The influence of financial constraints on the investment-cash flow sensitivity in Dutch SMEs

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'Wij potten niet op. Maar wij zijn wel in staat, ook bij tegenvallers, de toekomst van de hogeschool inclusief haar medewerkers en daarmee al haar activiteiten, zeker te stellen.'

Translation: 'We do not hoard. Yet, we are capable, also with adversity, to ensure the future of the university of applied science including all its employees and with all its activities.'

W. Boomkamp, Chairman board of directors Saxion, reacted on the accusation of the General Education Alliance that there is too much money being hoarded by universities (Twentse Courant Tubantia, April 8, 2006)

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Management summary

The focus of empirical literature on the relation between investment and internal finance is on the influence of financial constraints. However, literature is ambiguous whether this influence has a positive or a negative effect on the relationship. Studies comparable with Fazzari et al. (1988; 2000) conclude that investment-cash flow sensitivity for financially constrained firms is higher compared to lower financially constrained firms. However, studies comparable with Kaplan & Zingales (1997; 2000), conclude the contrary, lower constrained firms displayed a higher sensitivity of cash flow to investment than higher constrained firms. Clearly et al. (2007) combines the results of these studies and proved that the ICFS is U-shaped.

In this paper the influence of financial constraints on the ICFS is studied for a sample of Dutch SMEs, while controlling for industry influences and is guided by the following question:

'Do financial constraints influence the relationship between internal finance and investments of Dutch SMEs?'

The sample is divided by using the SA-index (Hadlock & Pierce, 2010) into financial constrained, financial unconstrained or neither of both. This index is used since older / larger firms are expected to be less financial constrained than younger / smaller firms (Carreira & Silva, 2010; Hughes, 1994; Lopez-Gracia & Aybar-Arias, 2000).

The data analyse provide Dutch evidence showing that internal finance is postively related with investment. The focus of this research is however on the influence of financial constraints on this relationship. It was expected that financial constrained firms had a stronger ICFS compared with financially unconstrained firms. The results of the data do not support this expectation. Both the constrained and the financially unconstrained firms did not show a signifiacnt ICFS. This could be an indication that the ICFS is non-monotonic, suggested by among others Cleary et al. (2007), Guariglia (2008), Hadlock & Pierce (2010) and Hovakimian (2009). They argued that this non-monotonic behavior if investment is caused by a trade-off between the two effects (1) the risk of default and liquidation and (2) the need to generate revenue to repay debt.

Consequently, this study finds evidence that internal finance influence the investments for Dutch SMEs during the period 2009-2012. This conclusion is robust for different measures for sizes and controlled for investment opportunities and industries. The influence of financial constraints on this relationship is not proved.

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Further, I would like to express my gratitude and appreciation to my first supervisor Prof. Dr. R. Kabir for making time to answer my questions and his helpful and constructive advices. Due to his critical questions he helped me to make the right choices and guided me during this research. Also I would like to share my appreciation to Dr. X. Huang for her valuable advice. They were both there for me by giving their advice and helping me overcome difficulties during this research.

Also I like to express my appreciation and great respect for someone I met one year ago in Laos. Vaa Her worked by the Kajsiab project, where I did some volunteering work. He showed me an inexhaustibly dedication to study, even after working days from over 14 hours. That impressed me extremely. People in western countries, me included, take for granted that we can study. In Laos I faced that this is not for everyone the fact. I opened my eyes and started to realize that, despite the difficulties, I also had to work hard in order to complete my study. Therefore I would like to express my great respect to Vaa!

> *Where the willingness is great, the difficulties cannot be great.'*
> *Niccolo Machiavelli*

I would like to thank my family for their endless support. And that is not only during this study, but also during previous studies. Finally, I would also like to thank my girlfriend for her help, support, but more important for being patient. She helped me to overcome some hard times.

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Guus Scheuten

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1. INTRODUCTION

The accessibility to external finance of small and medium-sized enterprises (SMEs) has become more interesting after the recent financial crisis, according to among others OECD (2012) and Silva & Carreira (2010). However, the existence of different economic theories, literature is ambiguous about the empirical measure for financial constraints since it is not directly observable. It is an abstract concept. This chapter contains an introduction to this topic. First, in paragraph 1.1, the research background is described. Paragraph 1.2 contains the research motivation for this study and in paragraph 1.3 the objectives and relevance are discussed. Subsequently, in paragraph 1.4, the research question and the different sub questions are formulated. The last paragraph of this chapter contains the structure of this thesis.

