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THE IMPACT OF THE GLOBAL FINANCIAL CRISIS ON THE CASH FLOW SENSITIVITY OF INVESTMENT: SOME EVIDENCE FROM THE JOHANNESBURG STOCK EXCHANGE LISTED NON-FINANCIAL FIRMS

MUNTHALI ROLAND

STUDENT NO: 11628825

MASTER OF COMMERCE IN COST AND MANAGEMENT ACCOUNTING

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BY

MUNTHALI ROLAND

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Supervisor: Prof. V. Moyo   …………………..

Co-Supervisor: Mr F. Mache   ……………………

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DECLARATION

I, the undersigned **Munthali Roland (11628825),** do hereby declare that this dissertation for the Master of Commerce (MCOM in Cost and Management Accounting) at the University of Venda has not been previously submitted in part or in full, for a degree at this institution or any other except where due acknowledgement has been made. It is a product of my own investigation and all reference material contained therein has been fully acknowledged and a list of references is given.

Signature …………………………...   Date…………………………………

Munthali Roland (11628825)

DEDICATION

This research is dedicated to my parents. Thank you for the wonderful support that you gave me throughout my studies.

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<div align="center">To God be the Glory.</div>

ABSTRACT

The relationship between a firm's investment behaviour, financial constraints and the level of internally generated cash flows has been a subject of extensive discussion in finance literature. The discussion revolves around the effectiveness of investment cash flow sensitivity (ICFS) as a measure of financial constraints with contradicting conclusions. Empirical literature is also not in agreement about the best firm-specific proxy to distinguish firms into financially-constrained versus financially-unconstrained ones and the effect of the 2007 to 2009 global financial crisis on the ICFS of South African firms is still to be determined. There are very limited studies that have investigated ICFS in developing economies. This is important as institutional differences and capital market developments between developed and developing economies justify a separate study of South Africa as a developing economy. This study used data drawn from 131 Johannesburg Stock Exchange listed non-financial firms for the period 2003 to 2016 to establish the most suitable criterion for distinguishing firms into financially constrained versus unconstrained, to determine the effect of the 2007 to 2009 global financial crisis on the ICFS and to determine if ICFS is a good measure of financial constraints. The data for the 131 sampled firms was obtained from the financial statements on the IRESS database. The dataset was split into constrained versus unconstrained firms using three firm specific splitting variables: firm size, cash flow holding and dividends pay-out. The data was further split into panel 1 (2003 to 2006 covering the period before the global crisis); panel 2 (2006 to 2010 covering the period including the global financial crisis period) and panel 3 (2010 to 2016 covering the post global financial crisis period). The study utilised the system generalized moments method (GMM) regression model that yields consistent estimates even with unbalanced panel data sets and the Fixed Effects estimator. The models were both implemented on STATA 15 software. Samples split based on the dividend pay-out showed the highest ICFS for financially-constrained firms before, during and after the global financial crisis period. ICFS is highest during the period including the global financial crisis years compared to samples split using firm size and cash flow holding. The study concludes that dividends pay-out is the best criterion to distinguish firms into financially-constrained versus unconstrained; the global financial crisis constrained all firms; and that ICFS can be a good measure of financial constraints. The main limitation to the study was that it used a small sample size in relation to other international studies.

Keywords: ICFS, financial constraints, internally-generated cash flow, global financial crisis, panel data analysis.

TABLE OF CONTENTS   **Page**

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

AGSA	Auditor General South Africa
BB	Blundell and Bond
CFSI	Cash Flow Sensitivity of Investment
DPE	Department of Public Enterprises
GMM	Generalized Method of Moments
ICFS	Investment Cash Flow Sensitivity
JSE	Johannesburg Stock Exchange
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
SPSS	Statistical Package for the Social Sciences
USA	United States of America
VIF	Variance Inflation Factor

CHAPTER 1: INTRODUCTION

1.1 Background to the study

Hovakimian and Hovakimian (2009) define cash flow sensitivity of investment (CFSI) or investment cash flow sensitivity (ICFS) as the responsiveness of the firm's level of investments to changes in internally-generated cash flows. The two, ICFS and CFSI, which are used interchangeably, imply that during periods of low cash flows, financially-constrained firms have inadequate cash to fund all their profitable investment projects. Thus, financially-constrained firms are those firms whose investments are highly sensitive to changes in internal cash flows (Moyen, 2004). Such firms rely heavily on internally-generated cash flows to fund investments as they face high costs of raising external finance. Financially-constrained firms tend to be young, possess few tangible assets, face lenders' restrictions and are greatly affected by shocks in the industry when compared to financially-unconstrained firms, and thus they are faced with hard capital rationing. On the contrary, financially-unconstrained firms tend to be large and mature and are viewed as more credit worthy by lenders and hence they are only faced with soft capital rationing (Winker, 1999).

A pioneering study by Fazzari, Hubbard and Petersen (1988) on US companies classified firms as financially-constrained versus unconstrained on the basis of dividend payments. The researchers found a high ICFS for financially-constrained firms and a low or indeterminate ICFS for unconstrained firms, and thus concluded that ICFS is a good measure of financial constraints. Financially-constrained firms have limited external financing options, and hence rely heavily on internally-generated cash flows to finance their growth options. The conclusion by Fazzari et al., (1988) that ICFS is a good measure of financial constraints is supported by a number of researchers among them Whited (1992), Hoshi, Kashyap and Scharfstein (1991), Bond and Meghir (1994), Kadapakkam, Kumar and Riddick (1998), Shin and Kim (2002) and Mizen and Vermeulen (2005) who found a high CFSI for financially-constrained firms such as young or small firms, firms with low or no credit rating and for independent firms which are not part of a group of companies. The financial constraints are as a result of a high cost of external financing which emanate from market imperfections, information asymmetries as concluded by Myers and Majluf (1984) or agency costs as argued by Jensen and Meckling (1976), Harris, Milton, and Raviv (1991) and Grossman and

Hart (1982). The financial constraints limit the firms' access to external sources of finance, and thus, forcing them to rely on internally-generated cash flows to fund their growth options (Hovakimian and Hovakimian, 2009; Chen and Chen 2012; Wale, 2015).

The use of ICFS as a measure of financial constraints is not without controversy. Kaplan and Zingales (1997) use an alternative classification method called the Kaplan-Zingales index (KZ index) to classify a sample of U.S. firms used by Fazzari et al., (1988) as constrained versus unconstrained using qualitative and quantitative information and then test for the ICFS. The results of their study show that contrary to the findings of Fazzari et al., (1998), less financially-constrained firms have a high ICFS. They conclude that ICFS is not a good measure of financial constraints as managers can deliberately decide to pay dividends or skip dividends. The argument rests on the fact that ICFS could be caused by excessive conservatism on the part of managers (Chang, Tan, Wong and Zhang, 2007; Cleary, 1999; Erickson and Whited 2000). This finding that ICFS cannot be a good measure of financial constraints by Kaplan and Zingales (1997) is supported by Cooper and Ejarque (2003), Allayannis and Mozumdar (2004), Cleary (1999, 2006); Cleary, Povel and Raith (2007), Gala and Gomes (2012), and Hardlock and Pierce (2010). Thus, there are still disagreements amongst scholars on whether ICFS is a good measure of financial constraints.

Financial constraints are not directly observable, and as such the distinction between a financially-constrained versus a financially-unconstrained firm is difficult (Carreira and Silva, 2013). Researchers have, therefore, relied on various proxies such as credit ratings (Almeida, Campello and Weisbach, 2004; Campello and Chen, 2010) and dividend pay-out (Fazzari et al., 1988; Moyen, 2004; Cleary, 2006). Firm-specific characteristics such as size, age and leverage (Gertler and Gilchrist, 1994; Andren and Jankensgard, 2015) have also been used to try and distinguish between financially-constrained and unconstrained firms (Farre-Mensa and Ljungqvist, 2016). Thus, there is still no agreed criterion of distinguishing firms into financially-constrained versus financially-unconstrained ones.

The global financial crisis of 2007 to 2009 provides a natural experiment to test whether cash flow sensitivities give an accurate indication of firms' increased difficulties in raising external finance for investment. As pointed out by Chen and Chen (2012), a financial crisis period will result in

2

financially-constrained firms having a higher and significant ICFS than unconstrained firms. During such a financial crisis period, firms that were classified as constrained prior to the financial crisis will become more constrained and, hence, their ICFS should be higher. At the same time those firms that where originally classified as unconstrained and had an indeterminate ICFS would now have some positive degree of ICFS due to limited access to the external market and reliance on internally-generated cash flows for investments. During such an economic shock, the internally-generated cash flows for all firms would be expected to decrease owing to depressed economic activity. Survey studies conducted by Campello, Graham and Harvey (2010) and empirical studies by Duchin, Ozbas and Sensoy (2010), Ivashina and Scharfstein (2010) and Bliss, Cheng and Denis (2015), provide evidence that the 2007 to 2009 global financial crisis was severe as it forced a number of companies to scale down, postpone or abandon capital expenditures.

1.2 Problem statement

Although earlier studies have dealt at length with the issue of ICFS, no consensus has been reached on its effectiveness as a measure of financial constraints. There is also no consensus on a suitable firm-specific proxy that can be used to distinguish between financially-constrained and financially-unconstrained firms. Furthermore, the data used in prior studies was drawn mainly from developed and a few emerging countries, and to the knowledge of the researcher no study focused on ICFS over time based within South African firms. According to Ameer (2014), ICFS may vary across countries due to institutional differences such as the level of capital market development, attraction of foreign direct investment, governance and general level of economic development. These institutional differences amongst countries, therefore, justify a separate study of South African firms, as findings from studies using data from developed countries may be inapplicable to firms in South Africa as an emerging market. Lastly, of the existing studies, few have taken into account the effect of the 2007 to 2009 global financial crisis on the ICFS as the global financial crisis was severe and constrained all firms across all countries including South Africa. Khramov (2012) proved that due to the financial crisis, financial constraints increased and the ICFS doubled as there were less internally-generated funds for companies to fund investment and growth options. The impact of the global financial crisis on the JSE-listed firms is still to be tested.

1.3 Aim of the study

Thus, this study seeks to determine the impact of the 2007 to 2009 global financial crisis on the ICFS of South African firms. It will also seek to determine whether ICFS is a good measure of financial constraints as well as establish a suitable criterion to distinguish between financially-constrained and unconstrained firms. The study will examine prior international studies which examined the ICFS without losing its focus on South Africa as an emerging market.

This is a two-staged study with the main aim of determining the effect of the global financial crisis on ICFS and ascertain whether ICFS is a good measure of financial constraints. In doing so, the study will seek to first establish a reliable firm-specific proxy to distinguish firms into financially-constrained and financially-unconstrained.

1.4 Research objectives

The objectives of the study are to:

- Establish the most suitable criteria to distinguish between financially constrained and unconstrained firms.
- Determine the effect of the 2007 to 2009 global financial crisis on the ICFS of JSE-listed firms.
- Determine if ICFS is a good measure of financial constraints amongst South African JSE-listed companies.

1.5 Research hypotheses

The hypotheses for the study are:

Hypotheses 1: Firm size is the best proxy to distinguish firms into financially-constrained versus financially-unconstrained.

Hypotheses 2: During the financial crisis, those firms that were classified as constrained prior the financial crisis should have a higher or increased ICFS. Those firms classified as unconstrained prior the financial crisis should have a marginal and significant (positive) ICFS.

Hypotheses 3: ICFS is not a good measure of financial constraints.

1.6 Significance of proposed study

This study tests the effectiveness of ICFS as a measure of financial constraints focusing on South African Johannesburg Securities Exchange (JSE) listed non-financial companies. It ascertains the effect of the global financial crisis of 2007 to 2009 on the ICFS of firms in South Africa. Above all, it establishes the most suitable firm-specific proxy to measure financial constraints. As there has not been a study that focuses on ICFS over time in South Africa, this study contributes to the existing literature on CFSI.

1.7 Delimitations and assumptions

The study is limited to non-financial companies listed on the JSE and whose financial statements are available on the IRESS database. In order to get a reasonable sample size before, during and after the 2007 to 2009 global financial crisis, the study focuses on the period from 2003 to 2016. The study focuses on non-financial firms because the capital structures of financial firms are regulated and they incur less capital expenditure than most non-financial firms.

The research was concerned with ICFS and expected that the ICFS of all firms increased during the financial crisis period as firms' internal cash flows had dwindled and they were exposed to fewer if any external financing options as banks were restricting credit as well. However, these sensitivities should have normalised or eased with the end of the crisis for both financially-constrained and unconstrained firms.

1.8 Organisation of the study

The study was structured as follows:

Chapter 1: Introduction. This chapter introduces the study. It gives a brief background to the study, the research problem, aims of the study, research questions, significance of the study and organisation of the study. It then concludes with a summary of the chapter and introduces Chapter 2.

Chapter 2: Literature review. This chapter highlights the findings of a number of researchers whose work was significant and relevant to the study of ICFS. It also links the current study to previous studies and highlights the various criterion used to distinguish firms into financially-constrained versus financially-unconstrained. It ends with a summary of the chapter and then introduces Chapter 3.

Chapter 3: Research methodology. The chapter presents the methodology used to collect data and how such data was set into panel data sets and then analysed. It presents the empirical model for testing ICFS of firms. All variables in the model and to be used in the study are also defined in the chapter. The chapter also highlights the statistical errors associated with panel data estimators and how they are handled in this study. It concludes with a summary of the chapter and introduces Chapter 4.

Chapter 4: Presentation, Interpretation and Analysis of Results. This chapter presents the results of data analysis as well as a discussion of the findings. It also links the results of the study to those in previous studies. It concludes with a summary of the chapter and introduces Chapter 5.

Chapter 5: Conclusion and Recommendations. This chapter concludes the research. Conclusions are drawn from the analysis of data and the research findings. It concludes on the impact of the global financial crisis on the ICFS of JSE-listed non-financial firms. The chapter highlights the limitations and recommendations for future studies.

1.9 Summary of the Chapter

This chapter introduced the topic by providing information on the background of the research area. It highlighted the problem statement, research objectives, research questions and the delimitations and assumptions of the study. The chapter also provided the reasons for the need for conducting this study and the organization of the study. The next chapter provides a review of literature with the aim of emphasizing the significance of this study based on the information provided in relation to the current study. It will highlight the current advances in research on the topic of ICFS and financial constraints.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter provides a literature review on ICFS and will also provide an insight into the research area. It starts by defining ICFS and financial constraints highlighting the history of the concept as well as advances made in previous studies. Highlighted are the sources of financial constraints. The chapter includes the role of internally-generated cash flow in investment and will discuss the various empirical criteria used to classify firms as financially-constrained and financially-unconstrained. A brief discussion of the effectiveness or lack thereof of ICFS as a measure of financial constraints is also presented. The chapter also discusses the causes of the 2007 to 2009 global financial crisis as well as its effects on the ICFS amongst firms. It concludes with a summary of the chapter and then introduces Chapter 3.

2.2 Definition of ICFS and financial constraints

Devereaux and Schiantarelli (1990) define ICFS as a measure of the extent to which a firm's investment behaviour is affected by the availability of internally-generated funds. It shows the relationship or association between internally-generated cash flows and a firm's level of investments. The ICFS is measured by regressing investment on cash flow, controlling for investment opportunities. ICFS has been extensively used as a measure of a firm's financial constraints (Fazzari et al., 1988; Whited, 1992; Bond and Meghir, 1994). Financial constraints refer to the difficulty of raising external financing or the cost differential between internally and externally-generated funds (Mulier, Schoors and Merlevede, 2016; Winker, 1999; Wale, 2015).

