.0 Before, During and After the Crisis

Model A: $ROA_{it} = \beta_0 + \beta_{Ai} INVD_{it} + \beta_{Ai} LEV_{it} + \beta_{Ai} SZ_{it} + \beta_{Ai} \Delta GS_{it} + v_{it} + \varepsilon_{it}$

Table 19: Regression Results of Equation Inventory Days with Dependent Variable Return on Assets

	Before Crisis	During Crisis	After Crisis
Inventory Days	2.85E-09	-0.001531	**6.36E-05***
Leverage	0.069438	0.266778	-0.045948
Firm Size	**0.060372*****	**2.314096*****	**0.070647*****
Growth in Sales	0.000567	**-1.912367*****	**-0.001917****
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1			

Model A in table 19 above tests whether there is a significant relationship between inventory days and corporate profitability for periods before, during and after the financial crisis. For the period of the crisis, inventory days has an insignificant negative relationship with profitability, which is consistent with Oseifuah (2018) who also found an insignificant negative relationship during the financial crisis. The change in the sign of the relationship shows that inventory practices did change for all three periods. Table 19 furthers shows that for the period after the crisis, inventory days had a significant positive relationship with profitability. This means that

companies possibly increased their inventory holding and conversion periods to increase firm profitability after the global financial crisis. This is consistent with studies carried out on conservative working capital policies and is also consistent with Mathuva (2010). Maintaining high levels of inventory, diminishes the costs of possible interruptions within the production process. Firms also reduce their losses associated with loss of business due to the shortage of stock for customer demand. Therefore, firms used similar inventory practices for periods before and after the crisis with the only difference being the significance of the relationship.

High stock build-up also reduces the costs associated with supplying goods. Lastly, maintaining high levels of stock also safeguards the firm against any macroeconomic conditions which may cause price fluctuations (Blinder & Maccini, 1991). Therefore, this a reflection of poor sales which are outweighed with the benefit of high inventory build-up which increases profitability. Firms need to adopt a form of monitoring policy in place in order to bring excessive inventory levels to the attention of management, to ensure that the benefit mentioned above, is maintained. Considering that the relationship between inventory days and profitability was positive before and after the crisis, indicates that the management of this resource reverted to pre-crisis practices. Interestingly, the larger positive coefficient for the post crisis period suggests that inventory management became more important to profitability than it was before the crisis. The increase in inventory days is consistent with the findings in section 4.1 of chapter IV which details the descriptive statistics. Both results indicate that inventory days worsened (increased) for the period after the crisis.

Model B: $ROA_{it} = \beta_0 + \beta_{Bi}ARD_{it} + \beta_{Bi}LEV_{it} + \beta_{Bi}SZ_{it} + \beta_{Bi}\Delta GS_{it} + v_{it} + \varepsilon_{it}$

Table 20: Regression Results of Equation Accounts Receivable Days with Dependent Variable Return on Assets

	Before Crisis	During Crisis	After Crisis
Accounts Receivable Days	4.33E-05	-0.001838	**-3.10E-05*** **
Leverage	0.039703	0.362186	**-0.047200***
Firm Size	**0.059993*** **	**1.795702*** **	**0.045508*** **
Growth in Sales	0.000554	-0.002593	**-0.002358*** **
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1			

Model B in table 20 above tests the significance of the relationship between profitability and accounts receivable days for the periods pre, during and post the crisis. The sign of the above relationship changed for periods before and after the crisis. The change in coefficients from

positive to negative from the periods before to the period during the financial crisis is indicative of the drivers of profitability and liquidity changing during the financial crisis. Interestingly, this change persisted into the period after the financial crisis with the relationship becoming significant after the financial crisis.

Companies appear to have reduced its trade debtor collections period in order to increase profitability for periods after the global financial crisis. The findings emphasize the importance of the development of their debtor collection period, to increase firm profitability. The above finding is consistent with Baveld (2012) who found the same relationship as above for non-crisis periods. This finding ties into section 4.1 of chapter IV which details the descriptive statistics. The results suggest that firms reduce its profitability by lengthening the time it takes to collect cash from debtors.

Model C: $ROA_{it} = \beta_0 + \beta_{Ci}APD_{it} + \beta_{Ci}LEV_{it} + \beta_{Ci}SZ_{it} + \beta_{Ci}\Delta GS_{it} + v_{it} + \varepsilon_{it}$

Table 21: Regression Results of Equation Accounts Payable Days with Dependent Variable Return on Assets

	Before Crisis	During Crisis	After Crisis
Accounts Payable Days	9.37E-10	-2.11E-06	-1.83E-06
Leverage	0.069435	0.273815	-0.043417
Firm Size	**0.060372*** **	**2.330535*** **	**0.067302*** **
Growth in Sales	0.000567	**-1.915158*** **	**-0.001916** **
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1			

Model C in table 21 above tests whether there is a significant relationship between accounts payable days and corporate profitability for periods prior to, during and post the financial crisis. The relationship between profitability and accounts payable days was negative for periods during and after the financial crisis. This may indicate that short-term creditors, experiencing their own liquidity constraints, would want to ensure that they have sufficient cash resources on hand to counter the effects of the harsh economic conditions posed by the financial crisis. As a result, firms possibly began resorting to long-term debt to supplement the deficit in cash resources for the short-term.

Model D: $ROA_{it} = \beta_0 + \beta_{Di}CCC_{it} + \beta_{Di}LEV_{it} + \beta_{Di}SZ_{it} + \beta_{Di}\Delta GS_{it} + v_{it} + \varepsilon_{it}$

Table 22: Regression Results of Equation the Cash Conversion Cycle with Dependent Variable Return on Assets

	Before Crisis	During Crisis	After Crisis
Cash Conversion Cycle	-1.32E-09	-0.000811	**-1.15E-05*** **
Leverage	0.034808	0.334624	**-0.045499***
Firm Size	**0.058178*** **	**1.850865*** **	**0.069646*** **
Growth in Sales	0.000556	-0.001100	**-0.002168** **
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1			

Model D in table 22 above tests whether there is a significant relationship between the cash conversion cycle and corporate profitability for periods before, during and after the financial crisis. The results emphasis the increasing importance of the management of cash resources after the financial crisis. The significance of the relationship between profitability and the cash conversion cycle increased after the financial crisis. This, when viewed with the increasing significance of leverage and profitability indicate the increasing reliance on short- and long-term debt for the sustainability of firms post the crisis period.

According to Shin and Soenen (1998), the reduced cash conversion cycle shows that there is bargaining power by the suppliers or customers which results in higher profitability given the market dominance. Furthermore, Mathuva (2010), explains that this relationship is due to the reduction in the investment of current assets, which increases profitability. This ensures that liquid cash is not kept on hand for prolonged periods but is rather used to generate profits.

According to table's 19, 20, 21 and 22 above**,** firm size has a significant positive relationship with return on assets for all three periods. This suggests that larger corporates have the ability to exploit economies of scale, therefore, larger corporates report higher profits when compared to smaller corporates (Makori & Jagongo, 2013). This corroborates the validity of the relationship and is consistent with Baveld (2012). This is corroborated by Bhattacharyya and Saxena (2009), who found that, firm size is seen as a primary factor when determining the profitability and market value of a firm, given the ability of larger firms to exploit economies of scale. In addition to the above, each of the tables mentioned exhibit high coefficients for the period of the crisis.

With reference to table's 19, 20, 21 and 22, for periods before and during the crisis the relationship between profitability and leverage was positive. This indicates that firms increased profitability by taking on more debt financing, however the relationship changed for periods after the crisis. It may also indicate that debt financing was more selectively available to only profitable firms as providers of capital also became more conservative. Table's 20 and 22 both show that leverage has a significant negative relationship with return on assets for the period after the crisis. This means that firms reduced its debt in its capital structure in order to increase firm profitability. This further means that less assets were financed by debt. Possible reasons for the increase in profitability could be due to the lower interest expense that would be incurred due to a possible reduction of debt. Therefore, this suggests that profitable firms depend less on debt financing. Furthermore, it could be possible that firms faced the lagged effects of the financial crisis which possibly made debt financing unattractive (Baxter, 2009).

4.3.3.0 Summary of Key Findings

Based on the findings from the regression analyses, it can be concluded that the working capital management policies for firms listed on the Johannesburg Stock Exchange are impacted during periods after the global financial crisis. As it can be seen from the results, firms need to revise its debtor's collection policy to a reduced collection period for periods post a financial crisis, which will result in an increase in profitability. Firms also need to revise its inventory conversion and holding polices for periods after a financial crisis, by creating a policy which results in stock build-up which may increases firm profitability.

The findings suggest that firms should prepare for a financial crisis by revising the individual components of its cash conversion cycle in order to increase firm profitability before a crisis. This can be done by revising both debtors' days and inventory days in order to adopt a more conservative working capital policy before a crisis.

What was common across the three periods was shown in the significance of the relationships between size and profitability. Furthermore, the significant negative relationship for growth in sales and profitability was common for periods during the financial crisis and after the global financial crisis. When the entire period as whole was evaluated, no significant relationships were found between the components of working capital and corporate profitability.

CHAPTER V – Conclusions, Recommendations & Areas of Future Focus

5.1.0.0 Conclusion

The study employed the use of panel data regression methodology in order to evaluate the impact of the global financial crisis on the components of working capital management practices for a sample of 384 non-financial firms listed on the Johannesburg Stock Exchange over a 21-year period (1998 to 2018). The study analyzed the impact of the global financial crisis on working capital management policies for firms for three interval periods: before (1998 to 2006), during (2007 to 2009) and after (2010 to 2018) the global financial crisis. The following findings were noted from the regression results.

The relationship between inventory days and profitability reflected a positive for the periods before and after the crisis, which indicated that the management of this resource reverted to pre-crisis practices. The coefficients from the regression results indicated that there was a larger positive coefficient for the period post the crisis which suggests that inventory management became more important to profitability than it was before the crisis. The positive relationship suggests that firms maintain high levels of inventory, which diminishes the costs of possible interruptions within the production process. Further findings suggest that companies appeared to have reduced its debtor's collection period in order to increase profitability for periods after the global financial crisis. Therefore, a firm's profitability is negatively impacted when its collection period is lengthened. The findings emphasize the importance of the development of their debtor collection period, to increase firm profitability.

The relationship between profitability and accounts payable days reflected a negative relationship for periods during and after the financial crisis. The relationship suggests that short-term creditors who experience liquidity constraints would want to ensure that they have sufficient cash resources on hand to counter the effects of the harsh economic conditions posed by the financial crisis. Due to the above, it is possible that firms began resorting to long-term debt to supplement the deficit in cash resources for the short-term. For the cash conversion cycle, the significance of the relationship between profitability and this variable increased after the financial crisis. The results emphasized the need for increased importance on the management of cash resources after the financial crisis. This, when viewed with the increasing significance of leverage and profitability indicate the increasing reliance on short- and long-term debt for the sustainability of firms post the crisis period.

The relationship between profitability and leverage was positive for periods before and during the crisis. This indicates that firms increased profitability by taking on more debt financing however, the relationship changed for periods after the crisis. It may also indicate that debt financing was more selectively available profitable firms only, as providers of capital also

became more conservative. For the period after the crisis, the study found a significant negative relationship with return on assets and leverage. This suggests that profitable firms reduced its debt in its capital structure in order to increase firm profitability after the crisis. Lastly, firm size had a significant positive relationship with profitability for all periods of the study (before, during and after the financial crisis). This suggests that larger corporates have the ability to exploit economies of scale, therefore, larger corporates report higher profits when compared to smaller corporates (Makori & Jagongo, 2013).

Based on the findings noted above, it can be concluded that the working capital management policies for firms listed on the Johannesburg Stock Exchange are impacted during periods after a financial crisis. The findings suggest that firms should prepare for a financial crisis by revising both debtors' days and inventory days in order to adopt a more conservative working capital policy before an economic crisis.

5.2.0.0 Recommendations & Areas of Future Focus

Given the findings above, the adoption of efficient working capital policies during non-crisis periods must be incorporated in order to ensure that firms can minimize the potential impact of liquidity constraints during periods of unforeseen economic distress.