1.1 Research background

Recently, increasing attention is devoted in analyzing the influence of internal finance in the investment behavior of firms. Moreover, there is extensive media attention devoted to cash holdings (Bates, Kahle, & Stulz, 2009). In 2006, the president of the board of directions of Saxion, Wim Boomkamp, reacted on the accusation of the 'general education alliance'[1] that there is too much money being hoarded by universities. According to Boomkamp the increase in liquidity is used as a preventive measure against possible setbacks.[2] Lins, Servaes, & Tufano (2010) support this statement, liquidity is used as a precautionary hedge against financial frictions on the capital market.This implies a wedge between the costs of internal and external finance.

Contrary, the classical Modigliani & Miller (1958) approach states that the capital structure is irrelevant to investment decisions. In the presence of the perfect capital market, there are no differential costs of external and internal finances. In this frictionless environment they are perfect substitutes of each other. However, their theoretical approach has been that of static, partial equilibrium analysis and is based on drastic simplifications. Once capital market imperfections are introduced, such as agency costs, information asymmetry, accessibility of the capital market or the tax system, the costs of external finance surpasses the costs of internal finance.

The pioneering paper of Fazzari, Hubbard & Petersen (1988) intensified the debate on the sensitivity of investment to internal finance. Under the assumption that external financing is more costly than internal financing, changes in cash flow, used as a proxy for internal finance, is an important determinant of marginal capital spending for constrained firms. They proved that the sensitivity of investment to cash flow is higher for firms that face a larger wedge between the costs of external and internal funds. This conclusion is generally supported by different other studies (Bond, Harhof, & Van Reenen, 1999; Carpenter, Fazzari, & Petersen, 1994; Nickell & Nicolitsas, 1999).

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[1] Dutch denomination is 'Algemene Onderwijsbond'
[2] Source: http://www.sax.nu/Nieuws/TabId/31405/art/670990/wim-boomkamp-oppotten-saxion-zeker-niet-onverantwoord%E2%80%9D.aspx

Kaplan & Zingales (1997) challenged the seminal study of Fazzari et al. (1988) extensively. They questioned the validity of the measure of financial constraints, a positive and statistically significant relationship between investment and cash flow used by Fazzari et al. (1988). Based on the same database complemented with firms annual reports, Kaplan & Zingales (1997) proved that the investment-cash flow sensitivity (ICFS) is the highest for firms which seem to be the least financially constrained. This has also been concluded by different researchers, such as Chang, Tan, Wong & Zhang (2007), Cleary (1999) and Erickson & Whited (2000).

Researchers devoted much attention to the influence of internal finance on investment. However, literature is ambiguous whether this influence has a positive or a negative effect on the relationship. Studies comparable with Fazzari et al. (1988; 2000) conclude that investment-cash flow sensitivity for financially constrained firms is higher compared to lower financially constrained firms. However, studies comparable with Kaplan & Zingales (1997; 2000) and Cleary (1999), conclude the contrary, lower constrained firms displayed a higher sensitivity of cash flow to investment than higher constrained firms.

According to Clearly et al. (2007), the cause of these contradictory conclusions is the lack of a precise empirical proxy for financial constraints. They argue that the relationship between investment and cash flow is everywhere positive. In their research they show that this relationship is U-shaped due to the interaction between the cost and revenue effect of investment. According to them, investment increases if internal funds are also large. However, when the internal funds are low, investments starts to increase as internal funds decrease further. They argued that this non-monotonic behavior if investment is caused by a trade-off between two effects. These effects are (1) the risk of default and liquidation and (2) the need to generate revenue to repay debt. Assuming that higher levels of investment involves higher repayments costs, and hence, a higher risk of default, there is a positive relation between investment and cash flow. On the contrary, when internal funds is low, the company need funds to repay their debt. As a result, the company invests in order to generate revenue to repay their debt. Hence, there is a positive relation between investment and cash flow. The non-monotonic investment-cash flow relation is also studied by Firth et al. (2012) for China's listed companies, Guariglia (2008) for firms in the UK, Hadlock & Pierce (2010) and Hovakimian (2009) for manufacturing firms in the US.