2.3 The relationship between ICFS and financial constraints

The link between ICFS and financial constraints is well documented with most researchers highlighting a high ICFS for financially-constrained firms (Fazzari et al., 1988; Chen and Chen, 2012; Almeida and Campello, 2007; Cleary et al., 2007; Alti, 2003; Hovakimian and Hovakimian, 2009). A high ICFS for financially-constrained firms implies that the firm's investment patterns are greatly responsive to internally-generated cash flow changes. In contrast, financially-unconstrained firms have the ability to increase their investment expenditures even when they have limited internally-generated cash flows. This is because they are able to raise external finance as the cost differential between their internal and external financing is small. Thus, unconstrained firms should exhibit a low ICFS as their investments will be less sensitive to changes in internal

cash flows. Bond and Meghir (1994) assert that internally generated funds emerge as the primary choice of funding investment plans either due to firms' inability to access the capital market or due to the higher cost associated with accessing external financing.

2.4 IFCS and financial constraints

A number of studies which focused on ICFS have been conducted. Fazzari et al., (1988) pioneered the study on ICFS by collecting data from 422 USA firms for the period 1970 to 1984 and split the sample into constrained and unconstrained firms based on their dividend policy. They propose that financially-constrained firms retain most of their internally-generated cash flows to finance their investment growth options, hence, they pay lower or no dividends. Therefore, a firm's ability to generate internal cash flows may impact on its investment behaviour. This means that financially-constrained firms are expected to increase investments only when they have enough internal cash flow to do so. On the other hand, financially-unconstrained firms were classified as those firms that were paying dividends as they had the cash flows to do so. The results of the study show that low or no dividend paying firms which they classified as financially-constrained exhibit a higher ICFS than high dividend paying firms which they classified as unconstrained which had a low or indeterminate ICFS. They, therefore, concluded that ICFS can be used as an effective measure of financial constraints faced by a firm.

Another study by Hadlock (1998) used data from 58 Australian firms for the years 1974 to 1975 and 1989 to 1990 and established a criterion for distinguishing firms as financially-constrained or unconstrained on a year by year basis using total assets and dividends pay-out. Their results suggest that the investment behaviour of firms that are financially-constrained exhibits a greater sensitivity to cash flow than firms that are categorised as financially-unconstrained. This is in line with conclusions by Fazzari et al., (1988) and is also supported by Shin and Kim (2002), Hovakimian and Hovakimian (2009) and Chen and Chen (2012).

2.5 ICFS and financial constraints: Some controversies

The first study to challenge the conclusion by Fazzari et al., (1988) that ICFS is a good measure of financial constraints was that of Kaplan and Zingales (1997) who adopted the same sample used by Fazzari et al., (1988). The researchers used qualitative information contained in the firm's annual reports as well as management's statements on liquidity to categorise the firms into financially-constrained and financially-unconstrained. Their results show that firms that were

classified as financially-constrained had a low ICFS and those that were classified as financially-unconstrained had a high ICFS. They assert that ICFS cannot be a good measure of financial constraints as paying dividends rests on management discretion. This view finds support from Cleary (1999) who used a larger data set and also concluded that the most financially-constrained firms have a low ICFS and financially-unconstrained firms had a high ICFS.

Following on the study by Kaplan and Zingales (1997), Kadapakkam et al., (1998) examined the extent to which investments in six Organisation for Economic Co-operation and Development (OECD) countries namely, Canada, France, Germany, Great Britain, Japan, and the USA were affected by cash flow availability. The study was interested to determine the extent to which a firm's investment reliance on internally-generated funds is affected by firm size, since there is a general agreement that smaller firms have limited access to external capital markets and, thus, their investment behaviour should be more affected by the availability of internal funds. The results show that, ICFS is generally higher in the large firms than in small firms. They attribute this to managerial agency considerations, and to the greater flexibility enjoyed by large firms in timing their investments. They concluded that ICFS cannot be an effective measure of financial constraints since small firms which are regarded as being constrained are generally expected to have limited access to external markets, thus, they should have a high ICFS which is not the case in their study.

Other studies, including Almeida and Campello (2002) developed a one period model to identify US firms that may face financial constraints. They classified firms as financially-constrained if they had limited or no access to credit facilities and unconstrained firms as those that had easy access to credit facilities. Their results show that unconstrained firms have no ICFS or their ICFS is insignificant as they can easily access credit, while financially-constrained firms displayed a positive ICFS which increased or decreased with availability of credit. The conclusion that unconstrained firm's investment patterns are not affected by changes in internally-generated cash flows is supported by Beck and Demirgue-Kunt (2006), and Savignac (2009) and Del Giovane, Eramo and Nobili (2011).

According to Uyar (2009), companies in developing countries are faced with different challenges when compared to their counterparts in the developed countries. The firms in developing countries

9

are exposed to relatively weak institutional factors such as poor regulatory systems, less developed stock markets, poor corporate governance and a big information asymmetry between managers and investors which limits the sources of external funding. The study concluded that as a result of these challenges, firms in developing countries are forced to hold large amounts of cash to meet their investment projects, thus, most of them are financially-constrained even though they have huge internal cash reserves.

Finally, a study by Wale (2015) was conducted in Africa and focused on financial constraints and financial development effects amongst manufacturing firms in six selected African countries (Nigeria, Egypt, Kenya, South Africa, Morocco and Tunisia). They used firm-level data obtained from the Orbis database for a period from 2005 to 2011. Their results show that the financial development in Africa is too weak and more policy attention is needed in this regard as all their sampled firms showed positive and significant ICFS which they regarded as being financially-constrained. This aspect contradicts with the previous findings in other studies which attributed financial constraints to either information asymmetry or agency costs (Kadapakkam et al., 1998; Shin and Kim, 2002; Gala and Gomes, 2012). The results of their study, however, cannot be generalized to all firms in South Africa as they only focused on 92 manufacturing firms.

2.6 Sources of financial constraints

A few studies attempt to trace the origins of financial constraints and these included Kadapakkam et al., (1998) who attributed them to asymmetric information and managerial agency conflict. In their research, Oliner and Rudebusch (1992) studied a subset of 500 Greek listed firms and proxy information problems on firm age, exchange listing and patterns of insider trading. They conclude that information asymmetry is the primary source of financial constraints with agency costs being secondary. Vogt (1994) arrived at a similar conclusion, noting that agency problems are significant for large, low dividend paying firms, while information asymmetry costs are important for small, low dividend paying firms.

2.6.1 Information asymmetry

Krishnaswami and Subramaniam (1999) define information asymmetry as a situation in which information is not equally available to everyone who might need it. Myers (1984) and Myers and Majluf (1984) highlight that information asymmetry implies that not all market participants have access to the same information, specifically between managers and market investors. They found

that information about a firm's performance held by managers is superior to that known by outside investors. Akerlof (1970) asserts that investment financing is normally a mixture of debt and equity financing because of the costs and benefits associated with each component so that a firm maintains a stable capital structure. Owing to the existence of information asymmetry, the use of internally-generated cash flow for investments becomes cheaper as raising external finance is costly because outside investors require a greater rate of return or compensation of the risk they take (Greenwald, Stiglitz and Weiss, 1984; Myers and Majluf, 1984; Makina and Wale, 2016).

2.6.2 Managerial agency conflict

Jensen and Meckling (1976) supported by Harris and Raviv (1991) explain the issue of agency conflict as a determinant of financial constraints. The researchers contend that an agency relationship exists between the equity or debt providers and management of a company with management acting as the agent on behalf of the equity or debt providers who bear the risk of investing in the firm. Management agency conflict stems from a situation where management through its dealings does not act in the best interest of investors. Myers (1977) highlights that managerial agency conflicts can be in the form of overinvestment and underinvestment. Overinvestment occurs when managers invest in projects even if they have a negative net present value or are unprofitable. They do this to increase their power through an increase in the resources under their control (Mello and Parsons, 1992; Mauer and Triantis, 1994; Parrino and Weisbach, 1999; Hovakimian, 2009). Underinvestment occurs when management is reluctant to invest in projects that have a positive net present value because they are afraid to dilute the power that they enjoy (Harris and Raviv, 1991; Makina and Wale, 2016).

Kapadakkam et al., (1998) argued that management may further their interests through increasing their level of power instead of catering for investor interests, which include higher dividends, increased share price and prompt interest and debt repayments for investors. This will lead to potential investors imposing a high premium on the cost of external financing to cater for the increased risk of management agency conflict.

2.7 The role of internally-generated cash flow for investment

Jordan, Westerfield and Ross (2011) define internally-generated cash flow as simply what the firm earns and subsequently retains back into the business after all expenses. Keynes (2006) define investment as the increment of capital, whether it consists of fixed capital, working capital or liquid capital. The over-reliance on internally-generated cash flow to fund investments or growth options is due to the high cost of external financing and signifies the existence of financial constraints that are faced by firms (Fazzari et al., 1988). In general, cash flow indicates the liquidity of a firm and its ability to invest, hence, an increase in cash flow will increase the liquidity of the company and its investing ability and a decrease in cash flow will decrease the liquidity of a company and its investing ability. According to Cassar (2004), about 80 percent of a firm's financing is acquired through internally-generated funds. They attribute this behaviour to the existence of information asymmetry (Myers and Majluf, 1984) and managerial agency conflict costs (Jensen and Meckling, 1976) involved in the raising of external funds. The importance of internally-generated cash flow on both financially-constrained and financially-unconstrained firms is that there are no third-party costs involved such as loan repayments and interest costs (Cowling and Mitchell, 2003).

The measure of cash flow which is widely used is net profit plus depreciation (Agca and Mozumdar, 2008; Fazzari et al., 1988; Guariglia, 2008; Kaplan and Zingales, 1997). Other researchers use a proxy that is slightly different in the definition, such as operating cash flow (Cleary et al., 2007; Firth, Malatesta, Xin and Xu, 2012), earnings before interest, taxes, depreciation and amortization (George, Kabir, and Qian, 2011), and net income before extraordinary items (Kapadakkam et al., 1998).

Following on studies by Ameer (2014) and Ding, Guariglia and Knight (2013), cash flow (the independent variable) in this study will be denoted as (CF), and measured as net profit after tax, and income before extraordinary items plus depreciation in order to remain consistent with previous studies.

2.8 The global financial crisis of 2007 to 2009

According to Minsky (1996), a credit crunch or financial crisis or recession is an economic condition in which loans and investment capital are difficult to obtain as financial institutions require more guarantees in the form of collateral. In such a period, banks and other lenders become wary of issuing loans, so the cost of borrowing rises, often to the point where deals simply do not

get done (Ang and Smedema, 2011). Verick and Islam (2010) and Hemmelgam and Nicodeme (2010) supported by Temin (2010) and Eigner and Umlauft (2015) attribute the global financial crisis of 2007 to 2009 to the existence of a poor financial regulation system and credit rating agencies, failure of governance and risk management through excessive borrowing, risky investments, and lack of transparency. It started with a housing bubble in the USA and cascaded into a full-blown recession.

Many home owners who had taken out sub-prime loans found that they were unable to meet their mortgage repayments. As the value of homes fell, the borrowers found themselves with negative equity. With a large number of borrowers failing to meet loan payments, banks were faced with a situation where the repossessed house and land was worth less than what the bank had provided originally. The banks had a liquidity crisis as giving and obtaining home loans became increasingly difficult as the fallout from the sub-prime lending was being felt. The exposure of the South African economy to the global market meant that South Africa was one of the first African countries to be struck by the global financial shock. In May 2009, South Africa officially declared experiencing the recession that resulted from the effects of the global financial crisis which started in the USA (Baxter, 2008).

2.9 Effects of the 2007 to 2009 global financial crisis on ICFS

The effects of the 2007 to 2009 global financial crisis on the global economy included limited firms' access to capital, the survival of many banks became uncertain and the equity markets tumbled. Consumer confidence fell to record lows in Europe and households held back on discretionary spending and purchases of capital goods were postponed. Some attention has been paid in recent studies to assess the effects of the 2007 to 2009 global financial crisis on South Africa, focusing on its implications on reduction in economic growth, increased poverty and unemployment (Marais, 2009; Jacobs, 2009). Ang and Smedema (2011) highlight that recessions are characterised by aggregate negative shocks to corporate income, decreases in equity values and limited credit.

A study by Khramov (2012) investigates the effects of the 2007 to 2009 financial crisis on ICFS among USA firms and shows that ICFS varies across industries, mainly due to differences in the expected value of a firm's capital that can be used as collateral security. The results show that the financial crisis increased liquidity constraints and almost doubled the CFSI. Due to limited credit

availability from lenders, most firms were forced to rely on their internally-generated cash flow to fund growth options especially in the wholesale trade, retail trade, construction, manufacturing, and services sectors. At the same time, firms with higher levels of assets experienced a lower but significant increase in ICFS. This is so because they were regarded as having more collateral security in the form of the assets they held and, hence, they could still acquire some credit from lenders to finance their investment projects.

Andren and Jankensgard (2015) assess the differential role of cash flow to investment across systematically different types of firms during the period 2000 to 2010. They conclude that for small firms, ICFS increased following the increase in the cost wedge between external and internal cost of capital. This is consistent with the view that ICFS captures financing constraints. They also assert that structural improvements in capital markets may have contributed to a downward trend in financing constraints post the 2007 to 2009 global financial crisis. This conclusion confirms that the relationship between cash flow and investment is sensitive to shifts in the cost of external finance owing to a financial crisis.

Recent studies have documented decreasing ICFS over time owing to capital market developments and a decrease in the cost of external financing (Ağca and Mozumdar, 2008; Brown, Fazzari and Petersen, 2009; Chen and Chen, 2012). They have reported a substantial reduction in ICFS in more recent years or even its complete disappearance thereof.

In line with previous findings, this study expects a high ICFS during the 2007 to 2009 global financial crisis period for firms previously classified as financially-constrained prior to the crisis. It will also expect a significant and positive ICFS for firms classified as financially-unconstrained prior the crisis as the economy was affected through limited credit.

2.10 Can ICFS be deemed a good measure of financial constraints?
Internally-generated cash flow plays an important role in determining a firm's investment behaviour. According to Chen and Chen (2012), if ICFS is a good measure of financial constraints, then the end of the financial crisis should imply the disappearance and end of the financial constraints. This will imply that post the financial crisis, those firms originally classified as financially-unconstrained prior to the crisis should have an insignificant ICFS and financially-constrained firms would have a lower positive ICFS. Hence this study will seek to assess if the

sensitivity disappeared or improved post the financial crisis period of 2007 to 2009. If the ICFS disappeared or improved, then this study will conclude that ICFS is a good measure of financial constraints as the two, ICFS and financial constraints, would have been proven to be positively correlated.

2.11 Classification of firms as financially-constrained or financially-unconstrained

Financial constraints are not directly observable and as such empirical literature has had to rely on various methods to separate financially-constrained and financially-unconstrained firms. Carreira and Silva (2013) contend that there is no item on the financial statements that shows the extent to which a firm is financially-constrained or unconstrained. Empirical literature, however, agrees that financial constraints are firm-specific and they vary with time. A firm can be constrained this year and then become unconstrained next year owing to establishing stronger investor-lender relationship and improvement in its financial environment.

Past researchers including Fazzari et al., (1988), Kaplan and Zingales (1997; 2000), Hovakimian and Hovakimian (2009), Hardlock and Pierce (2010), Ferrando and Mulier (2013), classified firms into financially-constrained versus financially-unconstrained using qualitative and quantitative information (Musso and Schiavo, 2008; Hovakimian, 2009).

2.11.1 Qualitative information criterion

The categorisation of a firm as being financially-constrained versus financially-unconstrained using qualitative information can be done through content analysis of financial statements, surveys and interviews.

2.11.1.1 Content analysis of Financial Statements

This criterion relies on company reports from financial statements which contain rich qualitative information on the financial status of the firm. Kaplan and Zingales (1997) and Hadlock and Pierce (2010) assigned each company a level of being financially-constrained using qualitative information by referring to statements made by managers of firms in their annual financial reports. The company reports will often state the symptoms or signs of the existence of financial constraints as managers seek to communicate to the various users of the financial statements. The major advantage of using this qualitative information classification criterion is that there exists a large pool of information through annual financial reports that can be used to assign a level of financial

constraints faced by a firm in order to aid in splitting a sample into constrained versus unconstrained. The disadvantages of using qualitative information classification criterion is that not all companies make available such reports with their financial statements as country regulations might not mandate them to do so and the reports are subjective in nature. As the reports are made internally by the company management, there also exists a chance of biasness where company directors might state that they are not financially-constrained in order to be perceived as a profitable investment by potential investors.