The present study focuses only on listed firms in South Africa. This study cannot be generalized to all countries and companies in the world. A much broader scope is required to gain a further understanding as to the impact of the global financial crisis on working capital management practices. Future research should look to include a numerous amount of countries within the study so that a comparison can be made. The comparison should include the differences between emerging and developed economies. The fact that only one crisis period was used created a limitation. To enhance the validity research on the global financial crisis and its impact on working capital management practices, future studies should look to include multiple crisis periods with different causes and implications where some form of comparison can be made. Furthermore, the analysis of the present study used annual data for the study, future research can be more precise if quarterly data is used.

Future researchers should also look to evaluate working capital management practices and its impact on profitability on an industry basis. This will provide input as to the different working capital practices that each industry adopts. Future research should also look to increase the number of working capital components under investigation such as: marketable securities, cash and short-term debt due within twelve months. Finally, future research should look to investigate the causality of trade credit during crisis periods, to gain an understanding as to why trade credit is extended during periods of crisis.

REFERENCES

Abor, J. (2005). The effect of capital structure on profitability: an empirical analysis of listed firms in Ghana. *The Journal of Risk Finance, 6*(5), 438-445.

Akoto, R. K., Awunyo-Vitor, D., & Angmor, P. L. (2013). Working capital management and profitability: Evidence from Ghanaian listed manufacturing firms. *Journal of Economics and International Finance, 5(9)*, 373-379.

Aktas, N., Croci, E., & Petmezas, D. (2015). Is working capital management value-enhancing? Evidence from firm performance and investments. *Journal of corporate finance, 30*, 98-113.

Alavinasab, S. M., & Davoudi, E. (2013). Studying the relationship between working capital management and profitability of listed companies in Tehran stock exchange. *Business Management Dynamics, 2*(7), 1.

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The journal of Finance, 23*(4), 589-609.

Arnold, G. (2008). *Corporate Financial Management* (4th ed.). Harlow, UK: Pearson Education.

Baltagi, B. (2005). *Econometric Analysis of Panel Data* (3rd ed.). New York: John Wiley & Sons Inc.

Baltagi, B. (2008). *Econometric Analysis of Panel Data* (4th ed.). Chichester: John Wiley & Sons Ltd.

Baños-Caballero, S., García-Teruel, P. J., & Martínez-Solano, P. (2012). How does working capital management affect the profitability of Spanish SMEs? *Small Business Economics, 39*(2), 517-529.

Bartov, E., Gul, F. A., & Tsui, J. S. (2000). Discretionary-accruals models and audit qualifications. *Journal of accounting and economics, 30*(3), 421-452.

Baveld, M., Bernard. (2012). Impact of working capital management on the profitability of public listed firms in The Netherlands during the financial crisis. *Master's thesis, University of Twente*, 1-84.

Baxter, R. (2009). The global economic crisis and its impact on South Africa and the country's mining industry. *Challenges for monetary policy-makers in emerging markets*, 105-116.

Berry, A., & Jarvis, R. (2005). *Accounting in a business context* (Fourth ed.): Patrick Bond.

Berryman, J. (1983). Small business failure and survey of the literature. *European Small Business Journal, 1*(4), 47-59.

Bhattacharyya, S., & Saxena, A. (2009). Does the firm size matter? An empirical enquiry into the performance of Indian manufacturing firms. *Munich Personal RePEc Archive*(13029), 1-14.

Bhunia, A. (2010). A trend analysis of liquidity management efficiency in selected private sector Indian steel industry. *International Journal of research in commerce and management, 1*(5), 618-628.

Bhunia, A. (2013). Importance of liquidity management on profitability. *Business Perspectives. Jauornal of Department of Commerce University of Kalyani, 4*, 43-53.

Blinder, A. S., & Maccini, L. J. (1991). The resurgence of inventory research: what have we learned? *Journal of Economic Surveys, 5*(4), 291-328.

Bond, S. R. (2002). Dynamic panel data models: a guide to micro data methods and practice. *Portuguese economic journal, 1*(2), 141-162.

Brechling, F. P., & Lipsey, R. G. (1963). Trade credit and monetary policy. *The Economic Journal, 73*(292), 618-641.

Carbo-Valverde, S., Rodriguez-Fernandez, F., & Udell, G. F. (2016). Trade credit, the financial crisis, and SME access to finance. *Journal of Money, Credit and Banking, 48*(1), 113-143.

Carpenter, R. E., Fazzari, S. M., Petersen, B. C., Kashyap, A. K., & Friedman, B. M. (1994). Inventory investment, internal-finance fluctuations, and the business cycle. *Brookings Papers on Economic Activity, 1994*(2), 75-138.

Charitou, M. S., Elfani, M., & Lois, P. (2010). The effect of working capital management on firm's profitability: Empirical evidence from an emerging market. *Journal of Business & Economics Research, 8*(12), 63-68.

Chatterjee, S., & Hadi, A. S. (1986). Influential observations, high leverage points, and outliers in linear regression. *Statistical science, 1*(3), 379-393.

Cook, R. D. (1977). Detection of influential observation in linear regression. *Technometrics, 19*(1), 15-18.

Cornett, M. M., McNutt, J. J., Strahan, P. E., & Tehranian, H. (2011). Liquidity risk management and credit supply in the financial crisis. *Journal of Financial Economics, 101*(2), 297-312.

Correia, C., Flynn, D., Uliana, E., & Wormald, M. (2015). *Financial Management* (8 ed.). Cape Town: Juta & Company.

Coulibaly, B., Sapriza, H., & Zlate, A. (2013). Financial frictions, trade credit, and the 2008–09 global financial crisis. *International Review of Economics & Finance, 26*, 25-38.

Croissant, Y., & Millo, G. (2008). Panel data econometrics in R: The plm package. *Journal of statistical software, 27*(2), 1-43.

Crotty, J. (2009). Structural causes of the global financial crisis: a critical assessment of the 'new financial architecture'. *Cambridge journal of economics, 33*(4), 563-580.

Daisuke, T. (2017). Working capital management during the global financial crisis: Evidence from Japan. *ELSEVIER, 49*(No. 17045), 206-219.

Damodaran, A. (2006). *Applied Corporate Finance* (4th ed.). Hoboken.

Dang, V. A., Kim, M., & Shin, Y. (2014). Asymmetric adjustment toward optimal capital structure: Evidence from a crisis. *International Review of Financial Analysis, 33*, 226-242.

Danso, A., & Adomako, S. (2014). The financing behaviour of firms and financial crisis. *Managerial Finance, 40*(12), 1159-1174.

de Rozari, P., Emanuel, Sudarma, Y., Suryana, Indiastuti, R., & Febrian, E. (2015). The integrated measuring of working capital management efficiency on financial performance in Indonesia stock exchange. *Information Management and Business Review, 7(3)*, 26-33.

Deloof, M. (2003). Does working capital management affect profitability of Belgian firms? *Journal of business finance & Accounting, 30*(3-4), 573-588.

Eljelly, A. M. (2004). Liquidity-profitability tradeoff: An empirical investigation in an emerging market. *International journal of commerce and management, 14*(2), 48-61.

Erkens, D. H., Hung, M., & Matos, P. (2012). Corporate governance in the 2007–2008 financial crisis: Evidence from financial institutions worldwide. *Journal of corporate finance, 18*(2), 389-411.

Falope, O. I., & Ajilore, O. T. (2009). Working capital management and corporate profitability: evidence from panel data analysis of selected quoted companies in Nigeria. *Research journal of business management, 3*(3), 73-84.

Fitzgerald, J., Gottschalk, P., & Moffitt, R. A. (1998). An analysis of sample attrition in panel data: The Michigan Panel Study of Income Dynamics. In (pp. 1-56): National Bureau of Economic Research Cambridge, Mass., USA.

Foster, J. B., & Magdoff, F. (2009). *The Great Financial Crisis: Causes and Consequences*. New York: NYU Press.

Frank, N., & Hesse, H. (2009). *FInancial Spillovers to Emerging Markets During the Global Financial Crisis*: International Monetary Fund.

Frankel, J., & Saravelos, G. (2012). Can leading indicators assess country vulnerability? Evidence from the 2008–09 global financial crisis. *Journal of International Economics, 87*(2), 216-231.

Gill, A., Biger, N., & Mathur, N. (2010). The relationship between working capital management and profitability: Evidence from the United States. *Business and Economics Journal, BEJ-10*, 1-9.

Gill, A., Biger, N., & Mathur, N. (2011). The effect of capital structure on profitability: Evidence from the United States. *International Journal of Management, 28*(4), 3-15.

Gujarati, D., & Porter, D. (2010). *Essentials of Econometrics* (4 ed.). New York: McGraw-Hill/Irwin.

Hampton, J. J., & Wagner, C. L. (1989). *Working Capital Management*. New York: John Wiley & Sons.

Haron, R., & Nomran, M., Naji. (2016). Determinants of working capital management before, during, and after the global financial crisis of 2008: Evidence from Malaysia. *The Journal of Developing Areas, 50(5)*, 461-468.

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica: Journal of the econometric society*, 1251-1271.

Hill, M. D., Kelly, G. W., & Highfield, M. J. (2010). Net operating working capital behavior: a first look. *Financial management, 39*(2), 783-805.

Hsiao, C. (1985). Benefits and limitations of panel data. *Econometric Reviews, 4*(1), 121-174.

Hsiao, C. (2007). Panel data analysis—advantages and challenges. *Test, 16*(1), 1-22.

Hsiao, C. (2014). *Analysis of panel data*: Cambridge University Press.

IASB. (2017). International Financial Reporting Standards. In *IAS 1: Presentation of Financial Statements*. London: LexisNexis.

Ivashina, V., & Scharfstein, D. (2008). Bank Lending during the financial crisis of 2008. *Journal of Finance economics, 97(3)*, 319-338.

Jose, M. L., Lancaster, C., & Stevens, J. L. (1996). Corporate returns and cash conversion cycles. *Journal of Economics and finance, 20*(1), 1-33.

Juan García-Teruel, P., & Martinez-Solano, P. (2007). Effects of working capital management on SME profitability. *International Journal of managerial finance, 3*(2), 164-177.

Karaduman, H. A., Akbas, H. E., Caliskan, A. O., & Durer, S. (2011). The relationship between working capital management and profitability: evidence from an emerging market. *International Research Journal of Finance and Economics, 62*(6), 61-67.

Karaduman, H. A., Akbas, H. E., Ozsozgun, A., & Durer, S. (2010). Effects of working capital management on profitability: the case for selected companies in the Istanbul stock exchange (2005-2008). *International Journal of Economics and Finance Studies, 2*(2), 47-54.

Keele, L., & Kelly, N. J. (2006). Dynamic models for dynamic theories: The ins and outs of lagged dependent variables. *Political analysis, 14*(2), 186-205.

Kesimli, I. G., & Günay, S. G. (2011). The impact of the global economic crisis on working capital of real sector in Turkey. *Business and Economic Horizons, 4*(1), 52-69.

Lamberg, S., & Vålming, S. (2009). Impact of Liquidity Management on Profitability: A study of the adaption of liquidity strategies in a financial crisis. In (pp. 1-82): UMEA School of Business.

Lamberson, M. (1995). Changes in Working Capital of Small Firms in Relation to Changes in Economic Activity. *American Journal of Business, 10*(2), 45-50.

Lazaridis, I., & Tryfonidis, D. (2006). Relationship between working capital management and profitability of listed companies in the Athens stock exchange. *Journal of Financial Management and Analysis, 19*(1), 1-12.

Lee Rodgers, J., & Nicewander, W. A. (1988). Thirteen ways to look at the correlation coefficient. *The American Statistician, 42*(1), 59-66.

Leedy, P. D., & Ormrod, J. E. (2015). *Practical Research: Planning and Design* (11 ed.). Essex: Pearson Education Limited.

Lyu, Y. (2015). Detection of outliers in panel data of intervention effects model based on variance of remainder disturbance. *Mathematical Problems in Engineering, 2015*, 1-12.

Makori, D. M., & Jagongo, A. (2013). Working capital management and firm profitability: Empirical evidence from manufacturing and construction firms listed on Nairobi securities exchange, Kenya. *International Journal of Accounting and Taxation, 1*(1), 1-14.

Mansoori, D. E., & Muhammad, D. (2012). The Effect of Working Capital Management on Firm's Profitability: Evidence from Singapore. *Interdisciplinary Journal of Contemporary Research in Business, 4*(5), 472-486.

Mathuva, D. (2010). The Influence of working capital management components on corporate profitability. *Research journal of business management, 4*(1), 1-11.