A substantial part of the studies which address the investment-cash flow sensitivity is based on panels of listed companies. These large listed organizations are less likely to suffer from financial constraints compared to SMEs. The latter are more likely to suffer from asymmetric information problems, and so from financing constraints, than the former due to the obligation to provide extra information when quoted (Carreira & Silva, 2010; Hughes, 1994; Lopez-Gracia & Aybar-Arias, 2000). Moreover, SMEs are the engine of the economic development, but due to these market imperfections and institutional fragility it inhibits their growth (Beck & Demirguc-Kunt, 2006). Therefore, small and medium-sized enterprises are an interesting group to focus on in order to study financing constraints. Recently, more attention is devoted to empirically study the effects of financial constraints for SMEs (e.g. Becchetti, Castelli, & Hasan, 2009; Beck & Demirguc-Kunt, 2006; Carpenter & Petersen, 2002a; D'Espallier & Guariglia, 2012; Guariglia, 2008). This study focuses on SMEs in the Netherlands, for the Dutch economy is an established market and a significant part (99%) of the

companies in this country are SMEs according to the 'small and medium enterprises report'[3] (EIM, 2011). Furthermore, SMEs are responsible for 50% of the gross value added. Moreover, Van Ees & Garretsen (1994) showed that 55% of the total finance for non-financial listed Dutch companies constitute internal finance over the period 1984-1990. Lastly, De Haan & Hinloopen (2003) proved that internal finance is the first type of funds in the pecking order strategy.

1.2 Research motivation

As a lecturer of Finance & Control at Saxion University of Applied Science the core topics taught are investment and finance. Students are taught various issues, like analyzing a financial position and decision-making process for accepting or rejecting investments projects. In this research these two issues are combined. Subsequently, students will not be taught exclusively from theory books, but also through experience, gained during this research.

Further, due to the recent financial crisis, a substantial part of the companies could become financially constrained, which can lead to an altered risk-taking behavior and cash management policies towards a company with a more liquid balance sheet (Almeida, Campello, & Weisbach, 2011). The importance of cash, which should be taken into account when assessing the capital structure decisions of firms, is growing (Bates et al., 2009). Khramov (2012) proved that due to the financial crisis, financial constraints increased and that the sensitivity of investment to cash flow doubled. Also Campello, Giambona, Graham & Harvey (2010a), Campello, Graham, & Harvey (2010b), and Dunchin, Ozbas & Sensoy (2010) showed that during the financial crisis, firms generally are more financially constrained. Since the financial crisis is still present, it is still convenient to study the relation between investment and internal finance.

Lastly, a growing number of research was conducted between the relationship of internal finance and investment behavior (e.g. Fazzari et al., 1988; Francis, Hasan, Song, & Waisman, 2012; Guariglia, 2008; Kaplan & Zingales, 1997). However, there is lack of emperical evidence based on SMEs, which are more likely to be more financially constrainted (D'Espallier & Guariglia, 2012; Guariglia, 2008; Silva & Carreira, 2010). Hence, this emperical research will focus on the influence of financial constraints on the relationship between internal finance and investments based on a sample including exclusively small and medium-sized enterprises from the Netherlands.

1.3 Objectives & relevance

Currently, students in the final stage of their bachelor study, so students who are writing their bachelor thesis at a university of applied science, are exclusively supervised by lecturers who are certificated with a master's degree. In order to eligible as a supervisor, this research should be realized. Moreover, the students can expect a lecturer who is capable in conducting research and who is competent in research methodology. By accomplish this research it contributes to the practical experience, which is substantially in dealing with difficulties during this phase of the study.

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[3] Dutch denomination is 'Kerngegevens MKB'

Besides the prior personal objective, there is an academic objective in conducting this research. This research aims to elucidate the concept of financial constraints and its influence on the relationship of internal finance and investments. Much attention is devoted to this influence, however, literature is ambiguous whether this influence has a positive or a negative effect on the relationship. This study attempts to shed further light on this debate. The objective of this research is to investigate what the influence of financial constraints is on the relationship between internal finance and investment behavior. Besides, quoting Bassetto & Kalatzis (2011, p. 264), *'the literature on financial constraint in investment decisions have not yet arrived at a definitive conclusion about when a firm is financially constraint.'*

1.4 Research question

This research project is guided by the main research question, which has been formulated as follows:

'Do financial constraints influence the relationship between internal finance and investments of Dutch SMEs?'