2.11.1.2 Survey study

This process involves simply asking the directors whether the company is financially-constrained or not through a survey study involving a questionnaire (Ferrando and Mulier, 2013; Campello et al., 2010). The main advantage of this method is that directors who are agents are better informed on the firm's position, but the subjective nature of this method means that potential biasness from an individual's point of view may exist. Del Giovane et al., (2011) propose a better survey study method to classify whether a firm is financially-constrained or financially-unconstrained. In their study, they propose that instead of asking directors of firms, the better method would be to ask financial institutions or credit providers the extent to which a firm was denied credit and the reasons behind it hence, controlling the risk of perception and biasness. Drawbacks of this method include data disclosure policies and confidentiality issues which may prohibit lenders from disclosing such information and reliability of information from respondents of the survey.

2.11.1.3 Listing status or business affiliation

This method classifies a firm as financially-constrained or financially-unconstrained based on whether the firm is listed on a securities exchange or not (Oliner and Rudebusch, 1992), affiliated to a particular group of companies or not (Hoshi et al., 1991; Shin and Park, 2002; Audretsch and Elston, 2002) and the type of industry (Devereux and Schiantarelli, 1990). Carreira and Silva (2013) assert that listed firms which they classified as financially-unconstrained can easily acquire financing through issuing equity and acquiring debt. Listed firms are more visible and more credible in the eyes of potential investors. As the information on listed firms is readily available through their publications, and annual financial statements this will in turn reduce the information asymmetry problem. The researchers regard unlisted firms as financially-constrained because they cannot easily issue equity and their financial information is not easily available to lenders, hence, they suffer from information asymmetry problems and, thus, they are financially-constrained. The main shortcoming of this method is that some firms which are listed may be financially-constrained as well but the method does not classify them as such.

This study will not adopt the use qualitative information through content analysis of financial statements, survey studies and listing to assert the level of financial constraints faced by a company as the process is time consuming for a large sample size. Analysing all the reports in an attempt to identify statements indicating the existence of financial constraints is cumbersome. As the current study is focused on JSE listed companies, the listing status to classify firms would not apply as well because all the firms are already listed (Kallandranis and Konstantinos, 2005; Marhof, M'Zali and Cosset, 2012).

2.11.2 Quantitative Information criterion

This criterion relies on firm financial statements which contain rich quantitative information and it mainly employs the use of proxies. Upton and Cook (2002) define a proxy as a measurement that is used to stand in for a variable that cannot be directly measured. Fazzari et al., (1988) were the first to employ the use of proxies to classifying firms into financially-constrained versus financially-unconstrained firms according to their dividend pay-out. The use of proxies that are quantitative in nature is also adopted by Moyen (2004) and Cleary (2006) who used the dividend pay-out ratio. Gertler and Gilchrist (1994), Andren and Jankensgard (2015) extended the use of

proxies to include leverage, size, age and cash flow holding level to categorise firms into financially-constrained versus financially-unconstrained firms. The advantage of using proxies is that they can be reliably measured and the information to calculate them is readily available from the financial statements. However, the main disadvantage arises when financial statements are not available as proxies then cannot be calculated (Bhaduri, 2008; Bassetto and Kalatzis, 2011; Andren and Jankensgard, 2015).

Drawing from the advantages and disadvantages of both qualitative and quantitative information criterion, this study will adopt the quantitative criterion in classifying firms as financially-constrained and financially-unconstrained through the use of the following proxies:

2.11.2.1 Firm size

Gertler and Gilchrist (1994) and Allayannis and Mozumdar (2004) supported by Almeida and Campello (2007) and Cleary (2006), have used firm size as a proxy to classify firms into financially-constrained versus financially-unconstrained. Small firms are generally regarded as young, have low credit ratings, less profitable, with high levels of firm-specific risk and less collateral thus making them less likely to attract external finance. According to Schaller (1993) small firms are more investment sensitive to changes in internally-generated cash flows than larger firms. They also exhibit characteristics typical of firms suffering from adverse selection and access to external finance problems. This will often force them to rely on internally-generated cash flows to fund their growth options. In general, small firms are expected to face more difficulty in accessing external funding in the form of debt or equity because they suffer from information asymmetry and agency problems. This will force investors to impose a high cost on the financing that they provide to small firms (Iuliana, 2008).

Fatoki and Assah (2011) measured firm size by total assets and asserted that firms must own assets, maintain proper information and focus on improving their management skills in-order to enhance their chances to acquire external finance. In a similar study, Atanasova and Wilson (2004) propose that a firm's total assets provide collateral to the external provider of funds and, hence, not owning tangible assets would be a deterrent factor to acquiring financing. Generally, large firms have higher stocks of tangibles, and hence better collateral when compared to smaller firms. However,

it is not easy to determine whether firms are financially constrained because they are small or small because they are financially constrained (Hovakimian, 2009). In contrast, studies by Devereux and Schiantarelli (1990) and Kadapakkam et al., (1998) concluded a high ICFS for larger firms and attributed this to management scepticism.

The commonly used measure of firm size in the past studies is the natural logarithm of total assets. Following a study by Andren and Jankensgard (2015), this study denotes firm size as (FS) and is measured as the natural logarithm of total assets in order to remain consistent with previous studies. This proxy is adopted to separate firms as financially-constrained and unconstrained. Unconstrained firms are defined as those whose average natural logarithm of total assets exceeds the median logarithm of total assets for the whole sample. Financially-constrained firms would be defined as those whose average natural logarithm of total assets is below the mean of the whole sample.

In line with the above findings, this study expects to obtain a high ICFS for firms classified as financially-constrained and a low ICFS for firms classified as financially-unconstrained on the basis of firm size (Almeida and Campello, 2007; Cleary, 2006; Allayannis and Mozumdar, 2004).

2.11.2.2 Dividends payment

Dividend payment has also been used as a proxy to distinguish between financially-constrained and financially-unconstrained firms. Fazzari et al., (1988) supported by Moyen (2004) highlight that firms which pay low dividends or no dividends at all are financially-constrained and firms that pay high dividends are financially-unconstrained. The two contend that dividend is not a mandatory expense and is only incurred when the firm is financially sound. Hence, only a financially-unconstrained firm can afford to pay dividends as the business is generating enough cash flows to do so. On the other hand, a firm that is financially-constrained would not be able to declare and pay dividends.

The researchers, Fazzari et al., (1988) and Moyen (2004), concluded that low or no dividend paying firms, which they categorised as financially-constrained, display a high IFCS and high dividend paying firms, which they classified as financially-unconstrained had a low ICFS. They attribute this to the fact that paying dividends is a choice that a company makes, and dividend

19

payments are an indication of a firm's good health signalling long term growth prospects, thus, dividend paying firms are financially-unconstrained. This view was largely supported by a number of researchers, among them Gilchrist and Himmelberg (1995), Guariglia (2008) and Shin and Kim (2002).

Contrary to this view, Kaplan and Zingales (1997) examined the same sample by Fazzari et al., (1988) and concluded a high ICFS for financially-unconstrained firms and a low ICFS for financially-constrained firms. Their results show that the ICFS of firms that are financially-constrained is least sensitive to the availability of internally-generated cash flows. Empirical support for this position is plentiful. Cooper and Ejarque (2003), Allayannis and Mozumdar (2004), Cleary (1999, 2006), Cleary et al. (2007) and Hardlock and Pierce (2010) arrived at a similar conclusion.

Following on studies by Fazzari et al., (1988), Almeida and Campello (2007), and Islam and Mozomudar (2007) for the purposes of this study, firms will be classified as financially-constrained or unconstrained according to their dividend pay-out denoted as (DP) and defined as ordinary dividends divided by net income. A firm is classified as financially-constrained if its mean dividends pay-out is below the mean dividend pay-out for the whole sample and financially-unconstrained if its mean dividend pay-out is above the mean dividend pay-out of the whole sample.

Consistent with previous studies by Fazzari et al., (1988) and Moyen (2004), this study expects a high ICFS for firms classified as financially-unconstrained and a low ICFS for firms classified as financially-constrained on the basis of dividend pay-out. This is so because firms that pay dividends have the means to do so and are financially sound, hence, they should have a low ICFS.

2.11.2.3 Cash holding level

Another criterion used to distinguish financially-constrained and financially-unconstrained firms is cash holding levels. Cleary (1999), Povel and Raith (2001) and Almeida et al., (2004) contend that cash and cash equivalents offer firms the capacity to rapidly exploit growth options by using the buffer liquidity available. A high cash balance, will also be a sign of a profitable business as the firm can afford to hold cash from its operating profits after all expenses. Based on this criterion, a firm is classified as financially-constrained when it has low levels of cash holdings. In contrast,

Hovakimian and Hovakimian (2009) however, suggests that a financially-constrained firm will have a large cash buffer in-order to meet future unforeseen contingencies as well as to exploit growth opportunities. Almeida et al., (2004) supported by Acharya, Almeida and Campello (2007) contend that a financially-constrained firm will hold cash in anticipation of future anticipated profitable investments as well as a means to deal with unexpected negative future market shocks including an increase in interest payments on debts, hence, the precautionary and speculative motive for cash holding.

Following on studies by Almeida et al., (2004), Ding et al., (2013) and Andren and Jankensgard (2015) for the purposes of this study, firms will be distinguished according to their cash holding levels denoted as CFH and defined as the sum of cash and cash equivalents. A firm is classified as financially constrained if its average cash holding level is less than the mean cash holding level of the whole sample and a firm is unconstrained when the average cash holding level is higher than the mean cash holding level of the full sample.

In line with previous studies by Cleary (1999) and Almeida et al., (2004), this study will expect a high ICFS for financially-constrained firms and a low ICFS for financially-unconstrained firms classified according to the cash holding level.

2.12 Summary of the Chapter

The chapter reviewed previous studies on the subject of CFSI. It defines ICFS and financial constraints highlighting the sources of financial constraints. It proceeded to give a review of empirical criterion commonly used by researchers to classify firms into financially-constrained versus financially-unconstrained firms. The chapter highlighted the use of proxies as the criterion adopted in this study and how each will be measured to distinguish between financially-constrained versus financially-unconstrained firms. It presented an overview of the causes and effects of the 2007 to 2009 global financial crisis as well as its impact on the ICFS of firms.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research philosophy and methodology to be followed in conducting the research. According to Miller (1998) methodology is a body of knowledge that enables researchers to explain and analyse the method of conducting the research and resources, identifying hypothesis and consequences, and relating to their potentialities to research advances. A description of the research design is also given as well as the data testing method for the relationship between investment and cash flow. The chapter also discusses the target population, sampling techniques and data collection procedure to be employed.

3.2 Philosophical perspective

Neuman (2011) best described a research philosophy or paradigm as a way of thinking. According to Oppong (2013), research paradigms differ on the objectives of the study and the way they will be achieved. The assumptions of the research paradigms give guidance on how the research is to be conducted. Denzin and Lincoln (2011) suggest that there are different research paradigms which include positivism, post-positivism, interpretivism and critical realism. Positivism is a philosophy that contends that there is an objective reality out there to be studied, captured and understood (De Vos and Strydom, 2011). This study falls under the positivism research philosophy as the role of the researcher is limited to data collection and interpretation through an objective approach. The research findings are also observable and quantifiable. Crowther and Lancaster (2008) supported by Collins (2010) and Wilson (2010), highlight that the positivist research philosophy approach rests on the fact that the researcher is independent of the research and the research is objective in nature. The quantifiable observations will lead themselves to a statistical analysis with the research being limited to what can be measured and quantified. The positivist approach undeniably has strengths, notably in terms of precision, control and objectivity (De Vos and Strydom, 2011).

3.3 Population of the study

This study used secondary data available on the IRESS database. This comprehensive database contains annual financial statements on all firms listed on the JSE from 1972 to date and is used by equity analysts, lenders, investors and academic researchers. The financial statements can be downloaded as standardised or published format in either Microsoft Excel or Word Format. The target population of the study consisted of all non-financial companies that were listed on the JSE

during the 14-year period from 2003 to 2016 as it covers the period before, during and after the global financial crisis of 2007 to 2009. The data was drawn from all sectors on the JSE (basic materials, oil and gas, industrials, consumer goods, healthcare, consumer services, telecommunications and technology) but excluded financial sector companies because their capital structures are regulated. A total of 287 non-financial firms are available on the IRESS database for the years included in the study.

3.4 Sampling strategy

Saunders, Lewis and Thornhill (2009) defines sampling as the process of selecting a number of individuals for a study in such a way that the individuals represent the group from which they were selected. Sekaran (2003) supports this idea by stating that the actual population from which the researcher is entitled to generalize therefore, is an accessible population and that the whole population is an ideal choice and the sample is a realistic choice. In the process of sampling, only a few items from the universe (entire population) are selected and the selected is called a sample. The broad sampling methods are non-probability sampling and probability sampling method. Zikmund (2003) defines non-probability sampling as a technique in which units of the sample are selected on the basis of their availability or personal judgement or convenience. Leedy and Omrod (2005) state that under probability sampling each member of the population has an equal chance of being selected.

For this study, a non-probability sampling technique was adopted as the researcher used all the data from non-financial firms available on the IRESS database for the period 2003 to 2016. The type of non-probability sampling is purposeful sampling as the researcher was concerned with all non-financial companies listed on the JSE. Patton (2002) highlights that purposeful sampling is widely used in research for the identification and selection of information related to the phenomenon of interest (non-financial companies). The sample for this study was be made up of non-financial companies listed on the JSE for the years 2003 to 2016 because they cover a period before the global financial crisis, a period during the financial crisis and a period post the global financial crisis. All the data used in the study was obtained from the standardised financial statements on the IRESS database. The term standardisation is used as items in the balance sheet, income statement, cash flow statement and other quantitative information obtained from published financial statements are analysed and categorised in a consistent manner. This will ensure that

meaningful interpretations and comparisons between different companies and years can be done. The study gathered secondary data that consisted of published annual financial statements.

3.5 Panel data specification

Baltagi (2009) refers to panel data as the pooling of observations on a cross-chapter of subjects over several time periods. It implies that each subject is observed over repeated periods of time. A panel can either be balanced or unbalanced. A balanced panel data has no missing observations and an unbalanced panel data contains missing observations. The structure of the data used in this research meets the definition of an unbalanced panel data as some companies will have missing observations due to being delisted. Hsiao (2005) asserts that the use of an unbalanced panel data increases the degree of freedom and reduces collinearity as it gives the researcher a large number of data points to analyse. The use of panel data has its advantages which include, more degrees of freedom and more sample variability than cross-sectional data which may be viewed as a panel with $T = 1$, or time series data which is a panel with $N = 1$, hence improving the efficiency of econometric estimates, less multicollinearity, allows for the control of heterogeneity and enables the testing of more complicated hypotheses than is possible with a single time series or cross-section (Hsiao, Mountain and Ho-Illman, 1995).

The main panel data sample consisted of all non-financial firms listed on the JSE whose financial statements are available on the IRESS database for the period 2003 to 2016. This is the main sample that was used to test the ICFS of financially-constrained versus financially-unconstrained firms as per the criterion identified in Chapter 2. Firms with 3 years or more of missing data were removed from the sample as including them would have reduced the balance of the panel. Variables included in the panel were obtained or calculated from the standardised annual financial statements of the listed non-financial companies. The final full sample comprised 131 listed non-financial firms that met the sampling criterion (see Annexure B for the comprehensive list of the companies used in this study).

As the study seeks to test ICFS over three periods of time, before, during and after the global financial crisis, the panel data sets will be split into three samples, that is, 2003 to 2006, 2006 to 2010 and 2010 to 2016. The panel data samples are discussed below as Panel 1, Panel 2 and Panel 3:

- **Panel 1 data sample:** It comprises of non-financial companies for the period before the recession, that is, 2003 to 2006. The panel was used to test the ICFS prior the 2007 to 2009 global financial crisis. Firms were split into financially constrained firms versus financially unconstrained as per the three-classification criterion identified and discussed in Chapter 2 (firm size, dividend pay-out and cash holding level). This will give the measure of ICFS for financially-constrained versus financially-unconstrained South African firms before the global recession.