Meltzer, A. H. (1960). Mercantile credit, monetary policy, and size of firms. *The Review of Economics and Statistics*, 429-437.

Mian, S. L., & Smith Jr, C. W. (1992). Accounts receivable management policy: theory and evidence. *The journal of Finance, 47*(1), 169-200.

Miller, M. H. (1988). The Modigliani-Miller propositions after thirty years. *Journal of economic perspectives, 2*(4), 99-120.

Mnyande, M. (2012). *South Africa's macroeconomic outlook in the wake of the sovereign debt crisis and reforms to financial sector and regulation, South African Reserve Bank*.

Mohamad, N. E. A. B., & Saad, N. B. M. (2010). Working capital management: The effect of market valuation and profitability in Malaysia. *International Journal of Business and Management, 5*(11), 140.

Moss, J. D., & Stine, B. (1993). Cash conversion cycle and firm size: a study of retail firms. *Managerial Finance, 19*(8), 25-34.

Napompech, K. (2012). Effects of working capital management on the profitability of Thai listed firms. *International Journal of Trade, Economics and Finance, 3*(3), 227-232.

Nazir, M. S., & Afza, T. (2009). Impact of aggressive working capital management policy on firms' profitability. *IUP Journal of Applied Finance, 15*(8), 19-30.

Opler, T. C., & Titman, S. (1994). Financial distress and corporate performance. *The journal of Finance, 49*(3), 1015-1040.

Oseifuah, E. (2016). Determinants of Working Capital Requirements: Evidence from Selected Non-financial Firms Listed on the Johannesburg Securities Exchange. *The Journal of Accounting and Management, 6*(1), 35-45.

Oseifuah, E. (2018). Global Financial Crisis, Working Capital Management and Profitability of Nonfinancial Firms Listed On the Johannesburg Stock Exchange, South Africa. *Academy of Entrepreneurship Journal, 24*(3), 1-12.

Oseifuah, E. K., & Gyekye, A. (2017). Cash conversion cycle theory and corporate profitability: Evidence from non-financial firms listed on the Johannesburg Stock Exchange. *The Journal of Accounting and Management, 6*(3), 37-51.

Padachi, K. (2006). Trends in working capital management and its impact on firms' performance: an analysis of Mauritian small manufacturing firms. *International review of business research papers, 2*(2), 45-58.

Padayachee, V. (2016). Global economic recession: effects and implications for South Africa at a time of political challenges. . In (pp. 1-20): Claves de la Economia Mundial.

Pais, M. A., & Gama, P. M. (2015). Working capital management and SMEs profitability: Portuguese evidence. *International Journal of managerial finance, 11*(3), 341-358.

Petersen, M. A., & Rajan, R. G. (1997). Trade credit: theories and evidence. *The review of financial studies, 10*(3), 661-691.

Raddatz, C. (2008). *Credit chains and sectoral comovement: does the use of trade credit amplify sectoral shocks?* : The World Bank.

Raheman, A., & Nasr, M. (2007). Working capital management and profitability–case of Pakistani firms. *International review of business research papers, 3*(1), 279-300.

Ramiah, V., Zhao, Y., & Moosa, I. (2014). Working capital management during the global financial crisis: the Australian experience. *Qualitative Research in Financial Markets, 6*(3), 332-351.

Ricci, C., & Vito, N. (2000). International working capital practices in the UK. *European Financial Management, 6*(1), 69-84.

Richards, V. D., & Laughlin, E. J. (1980). A cash conversion cycle approach to liquidity analysis. *Financial management*, 32-38.

Roberts, M. R., & Whited, T. M. (2013). Endogeneity in empirical corporate finance1. In *Handbook of the Economics of Finance* (Vol. 2, pp. 493-572): Elsevier.

Salawu, R. O. (2007). Capital industry practice and aggressive conservative working capital policies in Nigeria. *Global Journal of Business Research, 1*(2), 109-117.

Samiloglu, F., & Demirgunes, K. (2008). The effect of working capital management on firm profitability: Evidence from Turkey. *The International journal of applied Economics and Finance, 2*(1), 44-50.

Schwartz, R. A. (1974). An economic model of trade credit. *Journal of financial and quantitative analysis, 9*(4), 643-657.

Sharma, A., & Kumar, S. (2011). Effect of working capital management on firm profitability: Empirical evidence from India. *Global Business Review, 12*(1), 159-173.

Shin, H.-H., & Soenen, L. (1998). Efficiency of working capital management and corporate profitability. *Financial practice and education, 8*, 37-45.

Smith, J. K. (1987). Trade credit and informational asymmetry. *The journal of Finance, 42*(4), 863-872.

Smith, K. (1980). Profitability versus Liquidity Trade off in Working Capital. *Journal of Cash Management, 5*(6), 64-68.

Smith, M. B., & Begemann, E. (1997). Measuring associations between working capital and return on investment. *South African Journal of Business Management, 28*(1), 1-5.

Tauringana, V., & Adjapong Afrifa, G. (2013). The relative importance of working capital management and its components to SMEs' profitability. *Journal of Small Business and Enterprise Development, 20*(3), 453-469.

Te Velde, D. W., Ahmed, M. M., Alemu, G., Bategeka, L., Calí, M., Castel-Branco, C., . . . Hangi, M. (2008). The global financial crisis and developing countries. *ODI Background Note. London: Overseas Development Institute*, 1-37.

Tsuruta, D., & Uchida, H. (2013). Real Driver of Trade Credit. *The Research Institute of Economy, Trade and Industry Discussion Paper Series*, 1-23.

Vural, G., Sökmen, A. G., & Çetenak, E. H. (2012). Affects of working capital management on firm's performance: evidence from Turkey. *International Journal of Economics and Financial Issues, 2*(4), 488-495.

Wang, Y.-J. (2002). Liquidity management, operating performance, and corporate value: evidence from Japan and Taiwan. *Journal of multinational financial management, 12*(2), 159-169.

Wanguu, K. C. (2015). The effect of aggressive working capital policy on profitability of non-financial firms listed at Nairobi securities exchange. *International journal of Commerce & Business studies, 3*(4), 15-24.

Weinraub, H. J., & Visscher, S. (1998). Industry practice relating to aggressive conservative working capital policies. *Journal of Financial and Strategic Decision, 11*(2), 11-18.

Wilkins, A. S. (2018). To lag or not to lag?: Re-evaluating the use of lagged dependent variables in regression analysis. *Political Science Research and Methods, 6*(2), 393-411.

Yang, X. (2011). The role of trade credit in the recent subprime financial crisis. *Journal of Economics and Business, 63*(5), 517-529.

Zariyawati, M. A., Annuar, M. N., Taufiq, H., & Rahim, A. A. (2009). Working capital management and corporate performance: Case of Malaysia. *Journal of Modern Accounting and Auditing, 5*(11), 47-54.

APPENDICES

Appendix A – Descriptive statistics for the Entire period (1998 to 2018)

Table 23: Descriptive Statistics (Mean) for the 'Entire' period

Variables	Mean
Return on Assets	0.178
Inventory Days	74.096
Accounts Receivable Days	78.0415
Accounts Payable Days	125.084
Cash Conversion Cycle	27.053
Leverage	0.579
Size	14.479
Growth in Sales	0.616

(Source: Authors Computation)

Appendix B – Correlation Coefficients for the Entire period (1998 to 2018)

Table 24: Correlation Coefficients for the 'Entire' period (1998 to 2018)

	INVD	ARD	APD	CCC	ROA	LEV	GS	SZ
INVD	**1**							
ARD	0.068**	**1**						
APD	0.229**	0.392**	**1**					
CCC	0.370**	0.209**	-0.663**	**1**				
ROA	-0.092**	-0.090**	-0.036	-0.066**	**1**			
LEV	-0.096**	0.010	0.223**	-0.275**	0.056**	**1**		
GS	-0.015	0.002	0.008	-0.016	0.042*	0.028	**1**	
SZ	-0.105**	-0.107**	-0.144**	0.026	0.159**	0.008	-0.023	**1**

***** Significant at the 0.05 level; ****** Significant at the 0.01 level

ROA: Return on Assets; **INVD**: Inventory Days; **ARD**: Accounts Receivable Days; **APD**: Accounts Payable Days; **CCC**: Cash Conversion Cycle; **LEV**: Leverage; **SZ**: Size; **GS**: Growth in Sales

Table 25: Correlation coefficients for the period 'Before' the financial crisis (1998 to 2006)

	INVD	ARD	APD	CCC	ROA	LEV	GS	SZ
INVD	**1**							
ARD	0.220******	**1**						
APD	0.352******	0.377******	**1**					
CCC	0.352******	0.161******	-0.674******	**1**				
ROA	-0.158******	-0.048	-0.019	-0.099******	**1**			
LEV	-0.132******	-0.029	0.169******	-0.274******	0.027	**1**		
GS	-0.022	0.008	0.012	-0.023	0.050	0.051	**1**	
SZ	-0.179******	-0.058	-0.135******	0.004	0.257******	-0.067*****	-0.026	**1**

***** Significant at the 0.05 level; ****** Significant at the 0.01 level

ROA: Return on Assets; **INVD**: Inventory Days; **ARD**: Accounts Receivable Days; **APD**: Accounts Payable Days; **CCC**: Cash Conversion Cycle; **LEV**: Leverage; **SZ**: Size; **GS**: Growth in Sales

Table 26: Correlation coefficients for the period 'During' the financial crisis (2007 to 2009)

	INVD	**ARD**	**APD**	**CCC**	**ROA**	**LEV**	**GS**	**SZ**
INVD	**1**							
ARD	-0.017	**1**						
APD	0.133******	0.390******	**1**					
CCC	0.315******	0.044	-0.801******	**1**				
ROA	-0.018	-0.135******	-0.008	-0.061	**1**			
LEV	-0.064	-0.000	0.238******	-0.278******	0.257******	**1**		
GS	-0.022	0.017	0.043	-0.048	0.144******	0.051	**1**	
SZ	-0.059	-0.187******	-0.216******	0.111******	0.138******	-0.099*****	-0.008	**1**

***** Significant at the 0.05 level; ****** Significant at the 0.01 level

ROA: Return on Assets; **INVD**: Inventory Days; **ARD**: Accounts Receivable Days; **APD**: Accounts Payable Days; **CCC**: Cash Conversion Cycle; **LEV**: Leverage; **SZ**: Size; **GS**: Growth in Sales

Table 27: Correlation coefficients for the period 'After' the financial crisis (2010 to 2018)

	INVD	**ARD**	**APD**	**CCC**	**ROA**	**LEV**	**GS**	**SZ**
INVD	**1**							
ARD	0.007	**1**						
APD	0.166******	0.342******	**1**					
CCC	0.288******	0.240******	-0.729******	**1**				
ROA	-0.038	-0.107******	-0.080******	0.001	**1**			
LEV	-0.067*****	0.033	0.263******	-0.275******	-0.049	**1**		
GS	-0.008	-0.013	-0.017	0.006	0.037	0.040	**1**	
SZ	-0.061*****	-0.146******	-0.155******	0.043	0.143******	0.120******	-0.037	**1**

***** Significant at the 0.05 level; ****** Significant at the 0.01 level

ROA: Return on Assets; **INVD**: Inventory Days; **ARD**: Accounts Receivable Days; **APD**: Accounts Payable Days; **CCC**: Cash Conversion Cycle; **LEV**: Leverage; **SZ**: Size; **GS**: Growth in Sales

Appendix C – Regression Results

1.1 Entire Period (1998 to 2018)

Model A:

Table 28: Pooled regression Full period:

Independent Variables	Coefficient for the Entire Period
Inventory Days	2.18E-09
Leverage	-0.024176
Firm Size	**0.064044*** **
Growth in Sales	0.000526
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1	

Model B:

Table 29: Pooled regression Full period:

Independent Variables	Coefficient for the Entire Period
Accounts Receivable Days	7.81E-07
Leverage	**-0.231912*** **
Firm Size	**0.059121*** **
Growth in Sales	-0.000140
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1	

Model C:

Table 30: Pooled regression Full period:

Independent Variables	Coefficient for the Entire Period
Accounts Payable Days	7.19E-10
Leverage	-0.024177
Firm Size	**0.064045*** **
Growth in Sales	0.000526
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1	

Model D:

Table 31: Pooled regression Full period:

Independent Variables	**Coefficient for the Entire Period**
Cash Conversion Cycle	-1.19E-09
Leverage	**-0.232016*** **
Firm Size	**0.059074*** **
Growth in Sales	-0.000140
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1	

Model A:

Table 32: Fixed Effects Full period:

Independent Variables	**Coefficient for the Entire Period**
Inventory Days	-3.04E-09
Leverage	-0.141793
Firm Size	**0.484884***
Growth in Sales	-0.000803
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1	

Model B:

Table 33: Fixed Effects Full period:

Independent Variables	**Coefficient for the Entire Period**
Accounts Receivable Days	-5.341590
Leverage	**5.84E-05*** **
Firm Size	-0.118022
Growth in Sales	**0.391772*** **
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1	

Model C:

Table 34: Fixed Effects Full period:

Independent Variables	Coefficient for the Entire Period
Accounts Payable Days	-9.96E-10
Leverage	-0.141790
Firm Size	**0.484884*** **
Growth in Sales	-0.000803
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1	

Model D:

Table 35: Fixed Effects Full period:

Independent Variables	Coefficient for the Entire Period
Cash Conversion Cycle	1.80E-09
Leverage	-0.134065
Firm Size	**0.369663*** **
Growth in Sales	-0.000159
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1	

1.2 Before, During and After the Financial Crisis

Model A:

Table 36: Fixed Effects for period Before, During and After the crisis

	Before Crisis	During Crisis	After Crisis
Inventory Days	-9.20E-06	-0.001531	**6.36E-05***
Leverage	0.153694	0.266778	-0.045948
Firm Size	**0.187438**	**2.314096*** **	**0.070647*** **
Growth in Sales	-0.001410	**-1.912367*** **	**-0.001917** **
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1			

Model A:

Table 37: Random effects for period Before, During and After the crisis

	Before Crisis	During Crisis	After Crisis
Inventory Days	2.85E-09	-0.001686	-1.30E-05
Leverage	0.069438	-0.040582	-0.039619
Firm Size	0.060372	0.249655	0.016570
Growth in Sales	0.000567	-0.405689	-0.001023
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1			

Model B:

Table 38: Fixed Effects for period Before, During and After the crisis

	Before Crisis	During Crisis	After Crisis
Accounts Receivable Days	8.55E-05	-0.001838	**6.36E-05***
Leverage	0.094721	0.362186	-0.045948
Firm Size	0.144888	**1.795702**	**0.070647****
Growth in Sales	-0.000238	-0.002593	**-0.001917****
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1			

Model B:

Table 39: Random Effects for period Before, During and After the crisis

	Before Crisis	During Crisis	After Crisis
Accounts Receivable Days	4.33E-05	-0.000322	-3.05E-05
Leverage	0.039703	-0.112254	-0.361829
Firm Size	0.059993	0.189722	0.053958
Growth in Sales	0.000554	1.23E-05	-0.002573
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1			

Model C:

Table 40: Fixed effects for period Before, During and After the crisis

	Before Crisis	During Crisis	After Crisis
Accounts Payable Days	4.42E-06	-2.11E-06	-1.83E-06
Leverage	0.139911	0.273815	-0.043417
Firm Size	0.187238	**2.330535*** **	**0.067302*** **
Growth in Sales	-0.001413	**-1.915158*** **	**-0.001916** **
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1			

Model C:

Table 41: Random effects for period Before, During and After the crisis

	Before Crisis	During Crisis	After Crisis
Accounts Payable Days	9.37E-10	0.000166	-4.41E-06
Leverage	0.069435	-0.027319	-0.035196
Firm Size	0.060372	0.258653	0.016221
Growth in Sales	0.000567	-0.400943	-0.001041
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1			

Model D:

Table 42: Fixed Effects for period Before, During and After the crisis

	Before Crisis	During Crisis	After Crisis
Cash Conversion Cycle	6.94E-10	-0.000811	**-1.15E-05*** **
Leverage	0.088321	0.334624	**-0.045499***
Firm Size	0.126295	**1.850865*** **	**0.069646*** **
Growth in Sales	-0.000239	-0.001100	**-0.002168** **
Levels of significance: *** **p**<0.01, ** **p**<0.05, * **p**<0.1			

Model D:

Table 43: Random Effects for period Before, During and After the crisis

	Before Crisis	During Crisis	After Crisis
Cash Conversion Cycle	-1.32E-09	-0.000170	-1.49E-05
Leverage	0.034808	-0.119585	-0.360117
Firm Size	0.058178	0.197633	0.060887
Growth in Sales	0.000556	4.93E-05	-0.002172
Levels of significance: ***** **p**<0.01, ****** **p**<0.05, ***** **p**<0.1			

Appendix D – Influential Observations

Outliers Attachments

Return on Assets vs the Individual components	**Model Number**
$ROA_{it} = \beta_0 + \beta_{Ai} INVD_{it} + \beta_{Ai} LEV_{it} + \beta_{Ai} SZ_{it} + \beta_{Ai} \Delta GS_{it} + v_{it} + \varepsilon_{it}$	**(A)**
$ROA_{it} = \beta_0 + \beta_{Bi} ARD_{it} + \beta_{Bi} LEV_{it} + \beta_{Bi} SZ_{it} + \beta_{Bi} \Delta GS_{it} + v_{it} + \varepsilon_{it}$	**(B)**
$ROA_{it} = \beta_0 + \beta_{Ci} APD_{it} + \beta_{Ci} LEV_{it} + \beta_{Ci} SZ_{it} + \beta_{Ci} \Delta GS_{it} + v_{it} + \varepsilon_{it}$	**(C)**
Return on Assets vs the CCC	
$ROA_{it} = \beta_0 + \beta_{Di} CCC_{it} + \beta_{Di} LEV_{it} + \beta_{Di} SZ_{it} + \beta_{Di} \Delta GS_{it} + v_{it} + \varepsilon_{it}$	**(D)**

Model A = INVD (Inventory Days)

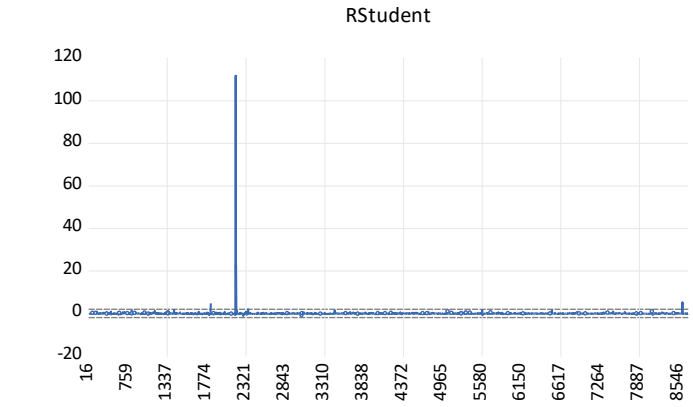
Model B= ARD (Accounts Receivable Days)

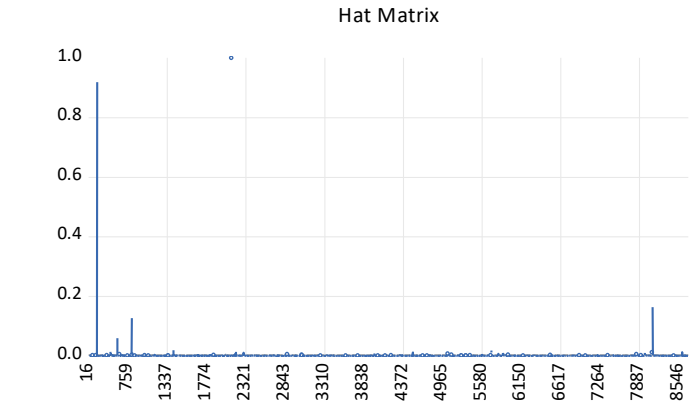
Model C = APD (Accounts Payable Days)

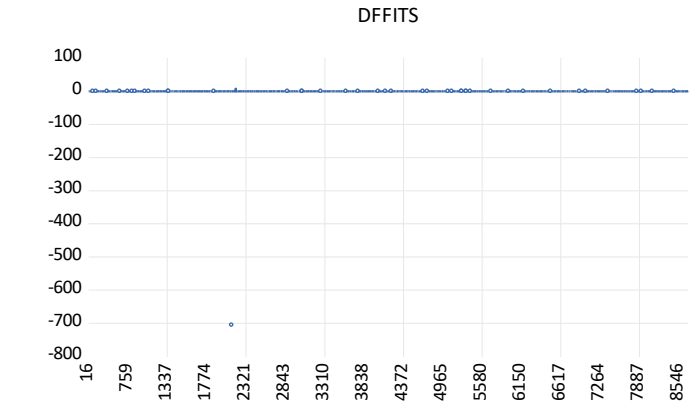
Model D = CCC (Cash Conversion Cycle)

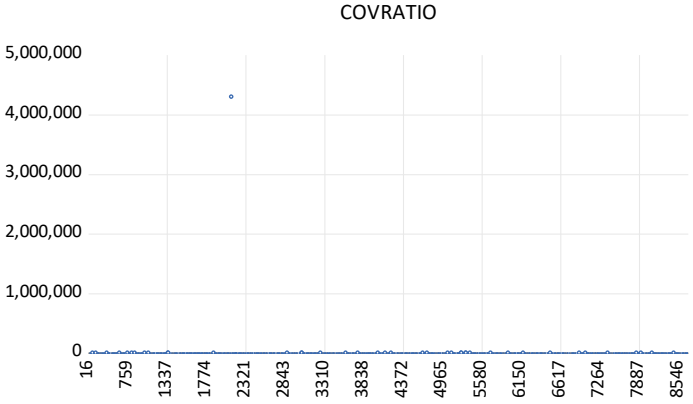
Influential Observations (Model A: INVD)