In order to answer the research question, the subsequent sub questions are central in this research:

1. How can the concepts 'internal finance', 'investments' and 'financial constraints' be defined and measured?
2. How are Dutch SMEs defined?
3. What is the theoretical and empirical relation between 'internal finance' and 'investments'?
4. To what extent is the relationship between 'internal finance and 'investments' affected by the degree of 'financial constraints' for SMEs?

The conceptual model of this research is depicted in figure 1.
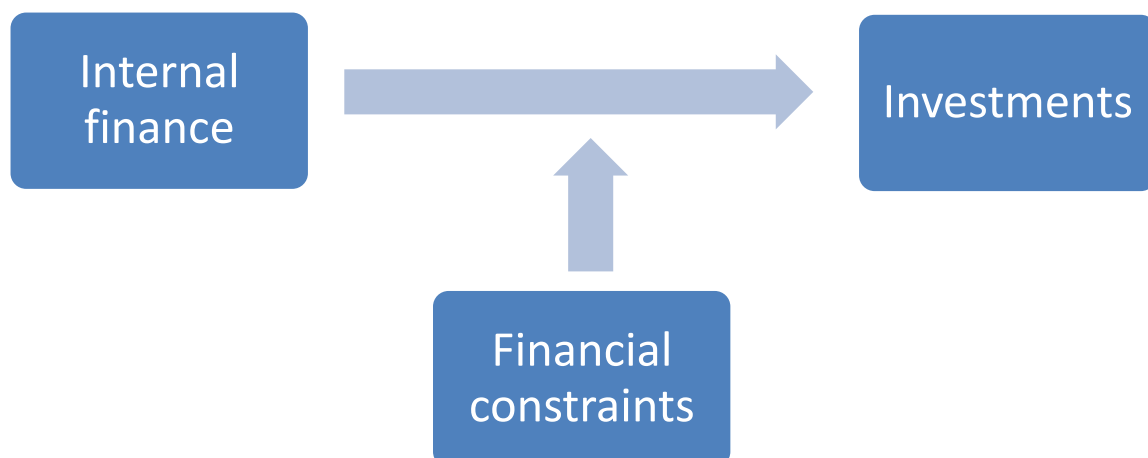
Figure 1: Conceptual model

1.5 Thesis structure

Preceding is the basis for the structure of this thesis. It consist of six chapters, the references and the appendices excluded, which are presented at the end of this thesis. This introductory chapter discussed the research problem, motivation, objectives, the relevance and the research structure. In chapter two relevant literature, linked to the research problem, will be discussed. Furthermore, this section contains an overview of the different theoretical approach which combines financial constraints with investment-internal finance sensitivity. This chapter ends with formulating the hypotheses. Chapter three elaborates the research methodology of this study. Moreover, the concepts of 'internal finance', 'investments' and 'financial constraints' are operationalized. The results of this research are elaborated in chapter four and in chapter five the conclusion is presented. Finally, chapter six consists of the discussion which contains the research limitations and the recommendations for future research.

2. LITERATURE REVIEW

To properly understand the influence of financial constraints on the relationship between investments and internal finance, this problem is placed in a broader perspective. This chapter contains an elaboration on the relevant literature in order to frame this research. First, in paragraph 2.1, the methodology of the search for literature is described. Paragraphs 2.2, 2.3 and 2.4 contain respectively the literature review of the variables 'internal finance', 'investment', and 'financial constraints'. Subsequently, paragraph 2.5 discusses the theory and the statements from the empirical literature with regard to the relationship between investments-internal finance sensitivity and the influence of financial constraints on this relationship. Finally, the hypotheses of this research are formulated.