- **Panel 2 data sample:** It comprises of non-financial companies for the period including the recession, that is, 2006 to 2010. The sample was also used to test the change in ICFS during the period including the 2007 to 2009 global financial crisis. In order to increase the sample size, panel 1 included a year prior and a year post the global crisis years of 2007 to 2009. Firms that where split into financially constrained firms versus financially unconstrained in **Panel 1** were maintained so as to see the change in ICFS during the period including the global recession.

- **Panel 3 data sample**: It comprises non-financial companies for the period after the recession, that is, 2010 to 2016. The sample will test the ICFS post the global financial crisis. Firms that where split into financially-constrained versus financially-unconstrained in **Panel 1** were maintained. This was done in order to take note of the change in ICFS post the global crisis.

Samples of the most suitable firm-specific criterion to distinguish firms into financially-constrained versus unconstrained were used to address objectives 2 and 3 of this study.

3.6 Empirical model and data analysis

Empirical research has over the past years relied on two models to test the IFCS relationship:

3.6.1 The Q model

Fazzari et al., (1988) first developed the Q model. This model asserts that a firm's investment behaviour is mainly determined by expectations of future profit opportunities, usually measured by the ratio of the market value of assets to its book value (Ağca and Mozomudar, 2008; George et al., 2011; Kaplan and Zingales, 1997; Cleary, 1999; Allayannis and Mozumdar, 2004; Cleary, 2006; Islam and Mozumdar, 2007; Makina and Wale, 2016). The advantage of the Q model is that it directly measures the value of future profitability. Criticism for the use of the Q model are highlighted by Carreira and Silva (2013) who state that the use of Q may overestimate the CFSI coefficient because cash flow may contain information about investment opportunities that were not originally captured by Q. Guariglia (2008) is also of the opinion that Q suffers from misspecification problems. Taking insights from Ağca and Mozomuda (2008), the Q model after adjusting it to include the availability of internal funds can be written as:

$$\left(\frac{I}{K}\right)it = \beta_0 + \beta_1 Q_{it} + \beta_2 \left(\frac{CF}{K}\right)it + \varepsilon_{it} \tag{1}$$

Where I denotes investment measured by all capital expenditures, difference between net property, plant and equipment at the end and beginning of the period plus depreciation; K denotes the capital stock at the beginning of the period; β_0 represents the intercept; $\beta_{1\text{-}2}$ represents the coefficient of the variables; Q denotes the ratio of the market value of assets to its book value; CF is the firms' internally generated cash flow measured as Net Income + Depreciation and ε_{it} represents the error term. β_2 shows the ICFS coefficient. (D'Espallier and Guariglia, 2015; Degryse and De Jong, 2006; Fazzari et al., 1988, 2000; Firth et al., 2012; Guariglia, 2008; D'Espallier, Vandemaele and Peeters, 2008) (See Annexure A for a comprehensive definition of variables).

3.6.2 The Euler equation model

An alternative econometric model to test ICFS is the Euler equation model. According to George et al., (2011) supported by Wale (2015), the Euler equation exploits the relationship between investments and internally generated cash flows in successive time periods and has the advantage that it does not require the use of future values like the Q model which requires a measure for future profitability. Taking insights from Carreira and Silva (2013) and Guariglia (2008) and modifying it a bit, the basic Euler econometric model for testing ICFS can be written as:

$$\left(\frac{I_{it}}{K_{t-1}}\right) = \beta_0 + \beta_1 \Delta S + \beta_2 \left(\frac{CF_{it}}{K_{it-1}}\right) + \varepsilon_{it} \tag{2}$$

Where I, β_0 to β_2, CF, K, ε_{it} are the same as above. ΔS denotes the natural logarithm of total sales

The extended Euler equation makes use of a number of explanatory variables, in the regression. These include total sales (S), dividends pay-out (D), total debt, past year or lagged investments (I_{it-1}) and cash flows (CF) for a sample that is not split into constrained versus unconstrained firms (George et al., 2011). Following on Laeven (2003), the inclusion of the variables will yield the following empirical specification:

$$\left(\frac{I_{it}}{K_{it-1}}\right) = \beta_0 + \beta_1 \left(\frac{S}{K_{it-1}}\right) + \beta_2 \left(\frac{CF}{K_{it-1}}\right) + \beta_3 \left(\frac{I_{it-1}}{K_{it-1}}\right) + \beta_4 \left(\frac{D}{K_{it-1}}\right) + \varepsilon_{it} \tag{3}$$

All variables are divided by K_{it-1}, the lagged total assets to normalise them. The explanatory variables or control are included in order to estimate the responsiveness of investments to cash flow and each one of them, that is, firm size, sales growth, dividends pay-out or past investments and also for robustness test. Following on this model, the main sample of all non-financial firms from 2003 to 2016 will be run using the Euler econometric model that will be modified to include the control variables, and explanatory variables and independent variable as defined in literature. This is given below as:

$$\left(\frac{I_{it}}{K_{it-1}}\right) = \beta_0 + \beta_1 \left(\frac{FS_{it}}{K_{it-1}}\right) + \beta_2 \left(\frac{CF_{it}}{K_{it-1}}\right) + \beta_3 \left(\frac{CF_{it-1}}{K_{t-1}}\right) + \beta_3 \left(\frac{CFH_{it}}{K_{t-1}}\right) + \beta_5 \left(\frac{I_{t-1}}{K_{t-1}}\right) + \beta_6 \left(\frac{DP_{it}}{K_{t-1}}\right) + \varepsilon_{it} \tag{4}$$

Taking insights from Chen and Chen (2012) and Makina and Wale (2016) the Euler econometric model that will be run to test the ICFS for the split samples is given as below and all variables are defined in Annexure A:

$$\left(\frac{I_{it}}{K_{it-1}}\right) = \beta_0 + \beta_2 \left(\frac{CFH_{it}}{K_{t-1}}\right) + \beta_3 \left(\frac{CFH_{it-1}}{K_{t-1}}\right) + \beta_3 \left(\frac{I_{t-1}}{K_{t-1}}\right) + \varepsilon_{it} \tag{5}$$

Past studies like those of George et al., (2011) and Maditinos, Tsinani and Sevic (2015) used ordinary least squares regression to fit the ICFS model. There are a number of other estimators that can be used to estimate the regression coefficients. These include the random effects, the fixed effects, the difference generalised methods of moments of Arellano and Bond (1991), (the

difference GMM) and the system generalised methods of moments of Blundell and Bond (1998), (the system GMM). Arellano and Bover (1995) and Blundell and Bond (1998) demonstrate that the correlation between the lagged dependant variable and the error term makes ordinary least squares (OLS) estimates biased and inconsistent, even when the error terms are not serially correlated.

Elsas and Florysiak (2013) and Qian, Zhou, Kong and Zhu (2009) contend that the system GMM is the most efficient estimator amongst the current estimators. The estimator is designed for datasets with many panels and few periods. It is able to handle unbalanced data sets. It assumes that there is no auto-correlation in the idiosyncratic errors and requires the initial condition that the panel-level effects be uncorrelated with the first difference of the first observation of the dependent variable. This study therefore used the system GMM and the Fixed Effects to fit the ICFS regression model for the data panels highlighted. They were implemented in STATA 15 software.

The system GMM test estimators of Blundell and Bond (1988) allows for the control of fixed effects and takes into account heteroscedasticity and auto correlation errors. Torres-Reyna (2007) asserts that the use of fixed-effects estimator is important especially when interested in analysing the impact of variables that vary over time. Fixed Effects explore the relationship between predictor and outcome variables within a particular subject. Thus, in this study, it would be the relationship between investment and internally-generated cash flows, ICFS. STATA 15 was used for analysing the data because it allows for the analysis of panel data sets with more data points.

3.7 Statistical error tests
The nature of the model may result in possible misspecification and hence the following tests were run:

3.7.1 The Multicollinearity test
Panel data regressions are prone to misspecification arising from the multicollinearity of the right-hand side variables (Koop, 2005). To avoid the misspecification of the model, this study tested for multicollinearity using the variance inflation factor (VIF). The test was used to measure the explanatory variables standard error caused by its correlation with other explanatory variables. As a general rule, if the VIF of a variable exceeds 10 (VIF>10), it indicates that the variables are multicollinear. However, the tolerance measure can also be used which is the reciprocal of VIF. If

the tolerance is less than 0.10 (1/VIF), it indicates that the variables are multicollinear and must be removed from the model so as to avoid misspecification (Mugumisi and Mawanza, 2014).

3.7.2 Outliers

These may also lead to the misspecification of the panel data. Outliners are defined as any value greater than a certain percentile of all of the observed data points (Qian et al., 2009). They are mainly handled through winsorization. Winsorization is the trimming of data to remove extreme values that do not help in the study (Baltagi, 2009). Winsorizing is not equivalent to simply excluding data, which is a simpler procedure, called trimming or truncation. In a trimmed estimator, the extreme values are discarded but in a winsorized estimator, the extreme values are instead replaced by certain percentiles, specified by option. This will reduce response biasness as extreme values are discarded. This study winsorized data to the 99th percentile level using the latest Stata 15 software.

3.8 Summary of the Chapter

This chapter briefly discussed the research philosophy. It then highlighted the population of the study. It illustrated the two broad sampling techniques and identified the reason why purposeful non-probability sampling will be used. It reviewed the panel data sets to be used as well as identifying the empirical models used in the study to test the ICFS coefficient. It proceeded to give the estimator to be used in the study as well as possible statistical errors and how they will be addressed.

CHAPTER 4: PRESENTATION AND INTERPRETATION OF RESULTS

4.1 Introduction

Chapter 4 presents and interprets the descriptive statistics and empirical findings of the study. It starts by presenting the descriptive statistics in the form of tables. This is then followed by the empirical findings which are also presented in the form of tables for both the main estimator and the robustness test estimator for the period 2003 to 2016. The findings are grouped into: findings for the full sample, findings for the sub-sample before, during and post the global financial crisis. The sample classifications have been discussed in the preceding chapter. The test results are linked to the hypotheses made in the previous chapter.

4.2 Descriptive statistics

In order to get an understanding of the full data sample, descriptive statistics are an important first step in the analysis of the panel data. The descriptive statistics are presented in Table 1.

Table 1: Descriptive Statistics for the Full Sample

Table 1 presents the summary statistics for the full sample which was made up of data drawn from 130 non-financial Johannesburg Stock Exchange listed companies for the years during the period 2003 to 2016. Only companies with three or less years of missing variables are included in the full sample. The panel dataset was constructed from data drawn from the annual financial statements which were obtained from the IRESS database. To eliminate outlier observations and the most extremely misrecorded data, all variables were winsorised to the **99th percentile**. The variables in the table are defined as follows: **Investment** denotes the independent variable Investment, **Investment$_{t-1}$** refers to the lagged investment, **cf** refers to the internally generated cash flow, **cf$_{t-1}$** refers to the lagged internally generated cash flow, **divp** refers to dividends payout, **fsize** denotes firm size, and **cfh** represents cash flow holding level. All the variables are defined in Annexure A.

Variable	No. of Obs	Mean	Median	Std. Dev.	Min.	Max.	Skewness	Kurtosis
Investment	1746	0.0872	0.0687	0.0863	-0.0301	0.2586	0.6332	2.4945
Investment$_{t-1}$	1743	0.1118	0.0760	0.1170	-0.0232	0.3643	1.0139	2.9837
cf	1746	0.1039	0.1038	0.0680	-0.0048	0.2157	0.0174	2.0285
cf$_{t-1}$	1743	0.1053	0.1068	0.0692	-0.0069	0.2174	-0.0258	2.0328
divp	1746	0.0195	0.0079	0.0246	0.0000	0.0706	1.0453	2.6696
fsize	1746	14.6856	14.7361	1.8946	11.5403	17.5586	-0.1190	1.9226
cfh	1746	0.1225	0.0900	0.1004	0.0130	0.3238	0.8269	2.4378

The summary statistics for the full panel indicate that the mean investment for the 130 JSE-listed non-financial firms was 0.0872 or 8.72% with a standard deviation of 0.0863 or 8.63%. This means that on average, firms invested 8.72% which is higher than the mean investment by Malaysian firms of -2.03% as put forward by Chyi and Tien (2014). The mean lagged investment was 0.1118 or 11.18% with a standard deviation of 0.1170 or 11.70%. The statistics also indicate that firms

listed between 2003 to 2016 generate a mean internally generated cash flow of 0.1039 or 10.39% with a standard deviation of 0.0680 or 6.8%. The mean dividend payout was 0.0195 or 1.95%. and the standard deviation was 0.0246 or 2.46%. The statistics indicate that South African listed non-financial firms pay less dividends (1.95%), almost half when compared to companies in the USA as propounded by Hovakimian and Hovakimian (2009) who found that USA companies had a mean dividend payout of 0.288 or 2.88%.

The mean cash flow holding level was 0.1225 or 12.25% and the standard deviation was 0.1004 or 10.04%. This statistic means that on average, South African firms hold 12.25% of their internally generated cash flow. This is almost half when compared to companies in the USA (0.3445 or 34.45%) as reported by Ascioglu, Hedge and McDermott (2008) for their sample of 509 firms listed on the New York Stock Exchange covering the period 2000 to 2003.

South African non-financial firms are much smaller than their European and US counterparts but bigger than firms in China. The mean sample firm size for this study is 14.6856 with the minimum of 11.5403 and the maximum of 17.5586. In their study of firms in China, Wan and Xhu (2011) found a mean firm size of 9.209 whilst Devereux and Schiantarelli (1990) found a mean firm size of 20.6 for UK firms. Firm size as measured by natural logarithm of total assets is one on the classification criterion in this study and it expects that small firms have a mean lower than that of the full sample and should be financially-constrained, thus, should have a high ICFS.

The skewness of all variables, except for lagged cash flow (-0.0258) and firm size (-0.1190), were significantly greater than zero for the full panel. This means that the variables are more distributed to the right and are concentrated to the right of the mean value.

4.3 Empirical Findings

This section presents the results of the regression model 1 which was fitted using both the Blundell and Bond's (1998) system generalized method of moments (BB system GMM) and Fixed Effects estimators.

4.3.1 Multicollinearity Test

By its nature, a regression model is generally prone to misspecification arising from the collinearity of the right-hand side variables. To avoid the misspecification of the model, this study tested for multicollinearity of the variables using the variance inflation factor (VIF) before fitting the model. The test was done to identify if the explanatory variables had any standard error caused by their collinearity with other explanatory variables. According to Mugumisi and Mawanza (2014), if the VIF of a variable exceeds 10 (VIF>10), it indicates that the variables are multicollinear. However, the tolerance measure can also be used which is the reciprocal of VIF. If the tolerance is less than 0.10 (1/VIF), it indicates that variables are multicollinear and must be removed from the model so as to avoid model misspecification.

The full panel multicollinearity test results as per the BB system GMM estimator are presented in Table 2 and they revealed that all the variables except investment and lagged investment are not collinear as they had a VIF of less than 10. According to O'Brien (2007) and Akinwande, Dikko and Samson (2015), a high VIF for the dependent variable(s) can be ignored as they are not the explanatory variables under review. Thus, this study ignored the VIF's of investment and lagged investment under the BB system GMM estimator as they are related dependent variables. The robustness Fixed Effects estimator multicollinearity results are presented in Table 3 and revealed that there is no multicollinearity between all the variables as they had a VIF of less than 10. As no multicollinearity was identified, the study then proceeded to fit the variables in the model under the BB system GMM and Fixed Effects estimators. The results of the multicollinearity test using the BB system GMM and Fixed Effects estimator are presented in Tables 2 and 3 below.