Leverage Statistics









Date: 09/10/19 Time: 09:02

Sample: 1 8673

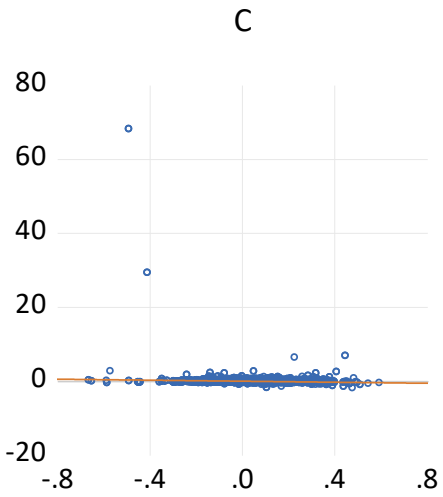
Included observations: 3047

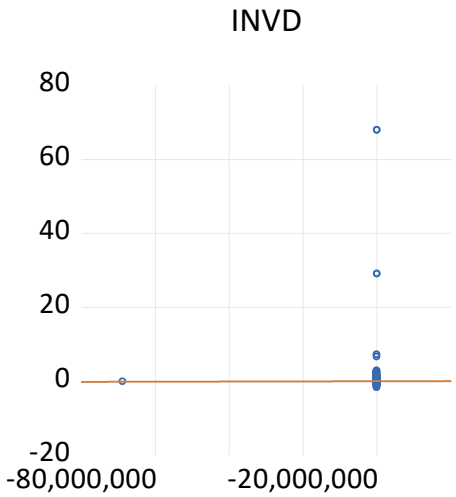
Observation	Residual	RStudent	DFFITS	COVRATIO	Hat Matrix
78	0.739558	0.537209	0.015089	1.001960	0.000788
181	1.117294	0.811615	0.021819	1.001284	0.000722
292	-0.680054	-0.494238	-0.021115	1.003071	0.001822
409	0.867357	0.629944	0.013294	1.001438	0.000445
479	1.343610	0.978741	0.077213	1.006293	0.006185
481	-0.646361	-0.470296	-0.030336	1.005447	0.004144
533	0.923705	0.671358	0.029172	1.002793	0.001885
534	-0.575555	-0.418340	-0.019075	1.003439	0.002075
536	-0.720194	-0.523541	-0.025211	1.003516	0.002314
615	-0.618167	-0.449087	-0.014681	1.002383	0.001068
655	0.696350	0.505921	0.017430	1.002412	0.001185
663	0.603789	0.438777	0.018038	1.003020	0.001687
665	0.580055	0.421536	0.017497	1.003078	0.001720
666	0.708953	0.515264	0.022541	1.003124	0.001910
667	0.610118	0.443351	0.017588	1.002898	0.001571
809	0.981365	0.714421	0.051112	1.005928	0.005092
810	2.331014	1.812731	0.692429	1.141614	0.127331
1112	-0.648472	-0.471546	-0.025586	1.004227	0.002935
1175	0.972034	0.706027	0.016958	1.001402	0.000577
1233	1.661752	1.208421	0.061888	1.001865	0.002616
1234	0.603211	0.438958	0.029234	1.005769	0.004416
1235	0.658112	0.479467	0.039437	1.008041	0.006720
1301	1.256256	0.912641	0.026534	1.001120	0.000845
1404	-0.807639	-0.586591	-0.013486	1.001608	0.000528
1483	2.791379	2.031010	0.108608	0.997724	0.002851
1658	0.713934	0.518510	0.011205	1.001670	0.000467
1706	-0.588096	-0.427450	-0.019360	1.003398	0.002047
1715	1.183076	0.859476	0.025396	1.001303	0.000872
1776	0.595532	0.432523	0.009800	1.001851	0.000513
1788	-0.909918	-0.660873	-0.014587	1.001414	0.000487
1790	-0.771243	-0.560120	-0.011308	1.001537	0.000407
1808	0.678006	0.492560	0.016016	1.002304	0.001056
1809	6.546719	4.773480	0.149000	0.965888	0.000973
1874	-0.689540	-0.500765	-0.009499	1.001593	0.000360
1926	0.634867	0.461084	0.010056	1.001772	0.000475
1950	-0.624788	-0.453739	-0.008670	1.001672	0.000365
1952	-0.883308	-0.641553	-0.014602	1.001486	0.000518
2009	0.906622	0.658513	0.016014	1.001523	0.000591
2081	-0.590356	-0.429493	-0.026909	1.005272	0.003910
2082	-0.568978	-0.413905	-0.025357	1.005122	0.003739
2083	-0.618331	-0.449810	-0.027577	1.005076	0.003745
2084	-0.682360	-0.496410	-0.030725	1.005075	0.003816
2085	-0.597440	-0.434613	-0.026663	1.005103	0.003750
2174	-0.892287	-0.650376	-0.056820	1.008589	0.007575

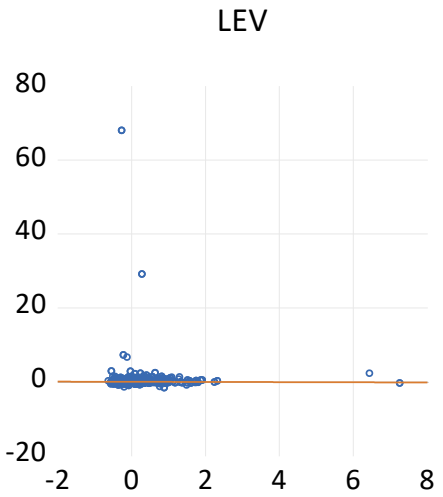
2175	67.91421	111.7456	8.457276	0.000290	0.005695
2177	29.05818	22.87884	1.299334	0.454190	0.003215
2179	1.559304	1.133246	0.043706	1.001020	0.001485
2250	-1.710919	-1.244729	-0.073491	1.002580	0.003474
2319	0.761355	0.553133	0.018463	1.002257	0.001113
2320	1.069326	0.776790	0.021843	1.001443	0.000790
2322	1.084268	0.787574	0.019377	1.001230	0.000605
2334	-0.836696	-0.607825	-0.018691	1.001984	0.000945
2345	2.685716	1.951572	0.036033	0.995736	0.000341
2825	-0.601922	-0.437163	-0.009876	1.001842	0.000510
3124	-1.361729	-0.990487	-0.056637	1.003301	0.003259
3140	1.339797	0.973806	0.041132	1.001869	0.001781
3216	-0.612449	-0.444903	-0.013583	1.002253	0.000931
3418	-0.628344	-0.456444	-0.013729	1.002208	0.000904
3419	2.045014	1.485722	0.032668	0.998500	0.000483
3420	1.351672	0.981731	0.018060	1.000398	0.000338
3421	0.715835	0.519873	0.010346	1.001597	0.000396
3681	1.033525	0.750749	0.020038	1.001430	0.000712
3846	0.659332	0.478823	0.008920	1.001615	0.000347
4309	0.848225	0.616600	0.029211	1.003266	0.002239
4592	0.930300	0.676535	0.037202	1.003918	0.003015
4803	0.704095	0.511508	0.016418	1.002246	0.001029
4804	0.576269	0.418658	0.014005	1.002477	0.001118
5027	1.197513	0.872464	0.071021	1.007022	0.006583
5580	2.349546	1.710299	0.110246	1.000984	0.004138
5581	-1.130218	-0.822016	-0.046407	1.003722	0.003177
5582	-0.979317	-0.711988	-0.035333	1.003276	0.002457
5762	0.720790	0.525261	0.044708	1.008444	0.007193
5795	-0.778920	-0.565743	-0.013569	1.001694	0.000575
5871	-0.944553	-0.688786	-0.063632	1.009406	0.008462
5978	0.680935	0.494616	0.013694	1.002010	0.000766
6524	2.188003	1.589931	0.044636	0.998279	0.000788
6859	0.675348	0.490579	0.014320	1.002102	0.000851
6860	0.970100	0.704737	0.021201	1.001734	0.000904
6861	0.884605	0.642819	0.025122	1.002494	0.001525
6862	0.736293	0.535469	0.030077	1.004332	0.003145
7320	0.825706	0.599691	0.012695	1.001502	0.000448
7326	0.636048	0.462002	0.012525	1.002030	0.000734
7354	0.649058	0.471372	0.009383	1.001676	0.000396
7355	0.619880	0.450170	0.008397	1.001660	0.000348
7356	0.614290	0.446120	0.008855	1.001712	0.000394
7357	0.726219	0.527414	0.010430	1.001579	0.000391
7358	0.709785	0.515538	0.012883	1.001833	0.000624
7359	0.638096	0.463555	0.014798	1.002312	0.001018
7365	0.603239	0.438439	0.019451	1.003300	0.001964
7546	1.246882	0.906393	0.041461	1.002386	0.002088
7658	0.748349	0.543507	0.011716	1.001624	0.000464
7659	0.697202	0.506382	0.012039	1.001789	0.000565
7664	1.379098	1.002272	0.039673	1.001559	0.001564
7852	-0.737012	-0.535558	-0.020980	1.002709	0.001532
8183	1.158381	0.846038	0.091200	1.012093	0.011487

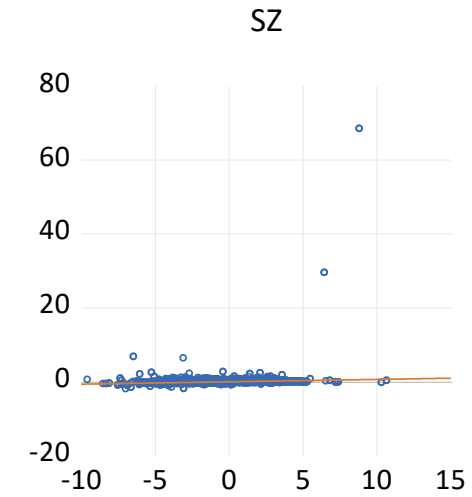
8188	-1.534346	-1.116264	-0.066784	1.003174	0.003567
8281	0.573718	0.416661	0.008608	1.001787	0.000427
8369	0.584544	0.424744	0.016265	1.002817	0.001464
8398	0.616281	0.447884	0.019077	1.003132	0.001811
8603	7.160620	5.230617	0.292610	0.960776	0.003120

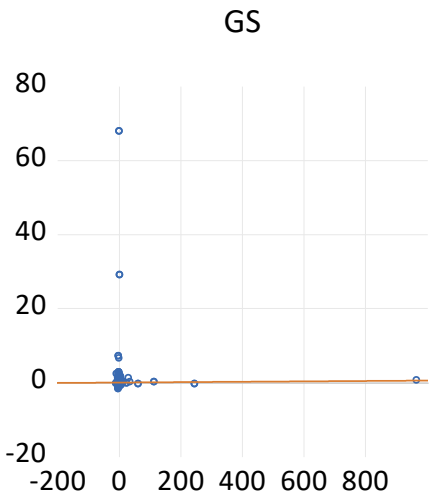
Leverage Statistics





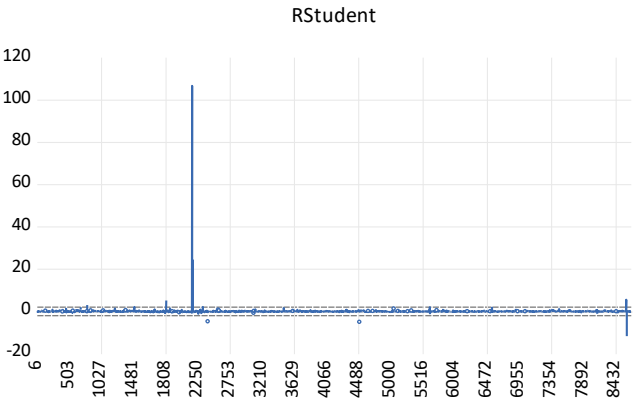


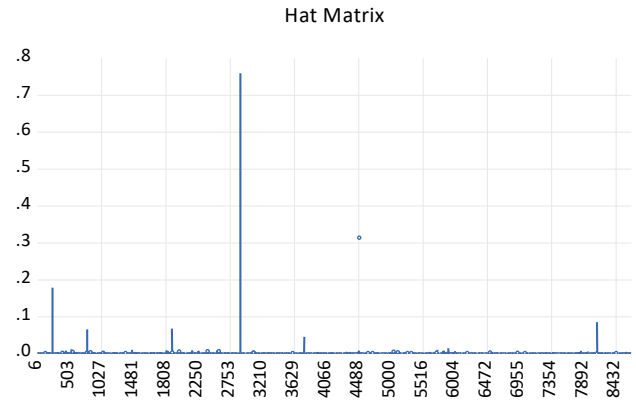


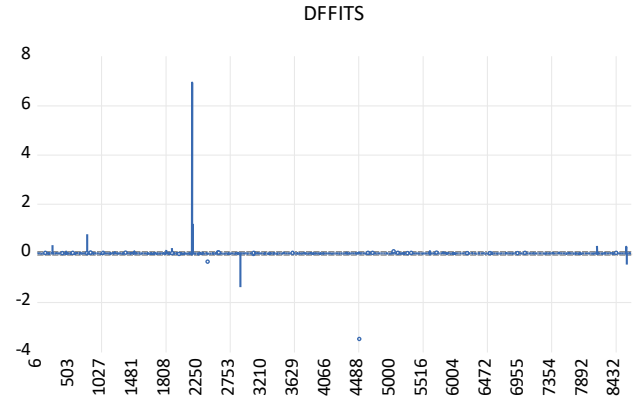


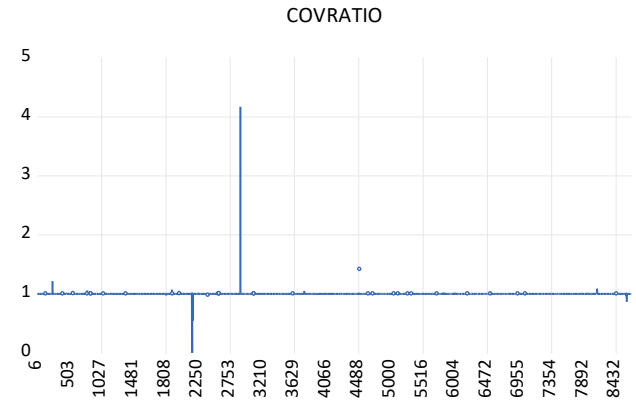
Influential Observations (Model B: ARD)