2.1 Literature search methodology

Analyzing prior research contributes to acquire relevant theoretical approaches, define variables and set up the research design. In order to acquire applicable literature 'Google Scholar', 'Science Direct' and 'Jstor' were used. With these websites it is possible to search on keywords and apply filters. A multiplicity of keywords was used to acquire relevant literature and to ensure to mitigate any bias of missing suitable scientific literature. Keywords used for this literature review are: corporate investment, cash flow, financial constraints, investment-cash flow sensitivity, corporate / external / internal finance, internal / external costs of funds, investment (behavior / decision / choice), neoclassical theory, agency theory, imperfect capital markets.

A distinction of usability of various scientific articles was made by using the filter. First criterion was the year of publication, however, this was not a substantially issue due to the increased interest of the impact of financial constraints on investment-cash flow sensitivity since the seminal paper of Fazzari et al. (1988). Second criterion was based on the journals (e.g. journal of banking and finance, journal of corporate finance, journal of finance, review of financial studies) which published the studies. Lastly, based on the relevance of the literature with the keywords, the websites produces a hierarchy of the literature.

Preceding search methodology resulted in an extensive list of literature useful for this research. Further selection and prioritization took place by eliminating articles based on a critical review of the title, abstract and introduction. A set of financial and economical books are used besides the scientific articles to expand the already collected literature. An enumeration of the scientific articles used for this research can be found in the references.

2.2 Internal finance

This section contains the theoretical considerations about internal finance. Moreover, proxies for measuring internal finance are elaborated. Jordan, Westerfield & Ross (2011, p. 105) used the following definition: *'Internal finance simply refers to what the firm earns and subsequently plows back into the business, such as retained earnings or depreciation.'* This money is generated by the business itself. The dominant source of funding is internal finance in Europe. In Japan it is shifting more to internal funding. Moreover, businesses in the United States finance two-thirds to three-quarters of their capital spending with internally generated finance (Megginson, Smart, & Gitman, 2006). Contrary, external financing refers to funds obtained outside of the firm. This generally involves getting cash from an outside source, like borrowing money or selling stock.

2.2.1 Theoretical consideration

Internal finance can be used in order to create cash holdings. In the presence of the perfect capital market, holding cash is irrelevant. Suppose that the cash flow of a company is insufficient for all of their future expenses. Consequence is that the company should raise funds to keep operating; it can do that at zero cost. In this frictionless environment there are no differential costs of external and internal finances, there is no liquidity premium (Opler, Pinkowitz, Stulz, & Williamson, 1999). Recently, more attention is devoted in the investigation of cash holdings in the empirical literature. Various researchers focus on determinants of corporate cash holding (Kim, Mauer, & Sherman, 1998; Ozkan & Ozkan, 2004; Pinkowitz & Williamson, 2001). These researchers based the study on the theory of Keynes (1936), who argued that there are two benefits to cash holdings; the transactions costs motive and the precautionary motive.

The transaction costs motive is based on the cost of converting cash substitutes into cash (Opler, Pinkowitz, Stulz, & Williamson, 1999). Companies that have a shortage of internal resources can raise funds by selling assets or issuing new debt or equity. Nevertheless, all of these options involve costs. As a result, it is expected that companies that incur higher transactions costs hold a greater amount of liquid assets (Ozkan & Ozkan, 2004). This motive is discussed by different researchers such as Miller & Orr (1966) and Myers & Majluf (1984).

The emphasis of the precautionary motive is on the costs which are from the execution of investments opportunities. This motive is based on the theory that firms accumulate cash if the costs of external finance are prohibitively high or in the case of a shortfall of the cash flow. This accumulation of cash is attained by internal finance. Hence, with this motivation of holding liquid assets, companies are able to continuously anticipate on investment opportunities. This research will focus on this last motive of holding cash.

2.2.2 Empirical approaches

Internal finance is traditionally measured by cash flow. Practically every researcher uses this variable (e.g. Ağca & Mozumdar, 2008; Fazzari et al., 1988; Guariglia, 2008; Kaplan & Zingales, 1997). The proxy of cash flow is used differently, though it is not a modeling issue in the literature. The measure of cash flow which is primarily used is net income before extraordinary items plus depreciation (e.g. Ağca & Mozumdar, 2008; Fazzari et al., 1988; Guariglia, 2008; Kaplan & Zingales, 1997). Other researchers use a proxy that is slightly different in the definition, such as operating cash flow (Clearly, Povel, & Raith, 2007; Firth, Malatesta, Xin, & Xu, 2012), earnings before interest, taxes, depreciation and amortization (George, Kabir, & Qian, 2011), net income before extraordinary items

plus depreciation and amortization (Chen & Chen, 2012) or net income before taxes plus depreciation (Silva & Carreira, 2010). However, the differences between these definitions are minimal and statistically negligible (Firth et al., 2012). Moreover, according to Guariglia et al. (2011), internally generated cash flow is important in financing incremental fixed assets.