Table 2: Blundell and Bond Full Panel Multicollinearity test results

Table 2 presents the results of the multicollinearity test of the Full Panel dataset (2003 – 2016) consisting of 1718 observations. The test was fitted using the Blundell and Bond (1998) regression model. It shows the variables under investigation in one column and the corresponding VIFs for each. The variables in the table are defined as follows: **Investment** denotes the independent variable Investment, **Investment$_{t-1}$** refers to the lagged investment, **cf** refers to the internally generated cash flow, **cf$_{t-1}$** refers to the lagged internally generated cash flow, **divp** refers to dividends payout, **fsize** denotes firm size, and **cfh** represents cash flow holding level. All the variables are defined in Annexure A. These variables are defined in Annexure A.

Variable	VIF Full Panel (2003-2016)	1/VIF Full Panel (2003-2016)
Investment	49.21	0.0203
Investment$_{t-1}$	44.14	0.0227
cf	7.10	0.1409
cf$_{t-1}$	6.89	0.1452
divp	5.23	0.1911
fsize	2.57	0.3891
cfh	2.47	0.4051
Mean VIF	**16.80**	

Table 3: Fixed Effects Full Panel Multicollinearity test results

Table 3 presents the results of the multicollinearity test of the Full Panel dataset (2003 – 2016) consisting of 1718 observations. The test was fitted using the Fixed effects regression estimator. It shows the variables under investigation in one column and the corresponding VIFs for each. The variables in the table are defined as follows: **Investment$_{t-1}$** refers to the lagged investment, **cf** refers to the internally generated cash flow, **cf$_{t-1}$** refers to the lagged internally generated cash flow, **divp** refers to dividends payout, **fsize** denotes firm size, and **cfh** represents cash flow holding level. All the variables are defined in Annexure A. These variables are defined in Annexure A.

Variable	VIF Full Panel (2003-2016)	1/VIF Full Panel (2003-2016)
Investment$_{t-1}$	6.92	0.1446
cf	6.79	0.1473
cf$_{t-1}$	5.05	0.1978
divp	2.45	0.4080
fsize	2.41	0.4153
cfh	2.05	0.4868
Mean VIF	**4.28**	

4.3.2 The Blundell and Bond Regression Results

The BB system GMM test results for firms split into constrained versus unconstrained as per the three-classification criterion discussed in Chapter 2 are presented in Tables 4, 5 and 6 below. The number of observations, Wald Chi2, Prob>Chi2, AR (1), AR (2) together with the Sargan test statistics are presented at the bottom of the table. These confirm that the model was well fitted across all samples. For the model across the three-sample splitting criterion, the AR (1) test statistic suggests the existence of negative first order autocorrelation for residuals. According to Roadman (2006) and Ramjee and Gwatidzo (2012), this result is expected and uninformative. They assert that to ascertain the correlation, the second order autocorrelation AR (2) results should be relied upon. The AR (2) revealed that the estimates are consistent as there is no second order autocorrelation of residuals. The Sargan test confirms the validity of the over-identifying restrictions implying that all the instrumental variables are valid for the BB system GMM estimator.

4.3.2.1 Blundell and Bond results as per Dividends payout variable criterion

The results of the main estimator for samples split according to the dividends payout variable discussed in chapter 3 are presented in Table 4 and discussed below.

Table 4: Blundell and Bond Regression results using dividends payout classification variable

Table 4 shows the regression results for the full panel and sub-panels split into constrained versus unconstrained as per the **dividends payout** variable. The regression model was fitted with the Blundell and Bond (1998) system GMM. All coefficients were estimated at 99% confidence level. **Investment** denotes the independent variable investment, **Investment$_{t-1}$** refers to the lagged investment, **cf** refers to the internally generated cash flow, **cf$_{t-1}$** refers to the lagged internally generated cash flow, **divp** refers to dividends payout, **fsize** denotes firm size, and **cfh** represents cash flow holding level. The variables are defined in Annexure A. T-statistics are reported in parentheses. The markings ***, **, and * indicate significances at 99, 95 and 90 percent levels respectively. The AR (1), AR (2) and the Sargan test statistics are shown at the bottom of the table.

Variable	2003 – 2016 Full Sample		2003 – 2006 Prior the Global Crisis		2006-2010 During the Global Crisis		2010 – 2016 Post the Global Crisis	
	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Investment	3.0726***	2.6217***	1.0250	-1.7275	25.8405**	13.6448*	-68.1023	1.2752
	(4.50)	(5.60)	(0.79)	(-0.96)	(2.91)	(2.20)	(-1.71)	(0.26)
Investment$_{t-1}$	-2.9362***	-2.2051***	-1.1325	0.8886	-25.6537**	-12.5551*	68.2976	-1.3634
	(-4.72)	(-5.96)	(-1.06)	(0.58)	(-2.96)	(-2.21)	(1.71)	(-0.27)
Cf	0.5039***	0.1402	0.2281	-0.2653	0.6812**	0.1195	0.3264**	0.2334
	(4.91)	(1.51)	(1.35)	(-1.33)	(2.68)	(0.54)	(3.20)	(1.06)
cf$_{t-1}$	0.2778**	0.1817	0.2641	-0.3423	0.2440	0.1139	0.1518	0.1747
	(3.12)	(1.82)	(1.85)	(-1.23)	(0.88)	(0.52)	(1.17)	(0.94)
Divp	-1.4044*	-0.1312	-0.6464	-0.0182	-0.3663	0.1514	-0.2416	-0.5114
	(-2.28)	(-1.52)	(-0.97)	(-0.06)	(-0.23)	(0.56)	(-1.18)	(-1.56)
Fsize	-0.0292*	0.0047	0.0931**	0.0144	-0.0906	00.309	-0.0054	0.0006
	(-2.10)	(0.63)	(3.02)	(0.50)	(-2.12)	(-0.90)	(-0.29)	(0.04)
Cfh	-0.1937	-0.2387***	-0.6380***	-0.1168	-0.5738	-0.0753	-0.0873	0.0372
	(-1.73)	(-3.60)	(-4.79)	(-0.59)	(-2.91)	(-0.45)	(-1.21)	(0.29)
Obs	976	627	295	55	311	196	483	117
Wald Chi2	111.48	90.02	54.84	25.39	38.75	17.16	24.36	19.63
Prob > Chi2	0.0000	0.0000	0.0000	0.0006	0.0000	0.0164	0.0010	0.0064
AR (1)	-5.7642***	-4.9561***	-1.5243***	-2.7086	-3.4057***	-1.6150	-4.3921***	-2.6263***
AR (2)	0.1275	-0.7661	-	-	1.3528	-1.6298	-1.403	-1.1849
Sargan Test	440.5039	208.4475	65.8749	9.1883	70.5146	23.8700	97.8714	73.2137

- **Full Sample 2003 to 2016**

  This study found a positive and significant ICFS coefficient for financially-constrained firms and an insignificant CFSI for financially-unconstrained firms for the full sample covering 2003 to 2016. The results show that constrained firms' investment patterns are greatly influenced by changes in internally-generated cash flows. On the other hand, unconstrained firms also rely on internally generated cashflows but not as much as constrained firms. This is in line with a study by Chen and Chen (2012) who also classified firms into low dividend paying or constrained and high dividend paying or unconstrained and found a coefficient of 0.04 for constrained firms and 0.01 for unconstrained firms. ICFS is higher for low or no dividend paying firms than for high dividend paying firms. They assert that firms paying dividends do so because they have the means, thus they are financially-unconstrained. They also have lower ICFS as they can afford to tap into the external market to borrow funding to finance their investment patterns. On the other hand, low or no paying dividends firms are classified as constrained and have a high ICFS as their investment patterns are greatly affected by changes in internally-generated cash flows as they cannot easily access external financing. Financially-constrained firms therefore depend more on internally generated cash flows to fund their investment options and hence have a high ICFS. The results of a high ICFS for financially-constrained firms classified as per dividends pay-out signifies that ICFS can be a good measure of financial constraints as the more financially-constrained a firm is, the higher the CFSI. Thus, the results do not support hypothesis 3 which states that IFCS is not a good measure of financial constraints.

- **Prior the global crisis 2003 to 2006**

  For the period 2003 to 2006, the estimator predicts a high, positive and insignificant ICFS for firms classified as constrained and a low, negative and insignificant ICFS for unconstrained firms. This shows that the investment patterns of constrained firms were greatly reliant on internally generated cash flows. On the other hand, financially-unconstrained firms were not reliant on internally generated cash flows for investment as they could invest even when they had low internally generated cash flows as shown by the negative ICFS coefficient. This conclusion finds support from past studies by Chen and Chen (2012) and Fazarri et al. (1988) who arrived at similar conclusions. It is expected that before the global financial crisis, unconstrained firms had the means to invest by borrowing from banks and could raise equity from capital markets without

relying on internally-generated cash flow, hence the negative ICFS. The constrained firms had a positive ICFS, meaning their investments relied heavily on internally generated cash flows. Thus, before the global crisis, financially-constrained firms depended more on internally-generated cash flows to fund their investment options and hence have a high ICFS than unconstrained firms that had a negative ICFS. The results of a high ICFS for financially-constrained firms classified as per dividend pay-out signifies that ICFS can be a good measure of financial constraints as the more financially-constrained a firm is, the less investments it can do and the higher the ICFS. These results show that this study does not support hypothesis 3 during the period before the global crisis.

- **During the global crisis 2006 to 2010**

  The results show a positive, high and significant ICFS for firms classified as constrained using the dividends pay-out and a high and positive, low but insignificant ICFS for unconstrained firms. The results show that during the global crisis, both constrained and unconstrained sample firms show some degree of being constrained. Those firms classified as constrained, remained constrained during this period and relied heavily on internally-generated cash flow for investment owing to the difficulty of obtaining finance as evidenced by an increase in the ICFS. Financially-constrained firms' investment patterns worsened during this period owing to difficulties in obtaining finance. This is consistent with a survey by Campello, Graham and Harvey (2010) who concluded that during the global crisis, all firms were forced to scale down or curtail their investment patterns and draw heavily on lines of credit owing to the severity of the crisis.

  Empirical support for this is plentiful. Khramov (2012) and Andren and Jankensgard (2015), Brown, Fazzari and Petersen (2009) and Chen and Chen (2012) all show that the global financial crisis increased liquidity constraints and almost doubled the CFSI. They attribute this to limited credit availability from lenders, thus, most constrained and unconstrained firms were forced to rely on their internally-generated cash flows to fund growth options. Thus, for South African firms, the global financial crisis was severe as both samples of constrained and unconstrained firms were constrained as they relied on internal cash flows for investment as shown by the high ICFS. The results support hypothesis 2 by providing evidence that the global financial crisis was severe and both samples of constrained and unconstrained firms were constrained as they relied on internal cash flows for investment.

- **Post the global crisis 2006 to 2010**

Post the crisis, the study found a positive, high and significant ICFS for financially-constrained firms for the period 2010 to 2016. The constrained firms had an improved, significant and lower IFCS post the crisis than during the crisis period. This is clear evidence that the constrained firms continued to be constrained post the crisis as they had been before and during the crisis period. This finding is in line with studies by Moyen (2004) and Chen and Chen (2012) who arrived at similar conclusions. Firms classified as unconstrained also had a high but insignificant ICFS and this indicates that although they are classified as unconstrained as per the dividends payout, their investment patterns were greatly influenced by changes in internally-generated cash flows as well post the global crisis period. This provides clear evidence that the negative effects of the crisis continued to be felt post the crisis by unconstrained firms. Thus, South African unconstrained firms continued to be constrained even post the crisis as they were still in recovery mode and thus, relied on internally-generated cash flows for investments. Therefore, the results do not support hypothesis 3.

Dividends pay-out variable as a classification criterion

The above results for the main sample and sub samples show that firms classified as constrained using the dividend payout criterion had a high, positive and in most cases significant ICFS. This, therefore, supports the notion that the dividend pay-out criterion is a good proxy to distinguish firms into constrained versus unconstrained as it is the constrained firms that had a high ICFS across the main and subsamples. ICFS can also be a good measure of financial constraints as the financially- constrained firms had a high ICFS, thus, financial constraints and ICFS have a positive relationship. This implies that firms which are financially-constrained are those that were paying low or no dividends and had a high, positive and in some cases significant ICFS coefficient. This is in line with findings by Fazarri et al. (1988), Gilchrist and Himmelberg (1995), Guariglia (2008), Shin and Kim (2002) and Chen and Chen (2012). They attribute this to the fact that paying dividends is a choice that a company makes and an indication of a firm's good health and signaling long term growth prospects, thus, dividend paying firms are financially-unconstrained. Therefore, the BB model does not find support for hypotheses 1 and 3.

4.3.2.2 Blundell and Bond results as per Cash flow holding variable criterion

The results of the main estimator for samples split according to the cash flow holding variable discussed in Chapter 3 are presented in Table 5 and discussed below.

Table 5: Blundell and Bond Regression results using cash flow holding classification variable

Table 5 shows the regression results for the full sample and subpanels split into constrained versus unconstrained as per the cash flow holding variable. The regression model was fitted with the Blundell and Bond (1998) system GMM. All coefficients were estimated at 99% confidence level. **Investment** denotes the independent variable investment**, Investment$_{t-1}$** refers to the lagged investment, **cf** refers to the internally generated cash flow, **cf$_{t-1}$** refers to the lagged internally generated cash flow, **divp** refers to dividends payout, **fsize** denotes firm size, and **cfh** represents cash flow holding level. The variables are defined in Annexure 1. T-statistics are reported in parentheses. The markings ***, **, and * indicate significances at 99, 95 and 90 percent levels respectively. The AR (1), AR (2) and the Sargan test statistics are shown at the bottom of the table.

Variable	2003 – 2016 Full Sample		2003 – 2006 Prior the Global Crisis		2006 – 2010 During the Global Crisis		2010 – 2016 Post the Global Crisis	
	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Investment	2.0844***	3.1193***	0.6450	2.7168	-19.0873*	9.6934***	-113.5972	11.6817
	(4.77)	(5.48)	(0.68)	(1.84)	(-2.23)	(3.41)	(-1.59)	(1.09)
Investment$_{t-1}$	-1.8420***	-2.7174***	-0.7765	-2.4303*	17.9844*	-8.6958***	113.6293	-11.7367
	(-5.08)	(-5.90)	(-0.99)	(-2.14)	(2.20)	(-3.58)	(1.59)	(-1.11)
Cf	0.3206**	0.3028	0.2908	0.2437	0.2298	0.2477	0.6147***	0.4105***
	(2.65)	(3.13)	(0.92)	(0.76)	(0.84)	(1.31)	(5.53)	(3.47)
cf$_{t-1}$	0.3945***	0.8323	0.1868	0.3135	0.7561****	0.0072	0.4521**	0.6010
	(4.05)	(1.37)	(0.63)	(0.92)	(3.33)	(0.03)	(3.23)	(-0.62)
Divp	-0.5542	-0.3316**	-0.2319	-1.0612	-0.2708	0.0514	-0.8762*	0.4122
	(-1.93)	(-2.87)	(-0.40)	(-1.24)	(-0.41)	(0.11)	(-2.21)	(1.68)
Fsize	-0.0201	-0.0060	0.0296	0.1668**	0.0265	-0.0512	0.0442	0.0077
	(-1.48)	(-0.47)	(1.20)	(2.69)	(0.48)	(-1.09)	(2.59)	(0.74)
Cfh	-0.3898**	-0.1963**	-1.4255***	-0.3418	-0.5473	-0.3766	-0.3698	0.0282
	(-2.72)	(-2.87)	(-3.67)	(-1.58)	(-1.74)	(-1.80)	(-1.91)	(0.31)
Obs	949	654	178	172	299	208	383	363
Wald Chi2	80.96	62.79	48.32	35.01	33.63	20.08	45.95	24.15
Prob> Chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0054	0.0000	0.0000
AR (1)	-6.1481***	-4.4255***	-1.8786***	-1.7970	-2.9284***	-2.6212***	-3.8084***	-4.6509***
AR (2)	-0.0842	0.4982	-	-	-1.7891	0.6534	-1.0325	-2.9688***
Sargan Test	359.9564	227.5316	51.3204	5.744	88.6388	8.5126	133.0354	164.5211

40

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- **Full Sample 2003 to 2016**

  This study found a positive, high and significant ICFS coefficient for constrained and a positive, low and insignificant ICFS for unconstrained firms for the full sample covering 2003 to 2016 as per the cash flow holding variable. This means that financially-constrained firms relied more on internally-generated cash flows to satisfy their investments and unconstrained firms did not depend too much on internal cash flows for investments. Constrained firms cannot afford to hold their profits as cash as they need to pay their obligations and will be left with low or no cash to hold, thus their investments are greatly responsive to changes in the availability of internally generated cash flows as shown by a high and significant ICFS. At the same time, high cash holding is a sign of an unconstrained and profitable business as the firm can afford to hold cash from its operating profits after paying all expenses, thus, investments are not greatly affected by changes in the availability of internally-generated cash flows as shown by a low and insignificant ICFS. This is in line with previous studies by Cleary (1999) and Almeida et al., (2004) who concluded a high ICFS for financially-constrained firms and a low ICFS for financially-unconstrained firms classified according to the cash holding level.