Leverage Statistics









Date: 09/10/19 Time: 09:07

Sample: 1 8673

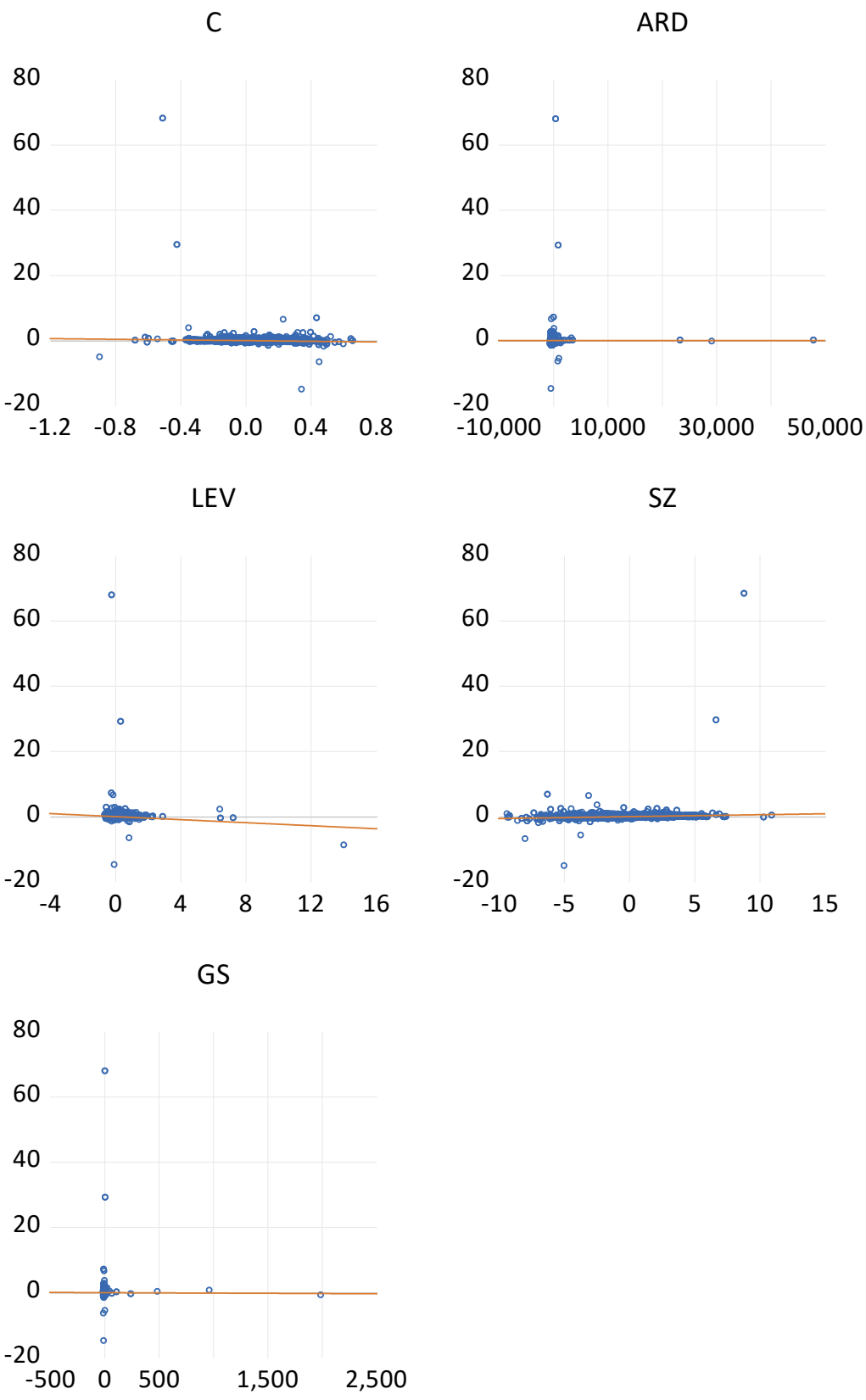
Included observations: 3694

Observation	Residual	RStudent	DFFITS	COVRATIO	Hat Matrix
78	0.749027	0.581377	0.014437	1.001335	0.000616
181	1.157266	0.898261	0.020709	1.000741	0.000531
182	0.833702	0.713794	0.332856	1.218101	0.178614
292	-0.770244	-0.598044	-0.021389	1.001977	0.001277
409	0.865013	0.671324	0.012640	1.000950	0.000354
477	0.744186	0.579789	0.052348	1.008878	0.008086
479	1.498536	1.165300	0.074443	1.003692	0.004064
481	-0.774955	-0.602201	-0.032649	1.003633	0.002931
533	0.828245	0.643093	0.023289	1.001948	0.001310
534	-0.681641	-0.529282	-0.019981	1.002207	0.001423
536	-0.824269	-0.640103	-0.025726	1.002256	0.001613
654	0.660919	0.513250	0.020874	1.002454	0.001651
655	0.808401	0.627498	0.016840	1.001378	0.000720
725	1.011251	0.784947	0.019855	1.001056	0.000639
726	1.687203	1.309815	0.032710	0.999848	0.000623
727	2.572511	1.998340	0.070620	0.998007	0.001247
809	1.194682	0.928449	0.050785	1.003142	0.002983
810	3.663610	2.945072	0.784079	1.062019	0.066189
958	0.664716	0.516032	0.016373	1.001803	0.001006
1175	0.995544	0.772672	0.016006	1.000866	0.000429
1233	1.740040	1.351658	0.057596	1.000918	0.001812
1234	0.782878	0.608284	0.031577	1.003380	0.002688
1235	0.918802	0.714313	0.044209	1.004363	0.003816
1301	1.348992	1.047135	0.024894	1.000461	0.000565
1404	-0.818922	-0.635569	-0.012920	1.001060	0.000413
1483	2.672127	2.076570	0.092409	0.998391	0.001976
1658	0.681814	0.529132	0.009856	1.001128	0.000347
1715	1.187719	0.921970	0.023986	1.000840	0.000676
1748	-0.659244	-0.511723	-0.014207	1.001572	0.000770
1788	-0.852580	-0.661673	-0.012403	1.000961	0.000351
1790	-0.792366	-0.614926	-0.010919	1.000990	0.000315
1809	6.522617	5.080455	0.138149	0.974271	0.000739
1862	1.751992	1.360170	0.035270	0.999751	0.000672
1874	-0.660572	-0.512630	-0.008676	1.001086	0.000286
1893	0.983020	0.790242	0.213912	1.073711	0.068271
1952	-0.925111	-0.717979	-0.013902	1.000900	0.000375
1976	-0.825405	-0.641985	-0.044199	1.005380	0.004718
2009	0.908595	0.705191	0.015231	1.001012	0.000466
2174	-0.896966	-0.697961	-0.052392	1.006194	0.005603
2175	67.90013	106.7870	6.942422	0.003588	0.004209
2177	29.15223	24.40629	1.194500	0.551412	0.002390
2179	1.655822	1.285723	0.041879	1.000353	0.001060
2250	-1.527669	-1.186745	-0.053386	1.001580	0.002020
2319	0.736048	0.571361	0.016387	1.001554	0.000822
2320	1.073623	0.833360	0.020676	1.000947	0.000615

2322	1.122018	0.870869	0.018877	1.000732	0.000470
2334	-0.882283	-0.684836	-0.017692	1.001244	0.000667
2336	-0.791266	-0.614156	-0.014888	1.001263	0.000587
2345	2.689238	2.088106	0.034889	0.996644	0.000279
2399	-6.388141	-4.985957	-0.356835	0.979540	0.005096
2554	0.722280	0.561170	0.028617	1.003345	0.002594
2825	-0.641502	-0.497852	-0.009627	1.001190	0.000374
2871	-0.974932	-0.757776	-0.043871	1.003815	0.003341
3124	-1.205776	-0.936606	-0.041822	1.002127	0.001990
3140	1.246117	0.967583	0.034027	1.001306	0.001235
3141	0.830394	0.644739	0.022697	1.001874	0.001238
3419	2.081825	1.616170	0.031599	0.998636	0.000382
3420	1.365409	1.059731	0.017661	1.000144	0.000278
3421	0.742878	0.576515	0.010174	1.001036	0.000311
3681	0.979165	0.759986	0.017091	1.000964	0.000505
3846	0.679277	0.527146	0.008838	1.001064	0.000281
4309	0.915679	0.711084	0.028203	1.002110	0.001571
4313	0.834956	0.648668	0.032005	1.003064	0.002429
4486	0.713286	0.554584	0.035325	1.004811	0.004041
4487	0.801653	0.623968	0.049222	1.006889	0.006184
4496	-5.529198	-5.193194	-3.501787	1.414444	0.312566
4592	1.106546	0.859407	0.035947	1.002033	0.001746
4803	0.733083	0.569042	0.015733	1.001498	0.000764
5027	1.464749	1.138799	0.069245	1.003374	0.003684
5580	2.472173	1.921769	0.100992	0.999839	0.002754
5581	-1.157660	-0.899396	-0.043875	1.002587	0.002374
5582	-1.060611	-0.823739	-0.034797	1.002134	0.001781
5762	0.913738	0.710643	0.048132	1.005127	0.004566
5795	-0.743170	-0.576776	-0.011938	1.001152	0.000428
6524	2.257265	1.752648	0.042105	0.998333	0.000577
6859	0.647272	0.502398	0.012771	1.001458	0.000646
6860	0.963196	0.747660	0.019681	1.001171	0.000692
6861	0.981090	0.761665	0.023946	1.001444	0.000987
6862	0.915935	0.711368	0.030317	1.002353	0.001813
7320	0.817776	0.634660	0.011954	1.001003	0.000355
7326	0.703431	0.545962	0.012676	1.001301	0.000539
7356	0.653590	0.507216	0.008892	1.001113	0.000307
7357	0.765781	0.594289	0.010360	1.001006	0.000304
7358	0.784865	0.609137	0.012519	1.001105	0.000422
7359	0.747123	0.579901	0.014495	1.001345	0.000624
7365	0.753440	0.584953	0.019701	1.001848	0.001133
7546	1.363815	1.059045	0.038510	1.001190	0.001321
7657	0.665943	0.516811	0.009428	1.001128	0.000333
7658	0.781029	0.606139	0.011432	1.001042	0.000356
7659	0.676475	0.525012	0.010973	1.001223	0.000437
7664	1.276062	0.990743	0.031920	1.001058	0.001037
7852	-0.786156	-0.610357	-0.020590	1.001819	0.001137
8180	0.844592	0.656151	0.032288	1.003040	0.002416
8182	0.770072	0.598964	0.041537	1.005508	0.004786
8183	1.385658	1.079103	0.090800	1.006901	0.007030
8187	1.224020	0.993260	0.303722	1.093519	0.085508

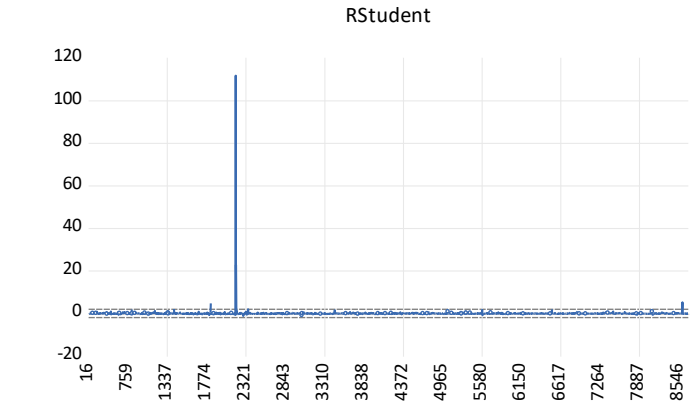
8188	-1.589131	-1.234902	-0.063679	1.002089	0.002652
8525	-1.165598	-0.904627	-0.015817	1.000503	0.000306
8603	7.103120	5.540621	0.266951	0.970692	0.002316
8607	-14.84043	-11.73628	-0.449095	0.865815	0.001462