  In contrast, Hovakimian and Hovakimian (2009), Almeida et al., (2004) and Acharya, Almeida and Campello (2007) found a negative ICFS and attributed this to the fact that a financially-constrained firm will hold cash in anticipation of future anticipated profitable investments and to deal with unexpected negative future market shocks including an increase in interest payments on debts, hence, the precautionary and speculative motive for cash holding.

  The results of a high ICFS for financially-constrained firms classified as per cash flow holding variable signifies that ICFS can be a good measure of financial constraints as the more financially-constrained a firm is, the less investments it can do and the higher the ICFS, thus, the BB model does not support hypothesis 3.

- **Prior the global crisis 2003 to 2006**

  The study found a positive, high and insignificant ICFS for firms classified as constrained using the cash flow holding variable and a positive, low and insignificant ICFS for unconstrained firms. This shows that financially-constrained firms' as per the cash flow holding depend highly on

internally-generated cash flows for investments. The results are in line with the findings of the full sample using the dividends payout classification criterion explained in the previous section and supported by Cleary (1999) and Almeida et al., (2004). On the other hand, the results are different from those by Hovakimian and Hovakimian (2009) who found a low ICFS for financially-constrained firms prior the crisis. Thus, before the global crisis, financially-constrained firms depended more on internally-generated cash flows to fund their investment options and hence have a high ICFS than unconstrained firms who had a positive but low ICFS. The results of a high ICFS for financially-constrained firms classified as per dividends pay-out signifies that ICFS can be a good measure of financial constraints as the more financially-constrained a firm is, the less investments it can do and the higher the ICFS, thus, the BB model does not support hypothesis 3 for the period before the global crisis.

- **During the global crisis 2006 to 2010**

  The results show a positive, low and insignificant ICFS for constrained firms and a positive, high and insignificant CFSI for unconstrained firms. This finding shows that during the crisis both groups of firms relied on internal cash flow to fund their investment patterns as the global financial crisis was severe with banks restricting credit options. However, those firms classified as unconstrained had a higher ICFS showing that they were more constrained during the financial crisis period, thus their investments were greatly dependent on internally generated cash flows. Therefore, the crisis forced a number of both constrained and unconstrained firms to scale down or curtail their investment patterns owing to the severity of the crisis as propounded by Khramov (2012), Andren and Jankensgard (2015), Brown et al., (2009) and Chen and Chen (2012). These results agree with those under the dividend pay-out variable during the financial crisis period subsample, thus supporting hypothesis 2 as all firms' investments were adversely affected by movements in their internally generated cash flow.

- **Post the global crisis 2010 to 2016**

  The period post the global crisis revealed a positive, high and significant ICFS for financially-constrained firms for the period 2010 to 2016. This is clear evidence that the negative effects of the global financial crisis continued to be felt post the crisis period as constrained firms still depended on internally-generated cash flows for investments. Firms that were classified as

unconstrained continued to significantly rely on internally generated cash flows for investments hence an increased ICFS from the period during the global crisis. The result indicates that although they are classified as unconstrained as per the cash flow holding variable, their investment patterns were greatly influenced by changes in internally-generated cash flows as well. This may be because companies had not yet fully recovered from the impact of the credit crunch which extended beyond 2006 to 2010 period. Thus, South African firms classified as constrained and unconstrained continued to be constrained even after the crisis as firms were still in recovery mode and thus relied on internally-generated cash flows for investments. Therefore, the results do not support hypothesis 3.

Cash flow holding as a classification criterion

The above results for the main sample and subsamples find support that cash flow holding variable is a good criterion for distinguishing firms into financially-constrained versus financially-unconstrained as the more financially constrained a firm is, the higher its ICFS. These results do not support hypothesis 1. Financially-constrained firms were holding low or no cash flow and had a high, positive and in some cases significant ICFS coefficient. This is in line with previous studies by Cleary (1999), Povel and Raith (2001) and Almeida et al., (2004). They attribute this to the fact that for a firm to hold a huge amount of cash flow, is a clear sign that it is profitable and can afford to hold cash after paying off all its expenses. Thus, financially-constrained firms are dependent on internally-generated cash flows for investments thus confirming that ICFS can be a measure of financial constraints and supporting hypothesis 3.

4.3.2.3 Blundell and Bond results as per Firm size variable criterion
The results of the main estimator for samples split according to firm size variable discussed in Chapter 3 are presented in Table 6 and discussed below.

Table 6: Blundell and Bond Regression results using firm size classification variable

Table 6 shows the regression results for the full sample and subsamples split into constrained versus unconstrained as per the firm size variable. The regression model was fitted with the Blundell and Bond (1998) system GMM. All coefficients were estimated at 95% confidence level. **Investment** denotes the independent variable investment**, Investment**$_{t-1}$ refers to the lagged investment, **cf** refers to the internally generated cash flow**, cf**$_{t-1}$ refers to the lagged internally generated cash flow, **divp** refers to dividends payout, **fsize** denotes firm size, and **cfh** represents cash flow holding level. The variables are defined in Annexure 1. T-statistics are reported in parentheses. The markings ***, **, and * indicate significances at 99, 95 and 90 percent levels respectively. The AR (1), AR (2) and the Sargan test statistics are shown at the bottom of the table.

Variable	2003 – 2016 Full Sample		2003 - 2006 Prior the Global Crisis		2006-2010 During the Global Crisis		2010 – 2016 Post the Global Crisis	
	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Investment	3.1208***	2.4834***	2.3901	1.0966	7.5697*	12.7055	-68.1023	2.5370
	(5.53)	(4.25)	(1.59)	(0.92)	(2.36)	(1.59)	-(1.71)	(0.47)
Investment$_{t-1}$	-2.8507***	-2.2226***	-2.4369	-0.9826	-6.9160*	-12.4586	68.2976	-2.7927
	(-5.68)	(-4.54)	(-1.81)	(-1.33)	(-2.48)	(-1.61)	(1.71)	(-0.54)
Cf	0.4666***	0.3296**	-0.0486	0.1842	0.3905	0.1418	0.3264**	0.7064***
	(4.39)	(3.05)	(-0.22)	(0.53)	(1.75)	(0.70)	(3.20)	(5.32)
cf$_{t-1}$	0.1858**	0.2928*	0.1230	0.1946	0.1454	0.4510*	0.1518	0.3777**
	(2.58)	(2.52)	(0.57)	(0.88)	(0.83)	(2.44)	(1.17)	(2.63)
Divp	-0.9705***	-0.2031	-1.3996*	-0.1456	-0.4831	-0.2673	-0.2416	-0.1083
	(-3.96)	(-0.89)	(-2.08)	(-0.37)	(-0.87)	(-0.61)	(-1.18)	(-0.22)
Fsize	-0.0330	0.0105	0.1914***	0.0832	-0.0502	-0.0245	-0.0054	0.0392***
	(-1.94)	(0.88)	(4.84)	(1.29)	(-1.57)	(-0.76)	(-0.29)	(3.69)
Cfh	-0.1820*	-0.3106**	-0.3780	-0.7967***	-0.4755*	-0.2941	-0.0873	0.3906*
	(-2.11)	(-2.95)	(-1.89)	(-3.96)	(-2.10)	(-1.59)	(-1.21)	(-2.15)
Obs	763	840	202	148	246	261	438	308
Wald Chi2	128.13	85.93	56.19	53.62	40.09	42.18	24.36	93.90
Prob > Chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0010	0.0000
AR (1)	-4.4765***	-5.2125***	-1.3503	-1.7338	-2.5796***	-3.7535***	-4.3921***	-3.7197***
AR (2)	0.3116	-0.7235	-	-	-0.6701	0.6848	-1.403	-2.0936***
Sargan Test	309.1236	327.0881	13.0181	2.5645	61.6521	99.9311	168.5869	102.7929

- **Full Sample 2003 to 2016**

  The results show a positive, high and significant ICFS for constrained firms and a positive, low and significant CFSI for unconstrained firms for the full sample covering 2003 to 2016. The result shows that financially-constrained firms depended more on internally generated cash flows for investments than the unconstrained firms. This is in line with previous studies by Gertler and Gilchrist (1994), Allayannis and Mozumdar (2004), Almeida and Campello (2007) and Cleary (2006) who found a high ICFS for financially-constrained firms and a low ICFS for financially-unconstrained firms classified according to firm size as measured by total assets. A high level of total assets imply that a firm can provide collateral to the external provider of funds and, hence, not owning tangible assets would be a deterrent factor to acquiring financing. Generally, large firms have higher stocks of assets, and hence better collateral when compared to smaller firms, thus, they are financially-unconstrained. Large firms can also easily tap into the external market and negotiate better borrowing rates.

  In contrast, studies by Devereux and Schiantarelli (1990) and Kadapakkam et al., (1998) found a high ICFS for larger unconstrained firms classified using the firm size variable. They attributed this to management skepticism and investment preferences. However, the result of this study shows that firms are dependent on internally generated cash flows for investments which signifies that ICFS can a good measure of financial constraints as the more financially-constrained a firm is, the less investments it can do and the higher the ICFS, thus, the BB model does not support hypothesis 3.

- **Prior the global crisis 2003 to 2006**

  This study found a low, negative and insignificant ICFS for firms classified as constrained and a high ICFS unconstrained firms. The results show that firms classified as constrained as per the firm size variable were not dependent on internally-generated cash flows for investments evidenced by the low CFSI. This implies that investment patterns of firms classified as constrained increased even as cash flows dwindled. This finding is different from that by Allayannis and Mozumdar (2004), Cleary (2006) and Almeida and Campello (2007) who obtained a high ICFS for firms classified as financially-constrained and a low ICFS for firms classified as unconstrained. This BB model also found a positive, high and insignificant CFSI for firms classified as financially

unconstrained. The result implies that financially-unconstrained firms depended more on internally-generated cash flow to fund their investments. This finding is not in line with the one under the dividends payout and cash flow holding variable highlighted in the previous sections, thus, firm size variable does not support hypotheses 1 and 3.

- **During the global crisis 2006 to 2010**

  The results show a positive, high and insignificant ICFS for firms classified as constrained using the cash flow holding variable and a positive, low and insignificant ICFS for unconstrained firms. The results show that to some degree during the crisis, both groups of firms relied on internally generated cash flows for investment as they both had positive ICFS. Financially-constrained firms however relied more on internally generated cash flows for investment evidenced by a high and positive CFSI. The result is similar to the one explained in the previous section under dividends payout variable during the global crisis and, thus, hypotheses 1, 2 and 3 are accepted.

- **Post the global crisis 2010 to 2016**

  The BB model found a positive, low and significant ICFS for financially constrained firms for the period 2010 to 2016. Firms classified as unconstrained had a positive, high and significant ICFS. This indicates that financially-constrained firms were less constrained post the crisis than during the global crisis as evidenced by an improved and lower CFSI and unconstrained firms were more constrained post the crisis than during the crisis. This may be because the effects of the crisis extended post the crisis for financially unconstrained firms. The improvement in CFSI for financially constrained firms may be attributed to the fact that firms were in a recovery phase. Financially-constrained firms had a low ICFS than financially unconstrained firms, thus, hypothesis 3 is accepted as the more financially constrained a firm is, the lower its ICFS.

Firm size as a classification criterion

The above results indicate that firm size variable is not a good criterion for classifying firms into financially-constrained versus financially-unconstrained as financially-constrained firms as per firm size variable do not show a high ICFS across all samples in the study. This implies that financially-constrained firms were not dependent on internally-generated cash flows for investments across the subsamples and had a lower ICFS in some cases. Therefore, ICFS cannot

be a good measure of financial constraints. Thus, the BB model supports hypothesis 3 and does not support hypothesis 1.

4.3.3 The Fixed Effects Robustness Regression Results

The next section presents the results of the Fixed Effects robustness test estimator for samples split according to the three-classification criterion discussed in Chapter 2. The results are presented in Tables 7, 8 and 9 below.

4.3.3.1 Fixed Effects results as per Dividends payout variable criterion.

The results of the robustness estimator for samples split according to dividends payout variable discussed in Chapter 3 are presented in Table 7 and then discussed below.

Table 7: Fixed Effects regression results using dividends pay-out classification variable

Table 7 shows the regression results for the full sample and subpanels split into constrained versus unconstrained as per the dividends payout variable. The regression model was fitted with the Fixed Effects estimator. All coefficients were estimated at 95% confidence level. **Investment** denotes the independent variable investment, **Investment$_{t-1}$** refers to the lagged investment, **cf** refers to the internally generated cash flow, **cf$_{t-1}$** refers to the lagged internally generated cash flow, **divp** refers to dividends payout, f**size** denotes firm size, and **cfh** represents cash flow holding level. The variables are defined in Annexure 1. T-statistics are reported in parentheses. The markings ***, **, and * indicate significances at 99, 95 and 90 percent levels respectively.

Variable	2003 - 2016 Full Sample		2003 - 2006 Prior the Global Crisis		2006-2010 During the Global Crisis		2010 – 2016 Post the Global Crisis	
	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Investment$_{t-1}$	-0.0183 (-0.75)	-0.0029 (-0.11)	-0.1192*** (-5.11)	-0.0566 (-1.34)	-0.1750*** (-3.66)	-0.0608 (-0.95)	-0.0816 (-1.71)	0.0415 (0.40)
Cf	0.3467*** (5.26)	-0.0104 (-0.11)	0.3008** (2.74)	-0.4318** (-3.08)	0.2664 (1.72)	0.0678 (0.49)	0.2825*** (4.04)	0.2097 (1.31)
cf$_{t-1}$	0.2016** (2.71)	0.2838** (3.18)	0.2044* (2.26)	0.2317 (1.25)	0.3045* (2.11)	0.2862* (2.24)	0.2015** (3.04)	0.1855 (1.30)
Divp	-0.1126 (-0.28)	-0.0324 (-0.37)	-1.2064* (-2.41)	-0.3050 (-1.17)	0.6935 (0.97)	-0.2382 (-1.58)	-0.0013 (-0.01)	-0.1594 (-1.07)
Fsize	0.0193** (3.00)	0.0074 (1.31)	0.1342*** (6.40)	0.0990** (3.13)	-0.0028 (-0.19)	-0.0120 (-0.74)	0.0418*** (5.15)	0.0236 (1.89)
Cfh	-0.1977** (-2.99)	-0.1778*** (-4.93)	-0.4422*** (-4.30)	-0.0649 (-0.27)	-0.2711* (-2.56)	-0.3345*** (-6.52)	-0.1487* (-2.54)	-0.0673 (-0.95)
Obs	1043	673	390	73	382	244	736	136
Mean VIF	2.71	8.59	3.22	8.32	3.47	9.39	4.33	6.37
Prob > Chi2	0.0000	0.0000	0.0000	0.0023	0.0000	0.0000	0.0000	0.0207

- **Full Sample 2003 to 2016**

This study found a positive, high and significant ICFS for constrained firms and a negative, low and insignificant ICFS for unconstrained firms for the full sample covering 2003 to 2016. This shows that constrained firms relied heavily on internal funds for investment than unconstrained firms. This is in line with the findings of the main estimator, the BB system GMM which are explained above. Thus, the results do not support hypothesis 3.