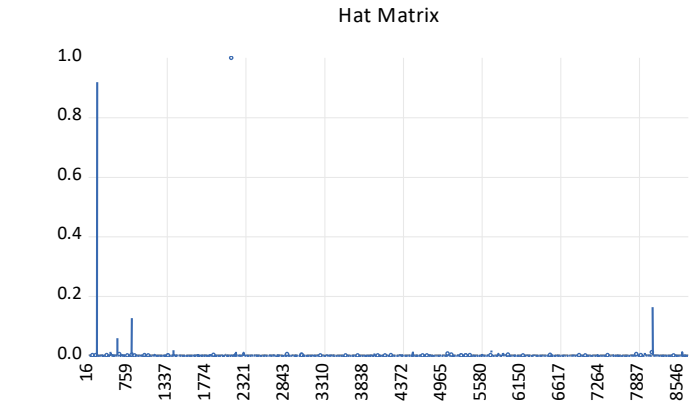
Leverage Statistics

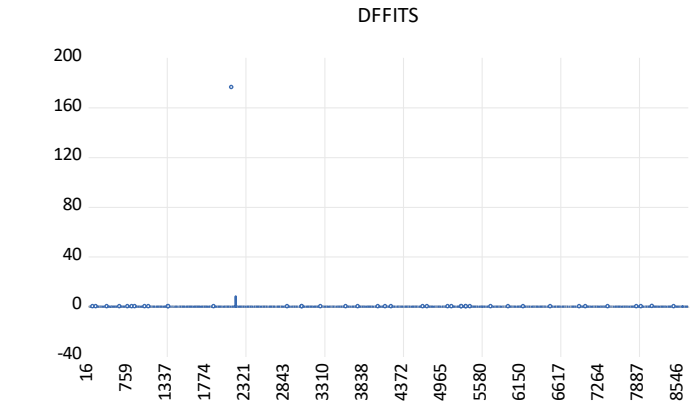


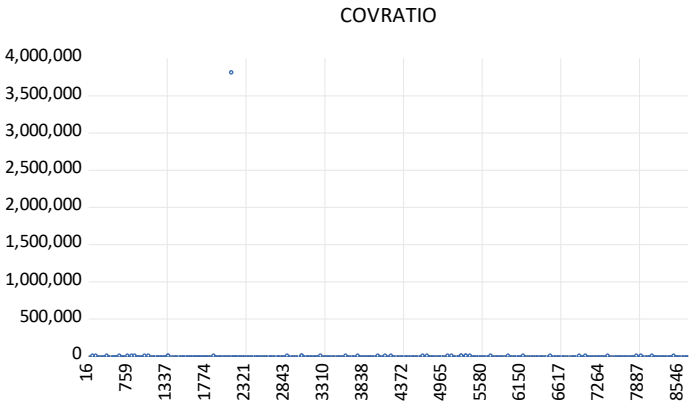
Influential Observations (Model C: APD)

Leverage Statistics









Date: 09/10/19 Time: 09:10

Sample: 1 8673

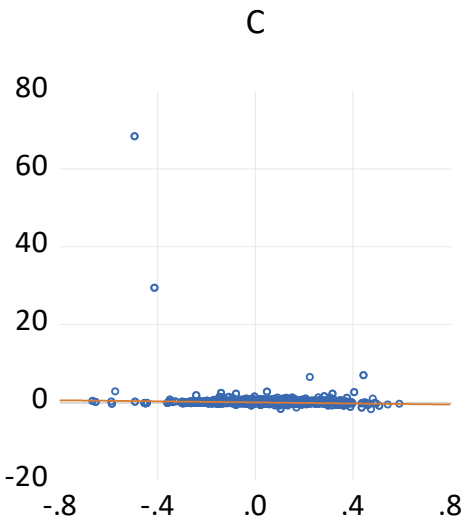
Included observations: 3047

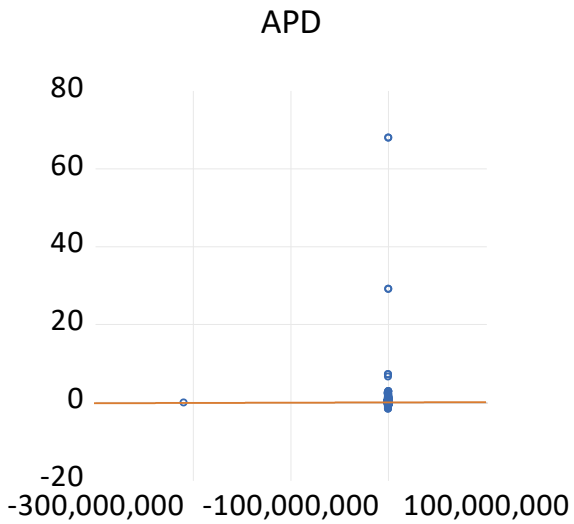
Observation	Residual	RStudent	DFFITS	COVRATIO	Hat Matrix
78	0.739558	0.537209	0.015089	1.001960	0.000788
181	1.117294	0.811615	0.021819	1.001284	0.000722
292	-0.680054	-0.494238	-0.021115	1.003071	0.001822
409	0.867358	0.629944	0.013294	1.001438	0.000445
479	1.343615	0.978744	0.077213	1.006293	0.006185
481	-0.646359	-0.470295	-0.030336	1.005447	0.004143
533	0.923705	0.671358	0.029172	1.002793	0.001885
534	-0.575555	-0.418340	-0.019075	1.003439	0.002075
536	-0.720195	-0.523542	-0.025211	1.003516	0.002314
615	-0.618167	-0.449087	-0.014681	1.002383	0.001068
655	0.696351	0.505921	0.017430	1.002412	0.001185
663	0.603788	0.438777	0.018038	1.003020	0.001687
665	0.580055	0.421536	0.017497	1.003078	0.001720
666	0.708952	0.515264	0.022541	1.003124	0.001910
667	0.610117	0.443351	0.017588	1.002898	0.001571
809	0.981366	0.714422	0.051112	1.005928	0.005092
810	2.331023	1.812738	0.692432	1.141614	0.127331
1112	-0.648471	-0.471545	-0.025586	1.004227	0.002935
1175	0.972031	0.706025	0.016958	1.001402	0.000577
1233	1.661753	1.208421	0.061888	1.001865	0.002616
1234	0.603212	0.438959	0.029234	1.005769	0.004416
1235	0.658113	0.479469	0.039437	1.008041	0.006720
1301	1.256256	0.912641	0.026534	1.001120	0.000845
1404	-0.807639	-0.586591	-0.013486	1.001608	0.000528
1483	2.791378	2.031010	0.108608	0.997724	0.002851
1658	0.713934	0.518510	0.011205	1.001670	0.000467
1706	-0.588096	-0.427450	-0.019360	1.003398	0.002047
1715	1.183076	0.859476	0.025396	1.001303	0.000872
1776	0.595532	0.432523	0.009800	1.001851	0.000513
1788	-0.909918	-0.660873	-0.014587	1.001414	0.000487
1790	-0.771243	-0.560120	-0.011308	1.001537	0.000407
1808	0.678006	0.492560	0.016016	1.002304	0.001056
1809	6.546719	4.773480	0.149000	0.965888	0.000973
1874	-0.689540	-0.500765	-0.009499	1.001593	0.000360
1926	0.634866	0.461084	0.010056	1.001772	0.000475
1950	-0.624788	-0.453739	-0.008670	1.001672	0.000365
1952	-0.883308	-0.641554	-0.014602	1.001486	0.000518
2009	0.906621	0.658513	0.016014	1.001523	0.000591
2081	-0.590356	-0.429494	-0.026909	1.005272	0.003910
2082	-0.568979	-0.413905	-0.025358	1.005122	0.003739
2083	-0.618331	-0.449810	-0.027577	1.005076	0.003745
2084	-0.682361	-0.496410	-0.030725	1.005075	0.003816
2085	-0.597440	-0.434613	-0.026663	1.005103	0.003750
2174	-0.892288	-0.650377	-0.056820	1.008589	0.007575
2175	67.91420	111.7456	8.457283	0.000290	0.005695
2177	29.05818	22.87884	1.299334	0.454190	0.003215

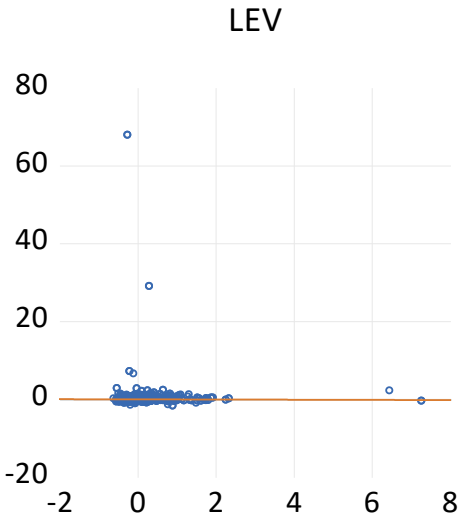
2179	1.559304	1.133246	0.043706	1.001020	0.001485
2250	-1.710918	-1.244728	-0.073491	1.002580	0.003474
2319	0.761354	0.553133	0.018463	1.002257	0.001113
2320	1.069326	0.776790	0.021843	1.001443	0.000790
2322	1.084268	0.787574	0.019377	1.001230	0.000605
2334	-0.836697	-0.607825	-0.018691	1.001984	0.000945
2345	2.685716	1.951572	0.036033	0.995736	0.000341
2825	-0.601922	-0.437163	-0.009876	1.001842	0.000510
3124	-1.361728	-0.990486	-0.056636	1.003301	0.003259
3140	1.339797	0.973806	0.041132	1.001869	0.001781
3216	-0.612450	-0.444903	-0.013583	1.002253	0.000931
3418	-0.628344	-0.456444	-0.013729	1.002208	0.000904
3419	2.045014	1.485722	0.032668	0.998500	0.000483
3420	1.351672	0.981731	0.018060	1.000398	0.000338
3421	0.715835	0.519873	0.010346	1.001597	0.000396
3681	1.033524	0.750748	0.020038	1.001430	0.000712
3846	0.659332	0.478823	0.008920	1.001615	0.000347
4309	0.848225	0.616601	0.029211	1.003266	0.002239
4592	0.930302	0.676536	0.037202	1.003918	0.003015
4803	0.704095	0.511508	0.016418	1.002246	0.001029
4804	0.576270	0.418659	0.014005	1.002477	0.001118
5027	1.197515	0.872466	0.071021	1.007022	0.006583
5580	2.349547	1.710299	0.110246	1.000984	0.004138
5581	-1.130218	-0.822016	-0.046407	1.003722	0.003177
5582	-0.979317	-0.711988	-0.035333	1.003276	0.002457
5762	0.720791	0.525262	0.044708	1.008444	0.007193
5795	-0.778920	-0.565743	-0.013569	1.001694	0.000575
5871	-0.944551	-0.688785	-0.063632	1.009406	0.008462
5978	0.680935	0.494616	0.013694	1.002010	0.000766
6524	2.188003	1.589931	0.044636	0.998279	0.000788
6859	0.675348	0.490578	0.014320	1.002102	0.000851
6860	0.970100	0.704737	0.021201	1.001734	0.000904
6861	0.884605	0.642820	0.025122	1.002494	0.001525
6862	0.736294	0.535470	0.030077	1.004332	0.003145
7320	0.825706	0.599690	0.012695	1.001502	0.000448
7326	0.636048	0.462002	0.012525	1.002030	0.000734
7354	0.649057	0.471372	0.009383	1.001676	0.000396
7355	0.619880	0.450170	0.008397	1.001660	0.000348
7356	0.614290	0.446120	0.008855	1.001712	0.000394
7357	0.726219	0.527414	0.010430	1.001579	0.000391
7358	0.709785	0.515538	0.012883	1.001833	0.000624
7359	0.638096	0.463555	0.014798	1.002312	0.001018
7365	0.603240	0.438439	0.019451	1.003300	0.001964
7546	1.246883	0.906394	0.041461	1.002386	0.002088
7658	0.748349	0.543507	0.011716	1.001624	0.000464
7659	0.697201	0.506382	0.012039	1.001789	0.000565
7664	1.379097	1.002272	0.039673	1.001559	0.001564
7852	-0.737012	-0.535558	-0.020980	1.002709	0.001532
8183	1.158351	0.846016	0.091197	1.012093	0.011487
8188	-1.534346	-1.116264	-0.066784	1.003174	0.003567
8281	0.573718	0.416661	0.008608	1.001787	0.000427

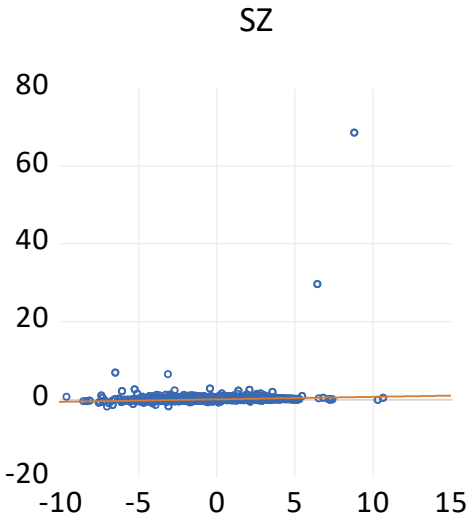
8369	0.584541	0.424742	0.016265	1.002817	0.001464
8398	0.616280	0.447884	0.019077	1.003132	0.001811
8603	7.160620	5.230617	0.292610	0.960776	0.003120

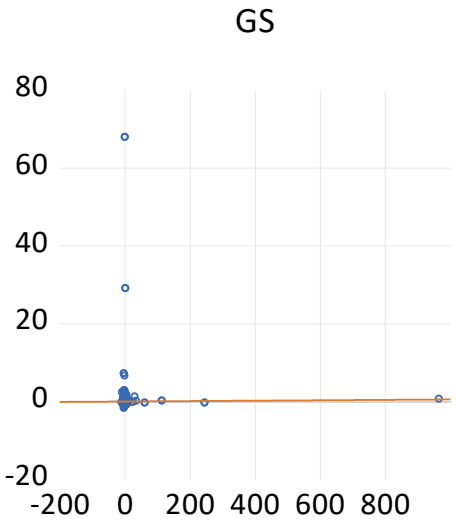
Leverage Statistics





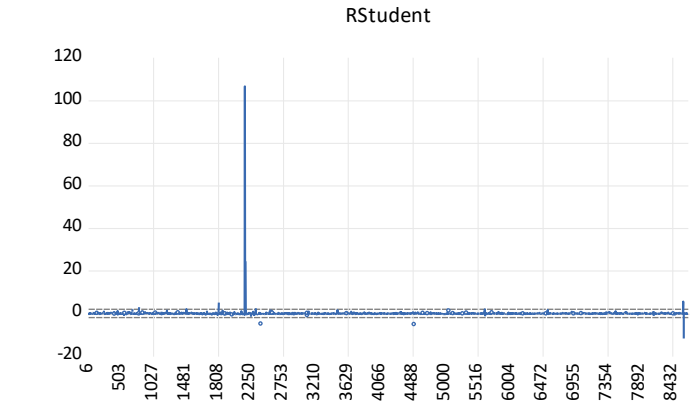


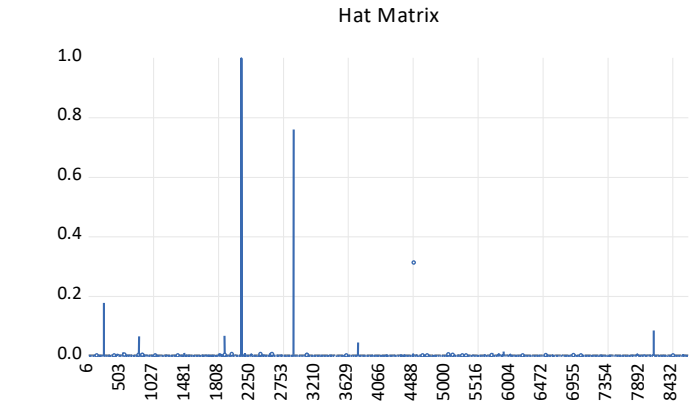


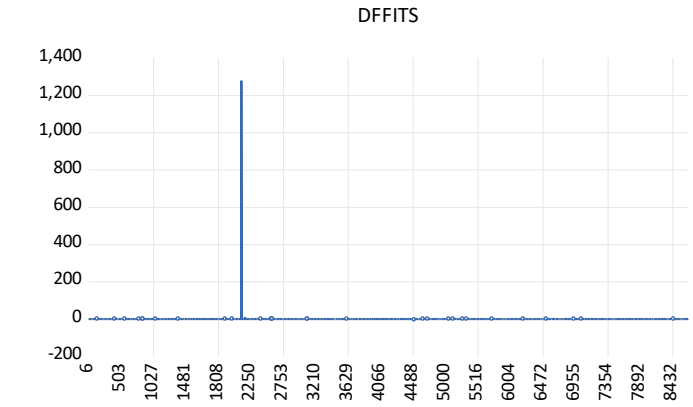


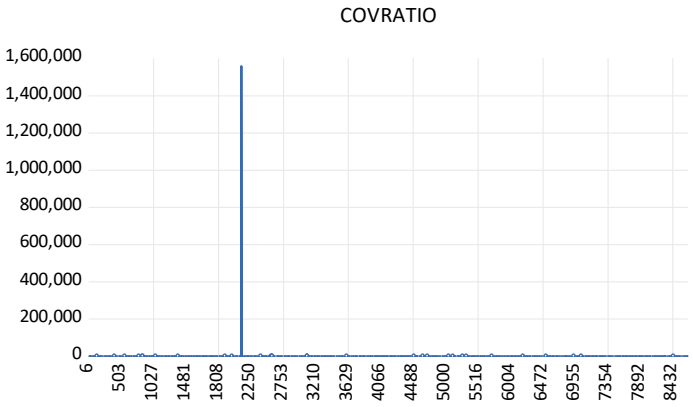
Influential Observations (Model D: CCC)

Leverage Statistics









Date: 09/10/19 Time: 09:13

Sample: 1 8673

Included observations: 3694

Observation	Residual	RStudent	DFFITS	COVRATIO	Hat Matrix
78	0.748967	0.581253	0.014435	1.001515	0.000616
181	1.157237	0.898118	0.020706	1.000794	0.000531
182	0.833704	0.713701	0.332813	1.218264	0.178614
292	-0.770286	-0.597997	-0.021388	1.002151	0.001278
409	0.864973	0.671203	0.012638	1.001100	0.000354
477	0.744238	0.579753	0.052345	1.009060	0.008086
479	1.498557	1.165161	0.074434	1.003595	0.004064
481	-0.774989	-0.602147	-0.032646	1.003806	0.002931
533	0.828202	0.642974	0.023285	1.002108	0.001310
534	-0.681685	-0.529246	-0.019980	1.002403	0.001423
536	-0.824311	-0.640050	-0.025724	1.002417	0.001613
654	0.660910	0.513175	0.020871	1.002655	0.001651
655	0.808378	0.627397	0.016837	1.001543	0.000720
725	1.011200	0.784803	0.019853	1.001161	0.000639
726	1.687178	1.309621	0.032706	0.999654	0.000623
727	2.572480	1.998050	0.070610	0.997198	0.001247
809	1.194696	0.928336	0.050779	1.003180	0.002983
810	3.663819	2.944851	0.784030	1.059816	0.066191
958	0.664688	0.515941	0.016371	1.002003	0.001006
1175	0.995506	0.772539	0.016004	1.000976	0.000429
1233	1.740033	1.351473	0.057588	1.000694	0.001812
1234	0.782888	0.608211	0.031573	1.003552	0.002688
1235	0.918824	0.714235	0.044204	1.004497	0.003816
1301	1.348954	1.046966	0.024891	1.000435	0.000565
1404	-0.818963	-0.635515	-0.012919	1.001222	0.000413
1483	2.672086	2.076262	0.092397	0.997496	0.001976
1658	0.681760	0.529019	0.009856	1.001324	0.000347
1715	1.187658	0.921800	0.023984	1.000881	0.000677
1748	-0.659311	-0.511707	-0.014208	1.001773	0.000770
1788	-0.852618	-0.661614	-0.012403	1.001114	0.000351
1790	-0.792419	-0.614885	-0.010920	1.001159	0.000315
1809	6.522581	5.079751	0.138134	0.967764	0.000739
1862	1.751934	1.359944	0.035267	0.999521	0.000672
1874	-0.660613	-0.512594	-0.008677	1.001287	0.000286
1893	0.983242	0.790317	0.213935	1.073822	0.068273
1952	-0.925163	-0.717924	-0.013903	1.001032	0.000375
1976	-0.825424	-0.641914	-0.044194	1.005541	0.004718
2009	0.908537	0.705053	0.015230	1.001149	0.000466
2174	-0.897070	-0.697949	-0.052393	1.006334	0.005604
2175	67.90003	106.7730	6.941788	0.000877	0.004209
2177	29.15217	24.40298	1.194375	0.474882	0.002390
2179	1.655773	1.285514	0.041874	1.000176	0.001060
2250	-1.527666	-1.186585	-0.053379	1.001470	0.002020
2319	0.735980	0.571232	0.016385	1.001737	0.000822
2320	1.073562	0.833202	0.020674	1.001030	0.000615

2322	1.121967	0.870713	0.018875	1.000798	0.000470
2334	-0.882350	-0.684797	-0.017693	1.001388	0.000667
2336	-0.791331	-0.614124	-0.014890	1.001433	0.000587
2345	2.689193	2.087793	0.034888	0.995738	0.000279
2399	-6.388112	-4.985270	-0.356787	0.973248	0.005096
2554	0.722252	0.561073	0.028612	1.003532	0.002594
2825	-0.641552	-0.497825	-0.009628	1.001395	0.000374
2871	-0.974931	-0.757674	-0.043865	1.003931	0.003341
3124	-1.205774	-0.936480	-0.041816	1.002161	0.001990
3140	1.246073	0.967421	0.034022	1.001324	0.001235
3141	0.830351	0.644620	0.022693	1.002033	0.001238
3419	2.081777	1.615917	0.031597	0.998201	0.000382
3420	1.365363	1.059553	0.017661	1.000112	0.000278
3421	0.742839	0.576409	0.010173	1.001217	0.000311
3681	0.979116	0.759847	0.017089	1.001079	0.000506
3846	0.679236	0.527043	0.008837	1.001261	0.000281
4309	0.915668	0.710980	0.028198	1.002245	0.001571
4313	0.834964	0.648588	0.032001	1.003222	0.002429
4486	0.713304	0.554524	0.035321	1.005000	0.004041
4487	0.801686	0.623911	0.049217	1.007056	0.006184
4496	-5.528693	-5.192059	-3.501096	1.404587	0.312575
4592	1.106544	0.859291	0.035942	1.002105	0.001746
4803	0.733057	0.568946	0.015731	1.001682	0.000764
5027	1.464769	1.138663	0.069236	1.003294	0.003684
5580	2.472180	1.921519	0.100978	0.999111	0.002754
5581	-1.157677	-0.899289	-0.043870	1.002640	0.002374
5582	-1.060645	-0.823655	-0.034794	1.002221	0.001781
5762	0.913765	0.710569	0.048127	1.005262	0.004566
5795	-0.743202	-0.576724	-0.011937	1.001334	0.000428
6524	2.257219	1.752379	0.042102	0.997774	0.000577
6859	0.647234	0.502302	0.012769	1.001661	0.000646
6860	0.963163	0.747535	0.019678	1.001292	0.000692
6861	0.981075	0.761551	0.023942	1.001558	0.000987
6862	0.915934	0.711273	0.030312	1.002487	0.001813
7320	0.817721	0.634533	0.011953	1.001165	0.000355
7326	0.703385	0.545854	0.012675	1.001492	0.000539
7356	0.653547	0.507116	0.008892	1.001315	0.000307
7357	0.765739	0.594177	0.010359	1.001182	0.000304
7358	0.784831	0.609029	0.012517	1.001276	0.000422
7359	0.747095	0.579802	0.014493	1.001526	0.000624
7365	0.753427	0.584865	0.019698	1.002028	0.001133
7546	1.363807	1.058898	0.038505	1.001158	0.001321
7657	0.665906	0.516713	0.009427	1.001327	0.000333
7658	0.780993	0.606031	0.011430	1.001214	0.000356
7659	0.676434	0.524910	0.010972	1.001420	0.000437
7664	1.276011	0.990572	0.031916	1.001064	0.001037
7852	-0.786190	-0.610302	-0.020588	1.001990	0.001137
8180	0.844558	0.656037	0.032283	1.003196	0.002416
8182	0.770051	0.598867	0.041530	1.005683	0.004786
8183	1.385648	1.078951	0.090787	1.006856	0.007030
8187	1.224210	0.993282	0.303731	1.093525	0.085509

8188	-1.589151	-1.234753	-0.063671	1.001946	0.002652
8525	-1.165639	-0.904539	-0.015817	1.000552	0.000306
8603	7.103098	5.539865	0.266916	0.962942	0.002316
8607	-14.84045	-11.73474	-0.449039	0.834876	0.001462

Leverage Statistics