- **Prior the global crisis 2003 to 2006**

The results show a positive, high and significant ICFS for firms classified as constrained using the dividends pay-out and a negative, low and significant ICFS for unconstrained firms. This shows that constrained firms relied heavily on internal funds for investment. This finding is in support of the results explained under the main estimator which also found a high but insignificant ICFS for financially-constrained firms as per the dividends payout variable during this period. The implications are explained in detail in the previous section of the main estimator results. Thus, this subsample results do not support hypothesis 3.

- **During the global crisis 2006 to 2010**

The Fixed Effects model found a positive, high and insignificant ICFS for firms classified as constrained using the dividends pay-out and a positive, low and insignificant ICFS for unconstrained firms. The positive ICFS coefficients show that both constrained and unconstrained firms relied on internal funds for investment. However, constrained firms relied more on internally-generated funds than unconstrained firms. This finding is in support of the results under the main estimator which also concluded a positive, high and insignificant ICFS for financially-constrained firms and a positive, low and insignificant CFSI for unconstrained firms as per the dividends payout. The implications are explained in detail in the previous section of the main estimator results. Thus, hypothesis 2 is supported and 3 is not supported.

- **Post the global crisis 2010 to 2016**

The results show a positive, high and significant ICFS for financially-constrained firms and a positive, low and insignificant CFSI for unconstrained firms. This is clear evidence that the constrained firms continued to be constrained post the crisis as they had been before and during

the crisis as their investments were greatly dependent on the availability of internally-generated cash flows. This result is in line with findings under the BB system GMM estimator as per the dividends pay-out and are explained above. Thus, the results do not support hypothesis 3.

Dividends payout as a classification criterion

This Fixed Effects model found a high IFCS for firms classified as constrained as per the dividends payout and a low CFSI for firms classified as unconstrained across the full sample and subsamples. The findings tie up with results under the BB system GMM estimator that dividends pay-out can be a good criterion for distinguishing firms into financially-constrained versus unconstrained and ICFS can be a good measure of financial constraints as financially-constrained firms have a high ICFS. Thus, the results do not support hypothesis 1.

4.3.3.2 Fixed Effects result as per Cash flow holding variable criterion

The results of the Fixed Effects robustness estimator for samples split according to cash flow holding variable discussed in Chapter 3 are presented in Table 8 and then discussed below.

Table 8: Fixed Effects regression results using cash flow holding classification variable

Table 8 shows the regression results for the full sample and subpanels split into constrained versus unconstrained as per the cash flow holding variable. The regression model was fitted with the Fixed Effects estimator. All coefficients were estimated at 99% confidence level. **Investment** denotes the independent variable investment, **Investment$_{t-1}$** refers to the lagged investment, **cf** refers to the internally generated cash flow, **cf$_{t-1}$** refers to the lagged internally generated cash flow, **divp** refers to dividends payout, **fsize** denotes firm size, and **cfh** represents cash flow holding level. The variables are defined in Annexure 1. T-statistics are reported in parentheses. The markings ***, **, and * indicate significances at 99, 95 and 90 percent levels respectively.

Variable	2003 – 2016 Full Sample		2003 - 2006 Prior the Global Crisis		2006-2010 During the Global Crisis		2010 – 2016 Post the Global Crisis	
	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Investment$_{t-1}$	0.0090 (0.42)	-0.0763** (-3.40)	-0.0769** (-3.13)	-0.1378*** (-4.36)	-0.1278** (-2.88)	-0.1250 (-1.78)	-0.1294** (-2.68)	0.0054 (0.08)
Cf	0.1658 (1.96)	0.2026** (3.07)	0.0471 (0.43)	0.4382** (3.38)	0.2313 (1.29)	0.1063 (0.95)	0.2594** (2.67)	0.3352*** (4.03)
cf$_{t-1}$	0.4215*** (4.72)	0.1044* (2.09)	0.4370* (2,58)	0.2068* (2.04)	0.4893** (3.39)	0.1434 (1.56)	0.4009*** (4.54)	-0.0279 (-0.42)
Divp	-0.1405 (-0.78)	-0.1949 (-1.97)	-0.8636* (-2.14)	-0.5884 (-1.75)	-0.5514 (-1.64)	-0.0812 (-0.35)	-0.3419 (-1.38)	0.2070 (1.19)
Fsize	0.0199** (3.00)	0.0114 (1.73)	0.1445*** (5.22)	0.0558*** (3.83)	-0.0203 (-0.98)	0.0071 (0.43)	0.0480*** (5.43)	0.0331*** (3.46)
Cfh	-0.2676** (-2.92)	-0.1733*** (-4.97)	-0.8024** (-3.19)	-0.4093*** (-4.43)	-0.5261** (-3.13)	-0.2380 (-3.37)	-0.3600*** (-3.51)	-0.0571 (-1.28)
Obs	1015	702	235	228	367	259	447	425
Mean VIF	4.45	4.67	4.42	4.44	5.03	5.53	4.62	5.10
Prob > Chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0332	0.0000	0.0000

- **Full Sample 2003 to 2016**

  The Fixed Effects model found a positive, low and insignificant ICFS for constrained firms and a positive, high and significant ICFS for unconstrained firms for the full sample covering 2003 to 2016. It shows that constrained firms were less dependent on internally-generated cash flows for investments than financially-unconstrained firms. This result is not in line with the findings of the main estimator which found a high and significant ICFS for financially-constrained firms and a low ICFS for financially-unconstrained firms as per the cash flow holding variable. This implies that according to the Fixed Effects, the ICFS for the full sample showed that both constrained and unconstrained firms were constrained for the years 2003 to 2016 with unconstrained firms being more constrained, thus, depending more on internally generated cash flows for investments. The finding therefore supports hypothesis 3.

- **Prior the global crisis 2003 to 2006**

  The results show a positive, low and insignificant ICFS for constrained firms and a positive, high and significant ICFS for unconstrained firms using the cash flow holding. The results show that firms classified as constrained were not dependent on internally generated cash flows for investments as evidenced by the low and insignificant ICFS. However, unconstrained firms were more dependent on internal funds for investments evident by a high and significant CFSI. The results are not the same as those of the main estimator explained in the previous section. The result that financially-constrained firms have a low ICFS implies that IFCS cannot be a good measure of financial constraints Thus, the Fixed Effects model supports hypothesis 3.

- **During the global crisis 2006 to 2010**

  The results show a positive, high and insignificant ICFS for firms classified as constrained using the cash flow holding variable and a positive, low and insignificant ICFS for unconstrained firms. Both constrained and unconstrained firms' investment patterns were affected by changes in internally generated cash flows during this period evidenced by their respective positive CFSI. This result ties up with the findings of the main estimator discussed in the previous section. Thus, the Fixed Effects model finds support for hypothesis 2 and does not support hypothesis 3.

- **Post the global crisis 2010 to 2016**

The Fixed Effects model found a positive, low and significant ICFS for financially-constrained and a positive, high and significant CFSI for financially-unconstrained firms for the period 2010 to 2016. The result shows that financially-constrained firms rely less on internal cash flows for investments evidenced by a low ICFS than financially-unconstrained firms, thus, ICFS is not a good measure of financial constraints. Therefore, the results support hypothesis 3.

Cash flow holding as a classification criterion

The above results indicate that cash flow holding variable is not a good criterion for distinguishing firms into financially-constrained versus financially-unconstrained as financially-constrained firms as per the cash flow holding variable do not show a high ICFS across all samples in the study. This implies that financially-constrained firms were not dependent on internally-generated cash flows for investments across the subsamples and had a lower ICFS in some cases, therefore, ICFS cannot be a good measure of financial constraints. Thus, the Fixed Effects model results supports hypothesis 3.

4.3.3.3 Fixed Effects result as per firm size variable criterion

The results of the Fixed Effects estimator for samples split according to firm size variable discussed in Chapter 3 are presented in Table 9 and then discussed below.

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Table 9: Fixed Effects regression results using firm size classification variable

Table 9 shows the regression results for the full sample and subsamples split into constrained versus unconstrained as per the firm size variable. The regression model was fitted with the Fixed Effects estimator. All coefficients were estimated at 99% confidence level. **Investment** denotes the independent variable investment, **Investment$_{t-1}$** refers to the lagged investment, **cf** refers to the internally generated cash flow, **cf$_{t-1}$** refers to the lagged internally generated cash flow, **divp** refers to dividends payout, **fsize** denotes firm size, and **cfh** represents cash flow holding level. The variables are defined in Annexure 1. T-statistics are reported in parentheses. The markings ***, **, and * indicate significances at 99, 95 and 90 percent levels respectively.

Variable	2003 - 2016 Full Sample		2003 – 2006 Prior the Global Crisis		2006-2010 During the Global Crisis		2010 – 2016 Post the Global Crisis	
	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Investment$_{t-1}$	0.0141 (0.49)	-0.0527** (-2.75)	-0.1468*** (-4.29)	-0.0623** (-3.21)	-0.1461** (-2.80)	-0.0900 (-1.63)	-0.0728 (-1.21)	-0.0610 (-0.98)
Cf	0.3094*** (4.29)	0.0803 (1.04)	0.2720* (2.47)	-0.0591 (-0.45)	0.3640* (2.49)	-0.0660 (-0.46)	0.2551*** (3.95)	0.3292** (2.77)
cf$_{t-1}$	0.1286 (1.81)	0.3568*** (4.61)	0.0934 (1.05)	0.2966* (2.05)	0.1474 (1.15)	0.5033*** (4.11)	0.1344* (2.34)	0.2782* (2.07)
Divp	-0.3528* (-2.07)	-0.1176 (-0.77)	-1.3257** (-3.24))	-0.1760 (-0.65)	-0.4149 (-1.18)	-0.1968 (-0.64)	0.0075 (0.04)	-0.1755 (-0.61)
Fsize	0.0270** (3.22)	0.0144* (2.31)	0.1522*** (6.43)	0.0863*** (3.88)	-0.0107 (-0.55)	0.0095 (0.47)	0.0430*** (3.67)	0.0355** (3.37)
Cfh	-0.1378* (-2.54)	-0.3028*** (-6.07)	-0.3917** (-3.14)	-0.4354** (-3.10)	-0.2657 (-2.61)	-0.3904** (-3.44)	-0.1077* (-2.08)	-0.1621 (-1.41)
Obs	815	901	267	196	301	325	513	359
Mean VIF	3.02	5.62	2.58	6.78	4.12	6.44	3.34	7.32
Prob > Chi2	0.0000	0.0000	0.0000	0.0000	0.0012	0.0002	0.0000	0.0001

54

- **Full Sample 2003 to 2016**

The Fixed Effects model results show a positive, high and significant CFSI coefficient for constrained firms and a positive, low and insignificant ICFS for unconstrained firms for the full sample period covering 2003 to 2016. The results show that financially-constrained firms investment patterns are greatly affected by changes in internally-generated cash flows. This is in line with findings under the main estimator which are explained under the BB system GMM results in the previous section. Thus, the results do not support hypothesis 3.

- **Prior the global crisis 2003 to 2006**

The results show a positive, high and significant ICFS for firms classified as constrained and a negative, low and insignificant ICFS for unconstrained firms. This highlights that constrained firms are greatly dependent on internally-generated cash flow for investments when compared to unconstrained firms. This finding is supported by Allayannis and Mozumdar (2004), Cleary (2006) and Almeida and Campello (2007) who asserted a high ICFS for firms classified as financially-constrained and a low ICFS for firms classified as financially-unconstrained on the basis of firm size. The results of the fixed effects estimator are in contrast to the BB system GMM estimator results which are discussed in the previous section. Thus, the fixed effects model does not support hypothesis 3.

- **During the global crisis 2006 to 2010**

The results show a high, positive and significant ICFS for constrained firms and a low, negative and insignificant ICFS for unconstrained firms for the sample period covering 2006 to 2010. The results show that financially-constrained firms' investment patterns are greatly affected by changes in internally-generated cash flows whereas unconstrained firms' investments were not affected that much by the global crisis as their ICFS is still negative and low. The findings are in line with the findings under the main estimator which are explained in the previous section under the BB system GMM estimator. Therefore, this result supports hypotheses 2 and 3.

- **Post the global crisis 2010 to 2016**

The fixed effects model shows a positive, low and significant ICFS for financially-constrained firms for the period 2010 to 2016. Firms classified as unconstrained also had a positive, high and significant ICFS. Constrained firms ICFS improved post the crisis and this may be attributed to the firms' being in a recovery phase. The results show that unconstrained firms'

investments are greatly dependent on changes in internally-generated cash flows and this may be attributed to the negative effects of the crisis that extended beyond 2010. The findings post the crisis are similar to those of the main estimator which are explained in the previous section. Thus, the results support hypothesis 2 and do not support hypothesis 3.

Firm size as a classification criterion

As with the cash flow holding variable, the above results find support that firm size variable is not a good criterion to distinguish firms into financially-constrained versus financially-unconstrained as financially-constrained firms as per the firm size variable do not show a high ICFS across all samples in the study. This implies that financially-constrained firms were not dependent on internally-generated cash flows for investments across the subsamples and had a lower ICFS in some cases, therefore, ICFS cannot be a good measure of financial constraints. Thus, the fixed effects model results support hypothesis 3 and do not support hypothesis 1.

4.4 Which variable is a good criterion to distinguish firms into financially-constrained and unconstrained?

Drawing from the main estimator, that is, the BB system GMM, it is evident that of the three variables, dividend pay-out is a good variable to distinguish firms into financially-constrained versus financially-unconstrained as they give consistent results. The quantitative proxy shows that ICFS is highest for firms classified as financially-constrained for the full sample and across the three subsamples as well. The results show that financially-constrained firms are highly dependent on internally-generated cash flows for investments. The conclusion that dividend pay-out is a good classification criterion is in line with studies by Gilchrist and Himmelberg (1995), Guariglia (2008), Shin and Kim (2002), Fazzari et al., (1988), Almeida and Campello (2007) and Islam and Mozomudar (2007). The robustness Fixed Effects test results presented and explained above confirm that dividends pay-out variable is a good variable to distinguish firms into financially-constrained versus financially-unconstrained firms as it gives consistent results as explained above. The cash flow holdings and firm size variables are not good distinguishing proxies as they do not give consistent results throughout the three study periods.

Thus, from the main estimator and the robustness test estimator results, this study confirms that the best criterion to distinguish firms into financially-constrained versus unconstrained is the dividends pay-out variable as highlighted under the discussion of the BB system GMM and the Fixed Effects estimators. Therefore, the study rejects hypothesis 1.

4.5 Correlation Results

Correlation matrices aid in determining the degree of association between two or more variables (Jahangir and Begum, 2008). The BB system GMM estimator was used to obtain the correlation matrix for the full sample of 2003 to 2016. The BB system GMM estimator was preferred over the Pearson correlation matrix and others because it is the latest test that is efficient and provides least biased results. The absolute value of the correlation coefficient will be in the range 0 to 1.

Table 10: Full Panel correlation matrix

Table 9 shows the correlation matrix for the Full Panel (2003-2016) dataset. The regression model was fitted with the Blundell and Bond (1998) system GMM. All coefficients were estimated at 95% confidence level. The variables in the table are defined as follows: **Investment** denotes the independent variable investment, **Investment$_{t-1}$** refers to the lagged investment, **cf** refers to the internally generated cash flow, **cf$_{t-1}$** refers to the lagged internally generated cash flow, **divp** refers to dividends payout, **fsize** denotes firm size, and **cfh** represents cash flow holding level. All the variables are defined in Annexure A.

Variable	Obs	Investment	Investment$_{t-1}$	Cf	cf$_{t-1}$	Divp	fsize	cfh
Investment	1718	1.0000						
Investment$_{t-1}$	1718	0.1683	1.0000					
cf	1718	0.1658	0.0499	1.0000				
cf$_{t-1}$	1718	0.1997	0.0941	0.6840	1.0000			
divp	1718	0.0301	-0.1222	0.4841	0.4901	1.0000		
fsize	1718	0.1559	0.0554	0.0283	0.0722	0.1657	1.0000	
cfh	1718	-0.1331	-0.1160	0.1954	0.1661	0.0688	-0.3089	1.0000

The results of the correlation matrix between independent variables indicated that investment is positively correlated to lagged investment, internally generated cash flow, lagged cash flow, dividend pay-out and firm size whilst negatively correlated to cash flow holding variable. This implies that the more the cash flow, dividend pay-out and lagged cash flow, the more investment there is.

4.6 Summary of the Chapter

The chapter presented the results from the analysis which was performed on the data collected from the IRESS database formerly INET BFA database. It also provided the interpretation of the results from the data analysis. The results from the analysis were presented in two parts: descriptive statistics and empirical analysis, and compared to those in previous studies in order to draw meaningful interpretations. The chapter concludes by presenting the correlation results and explaining the results. The next chapter concludes the study.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter concludes the study. The conclusions are drawn from test results which are presented and discussed in the previous chapter. The objectives of this study were; firstly, to establish the most suitable firm-specific criterion that can be used to distinguish financially-constrained firms from unconstrained firms; secondly, to investigate the impact of the global financial crisis on the CFSI; and thirdly, to determine if CFSI can be a good measure of financial constraints. The research was based on 131 JSE-listed non-financial firms for the period 2003 to 2016. It excluded financial firms as their capital structures are regulated. This chapter also discusses the limitations encountered which may have affected the results of the study. The chapter concludes by making recommendations for future studies under the same subject of ICFS.

5.2 The most suitable firm-specific criterion to distinguish firms into financially-constrained versus financially-unconstrained

As highlighted in Chapter 2, financial constraints are not directly observable and as such empirical literature has had to rely on qualitative and quantitative methods to separate financially-constrained and financially-unconstrained firms (Carreira and Silva, 2013). To establish the most suitable criterion, this study selected three firm-specific proxies to distinguish firms into financially-constrained versus financially-unconstrained and then tested the CFSI of each subsample using the BB system GMM and the Fixed Effects estimators. The best proxy is the one that would give the highest ICFS results for financially-constrained firms across the main sample and subsamples as these firms are expected to be greatly dependent on internally-generated cash flows for investments because they are constrained and cannot easily acquire external finance. The regression results of the BB system GMM and the Fixed Effects estimators highlighted in Chapter 4 for the main sample and sub samples show that firms classified as constrained using only the dividends pay-out criterion had a highest, positive and in most cases significant ICFS before, during and post the global crisis. The results show that the investment patterns of constrained firms as per the dividends pay-out were greatly affected by changes in internally-generated cash flows. Firms split using cash flow holding and firm size did not show results of a high ICFS for financially-constrained firms using the main sample and subsamples under the BB system GMM and the Fixed Effects. The two estimators gave

contradicting results with the BB system GMM showing a high ICFS for financially-constrained firms and the Fixed effects showing a low ICFS for the same sample or vice versa. Based on the results, the study concludes that dividends pay-out can be a good proxy to distinguish firms into financially-constrained versus unconstrained.

The findings of this study provide further support for studies by Gilchrist and Himmelberg (1995), Shin and Kim (2002) and Guariglia (2008) who contend that dividends pay-out is the most suitable, quantitative and firm-specific proxy to distinguish firms into financially-constrained versus unconstrained. According to Sher (2004), dividends are a sign of maturity, profitability, stability and access to capital markets of which financially-constrained firms have not achieved but are striving towards. That is why it is the financially-unconstrained firms that pay dividends. On the other hand, financially-constrained firms would not always have the means and ability to pay dividends. Thus, dividends pay-out is the most suitable criterion to distinguish firms into financially-constrained versus unconstrained and the study used only samples split based on the dividends pay-out to test objectives 2 and 3 below.

5.3 The impact of the global financial crisis on the CFSI

The results of samples split using the dividends pay-out criterion were used to investigate the impact of the global financial crisis as this study concluded that dividends pay-out is the most suitable criterion to distinguish firms into financially-constrained versus unconstrained. The results of the BB system GMM and the Fixed Effects for the sample period 2006 to 2010 covering the global financial crisis showed that financially-constrained firms had a positive, high and significant ICFS and unconstrained firms had a positive, low and insignificant ICFS. Those firms classified as constrained, were more constrained during this period and relied more heavily on internally-generated cash flow for investment owing to the difficulty of obtaining finance as evidenced by an increase in the ICFS. Financially-constrained firms' investments patterns therefore worsened during this period owing to difficulties in obtaining finance and depressed economic activity.

This is consistent with a survey by Brown, Fazzari and Petersen (2009) supported by Campello, Graham and Harvey (2010), and Duchin, Ozbas and Sensoy (2010), Ivashina and Scharfstein (2010), Khramov (2012), Chen and Chen (2012), Andren and Jankensgard (2015) and Bliss, Cheng and Denis (2015) who concluded that during the global crisis, all firms were forced to scale down or curtail their investment patterns and draw heavily on lines of credit owing to the severity of the crisis. Therefore, this study concluded that for the period 2006 to 2010 which

included the global financial crisis period of 2007 to 2009, both samples of financially-constrained and unconstrained firms faced a certain degree of being constrained and relied more on internally-generated cash flows for investments. Thus, the global financial crisis was severe as it worsened the ICFS of all firms due to increased difficulties in raising finance and a downturn in economic activities. In addressing objectives 2 and 3 below, this study used results of samples split using the dividends pay-out variable as it was found to be the best proxy to distinguish firms into financially-constrained versus unconstrained.

5.4 Can IFCS be deemed a good measure of financial constraints?

The results in Chapter 4 show a high and positive and in some cases significant ICFS for financially-constrained firms and a low, positive insignificant CFSI for financially-unconstrained firms across the main and subsamples using the dividends pay-out criterion under the BB system GMM and the Fixed Effects estimators. Financially-constrained firms had a positive, high and in most cases significant ICFS and unconstrained firms had a positive, low and in most cases insignificant CFSI for the periods pre, during and post the global financial crisis. The global financial crisis period had the highest positive ICFS for both constrained and unconstrained firms when compared to the pre-and post-crisis periods as all firms were constrained due to worsened investment patterns owing to difficulties in obtaining finance. The results of a high CFSI for financially-constrained firms classified as per dividends pay-out signifies that CFSI can be a good measure of financial constraints as the more financially-constrained a firm is, the higher the CFSI. Based on the findings, this study concludes that ICFS can be a good measure of financial constraints only if firms are split into financially-constrained versus unconstrained as per the dividends pay-out variable. This is in line with findings by Fazarri et al. (1988), Gilchrist and Himmelberg (1995), Guariglia (2008), Shin and Kim (2002) and Chen and Chen (2012) who concluded a high ICFS for financially-constrained firms and a low ICFS for financially-unconstrained firms split using the dividends pay-out variable, thus, highlighting a positive relationship between financial constraints and ICFS. The researchers attribute the high ICFS for financially-constrained firms to the fact that these firms tend to be young, possess few tangible assets, face lenders' restrictions and are greatly affected by shocks in the industry when compared to financially-unconstrained firms. The financial constraints limit the firms' access to external sources of finance, and thus, forcing them to rely on internally-generated cash flows to fund their growth options.

5.5 Limitations of the study

The limitations which the study was subjected to are; sample specification, size and balance of panels used and time constraints as discussed below.

5.5.1 Sample specification

The study was limited to JSE listed non-financial firms only. It excluded non-financial firms that were not listed on the JSE. The findings of this study can therefore not be generalized to all firms in South Africa as it only focused on non-financial firms listed on the JSE. The data on private companies is not publicly available and reliable because most of them are small firms and may not be audited or are audited by small accounting firms. A lot of time would have gone into verifying and validating the reliability of the financial statements for them to dependable.

5.5.2 Size and balance of panels used

This study is limited to 131 non-financial firms covering a 14-year period for the years 2003 to 2016. The analysis can be extended to consider longer periods and larger sample sizes. Previous international studies used larger samples with more than 300 firms and 5 000 observations. This research was limited to 131 non-financial firms that met the sampling criterion. A number of firms were dropped as they had 3 or more years of missing observations and there are only a few non-financial firms listed on the JSE, thus, reducing the balance of the panel.

5.5.3 Time constraint

In splitting firms into constrained versus unconstrained, the researcher relied on firm-specific proxies highlighted in Chapter 2 and Chapter 3. The researcher could have also used qualitative content analysis of financial statements to ascertain a level of a firm being financially-constrained or unconstrained. However, due to limited time, this study could not have done this as the content analysis of financial statements and reports is time consuming and would have entailed going through 14 years of financial statements for 131 non-financial firms used in the study.

5.4 Recommendations for future studies

Future studies on the area of ICFS can look at the following:

Firstly, for future studies it is also possible to use the same regression model highlighted in Chapter 3 of this study to test the CFSI of non-financial firms that are listed on the JSE versus

those that are unlisted. Unlisted firms are generally constrained because they have limited access to capital markets, hence, they would act as a good proxy for constrained firms. Data on unlisted private firms can be obtained directly from the owners of these companies or from their auditors who would have to seek permission from the owners first. State owned firms' data can be obtained from the Auditor General South Africa (AGSA) or Department of Public Enterprises (DPE).

Secondly, future studies can also attempt to assess the CFSI across different industries. Industries differ in terms of cash flows and access to finance, thus, a study on CFSI for different industries would identify how constrained each sector is and the extent to which investments are dependent on internally-generated cash flows.

Lastly, future studies can also do a comparative study of ICFS amongst South African JSE listed non-financial firms as a developing country versus listed firms in a developed country. Differences in capital market developments and institutional differences should have an effect on the ICFS of these countries' firms. This could provide insight in the analysis and reduce possible sample selection bias associated with using companies listed on only one stock exchange.

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ANNEXURE A: DEFINITION OF VARIABLES

Taking insights from Cleary (1999), Povel and Raith (2001), Moyen (2004), Almeida and Campello (2007), Fatoki and Assah (2011), Andren and Jankensgard (2015) and Wale (2015) variables in this study are defined as follows:

Name of Variable	Denoted as	Definition of variable
Firm size	FS	Natural Logarithm of total assets
Dividend pay-out	DP	Ordinary dividends paid divided by net income
Cash holding level	CFH	Sum of cash and cash equivalents
Lagged cash holding level	CFH_{it-1}	Prior year cash and cash equivalents
Capital Stock	K	Total assets
Lagged capital stock	K_{it-1}	Prior year total assets
Cash flow	CF	Net income (profit after tax) plus depreciation
Lagged cash flow	CH_{it-1}	Lagged net income (profit after tax) plus depreciation
Investment	I	Difference between net property, plant and equipment (Total non-current assets) at the end and beginning of the period plus depreciation.
Lagged investment	I_{it-1}	Prior year investment

ANNEXURE B: LIST OF COMPANIES USED IN THE STUDY

ADAPTIT
ADVTECH
AECI LTD
AFRICAN OXYGEN LTD
ALLIED ELECTRONIC CORP
ANGLO AMERICAN PLC
ANGLOGOLD ASHANTI
ARGENT INDUSTRIAL
ASPEN
ASSORE LTD
ASTRAL
ASTRAPAK
AVENG LTD
AVI
BARLOWORLD
CADIZ HOLDINGS
CASHBUILD LTD
CAXTON CTP PUBLISHERS
CHROMETRO LTD
CLICKS GROUP
COMAIR LTD
COMBINED MOTOR HOLDINGS
COMMAND HOLDINGS LTD
COMPU-CLEARING
CROOKES BROTHERS LTD
CULLINAN HOLDINGS LTD
DATACENTRIX HOLDINGS
DATATEC
DELTA EMD LTD
DIGICORE HOLDINGS
DISTELL GROUP LTD
DISTRIBUTION AND WAREHOUSING
DRDGOLD LTD
E MEDIA HOLDINGS LTD
ELB GROUP
EOH HOLDINGS
ESOR LTD
EVRAZ HIGHVELD STEEL AND VANADIUM
EXCELLERATE HOLDINGS
EXXARO
FAMOUS BRANDS LTD
FOSCHINI GROUP
GOLD FIELDS LTD
GOLD ONE
GROUP FIVE LTD

HARMONY GOLD MINING COMPANY

HOWDEN AFRICA HOLDINGS

HUDACO INDUSTRIES

HWANGE COLLIERY COMPANY LTD

IMPALA PLATINUM HOLDINGS LTD

IMPERIAL HOLDINGS LTD

INDEQUITY HOLDINGS LTD

IPSA GROUP PLC

ISA HOLDINGS LTD

ITALTILE LTD

JASCO ELECTRONICS HOLDINGS LTD

JD GROUP

KAIROS INDU

KAP INDUSTRIAL HOLDINGS

KUMBA IRON ORE LTD

LEWIS GROUP

LONMIN PLC

LONHRO PLC

MASONITE AFRICA LTD

MASSMART HOLDINGS LTD

METROFILE HOLDINGS

MICROMEGA HOLDINGS

MIDDLE EAST DIAMOND RESOURCES LTD

MIRANDA MINERAL HOLDINGS LTD

MONEYWEB HOLDINGS LTD

MORVEST GROUP

MR PRICE GROUP LTD

MTN GROUP

MURRAY AND ROBERTS HOLDINGS

MUSTEK LTD

NAMPAK

NASPERS LTD

NETCARE LTD

NICTUS LTD

NORTHAM PLATINUM LTD

NU-WORLD HOLDINGS LTD

OANDO PLC

OCEANA GROUP LTD

OLD MUTUAL PLC

OMNIA HOLDINGS LTD

ONELOGIX GROUP LTD

PARACON HOLDINGS

PETMIN LTD

PICK N PAY STORES LTD

PPC LTD

RANDGOLD AND EXPLORATION OMPANY

RCL FOODS LTD
REUNERT LTD
REX TRUEFORM CLOTHING COMPANY LTD
SACOIL HOLDINGS LTD
SANTOVA LTD
SASOL LTD
SECUREDATA HOLDINGS LTD
SHOPRITE HOLDINGS
SILVERBRIDGE HOLDINGS LTD
SOUTH AFRICAN COAL MINING HOLDINGS
SOUTHERN ELECTRICITY CO
SOVEREIGN FOOD
SPANJAARD LTD
SPUR CORPORATION
STEINHOFF INTERNATIONAL
SUN INTERNATIONAL
SUPER GROUP
TAWANA RESOURCES NL
TELKOM SA SOC LTD
THE BIDVEST GROUP LTD
THE FOSCHINI GROUP
THE SPAR GROUP LTD
TIGER BRANDS LIMITED
TONGAAT HULETT
TRANS HEX GROUP LTD
TRANSPACO LTD
TRENCOR LTD
TSOGO SUN HOLDINGS LTD
UCS GROUP
VALUE GROUP LTD
VERIMARK HOLDINGS LTD
WG WEARNE LTD
WESCOAL HOLDINGS LTD
WESIZWE PLATINUM LTD
WILSON BAYLY HOLMES OVCON LTD
WINHOLD LTD
WOOLWORTHS HOLDINGS LTD
WORKFORCE HOLDINGS LTD
YORK TIMBER HOLDINGS LTD
ZCI LTD

## ANNEXURE C: LANGUAGE EDITOR LETTER

Editing and Proofreading Report

01 December 2017

This letter serves to confirm that I, Dr I. Ndlovu of the English Department, University of Venda, have proofread and edited a Masters dissertation titled "The Impact of the Global Financial Crisis on the Cash Flow Sensitivity of Investment: Some Evidence from the Johannesburg Stock Exchange Listed Non-Financial Firms" by Munthali Roland to be submitted to the Department of Accountancy, School of Management Sciences at the University of Venda.

I carefully read through the dissertation, focusing on proofreading and minor editorial issues. The recommended suggestions are clearly highlighted through the Microsoft Tracks Changes System.

Yours Sincerely
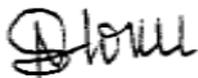
Dr Isaac Ndlovu, PhD
Lecturer: English Department
University of Venda
Private Bag X5050
Thohoyandou 0950
South Africa
Tel.: +27 15 962 8305
Fax: +27 15 962 4749
E-mail: isaac.ndlovu@univen.ac.za