2.3 Investment

This section contains the theoretical considerations about investment, where the dependence of investment on the availability of internal finance is discussed. Besides, proxies for investment opportunities and the associated rationale are elaborated. Keynes (2006, p. 69) defined investment as: *'the increment of capital equipment, whether it consists of fixed capital, working capital or liquid capital. Moreover, significant differences of definition are due to the exclusion from investment of one or more of these categories.'* Most of the researchers who studied the ICFS focused on tangible fixed capital.

2.3.1 Theoretical considerations

Modigliani & Miller (1958)[4] showed in their classic paper that the cost of capital for an organization is independent of the capital financial structure. Therefore, the market value of any firm is independent of its capital structure. The value of a firm is based on the present value of its future cash flows, which are generated through the execution of investments with a positive net present value. The investments of a firm should be driven only by the expected future profitability and it should not be affected by the availability of internal or external funds. Hence, in a perfect capital market the capital financial structure cannot influence the firm value. These perfect capitals market, based on drastic simplifications, exist without financing frictions, e.g. agency costs, information asymmetry, accessibility of the capital market or the tax system. Under these assumptions the financial policy and structure is irrelevant for real investments. Investment decisions of firms are not affected by their financing decisions in the perfect capital markets; firms have complete financial flexibility and can adjust their financial structure costless to meet unexpected needs. Consequently, investment decisions are not affected by their financing decisions. Hence, the only determinant of investments is the investment opportunities of an organization (Ağca & Mozumdar, 2008).

However, capital markets are not perfect due to the presence of financing frictions and therefore corporate finance gets interesting (Denis, Financial flexiblity and corporate liquidity, 2011). Presently, most researchers agree on the fact that investment decisions are influenced by financing decisions (e.g. Almeida et a., 2011; D'Espallier & Guariglia, 2012; Khramov, 2012). Due to captial market imperfections, the costs of external finance surpasses the costs of internal finance. Hence, investments are sensitive to internal finance, according to the seminal papers of Kaplan & Zingales (1997) and Fazzari et al. (2000). They both agree on the fact that the dependence of investments on the availability of internal finance, for profit maximizing firms in a one-period model, is:

$$\frac{\mathrm{d}I}{\mathrm{d}W} = \frac{C_{11}}{C_{11} - F_{11}} \tag{1}$$

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[4] This constructive approach with its central assumption of perfect capital markets is still the standard in teaching corporate finance (e.g. Hillier, Ross, Westerfield, Jaffe, & Jordan, 2010; Jordan et al., 2011).

I   investment, which is constrained to equal available internal finance

W   internally available finance, with constant opportunity costs

C(e, Θ) is the cost of external finance as a function of externally acquired finance and the extent of information asymmetry or agency problems

e   acquired external finance

Θ   the extent of information asymmetry or agency problems, i.e. the cost wedge between internal and external finance

F(I)   return to investment

The slope of investment demand is represented by F_{11} and the external cost function is denoted by C_{11}, i.e. the slope of the supply for external finance. In the situation with a flat investment demand, that is $F_{11} \approx 0$, then investments are mostly financed with internal finance ($dI/dW \approx 1$), resulting in a horizontal slope of the supply for external finance. This model is useful in the content of predicting the dependence of investment on internal finance. Nevertheless, it should be taken into account that control variables, i.e. the unobserved investment opportunities, are excluded in this model.

According to the theories of managerial agency theory and information asymmetry, the costs of external finance can surpass the costs of internal finance. As a consequence, this can cause an organization to forgo investment projects due to the lack of availability of internal finance or the premium on the costs of external finance.

2.3.2 Empirical approaches

Investment is measured as the increase / decrease in tangible fixed assets in a year raised with the depreciation, according to among others D'Espallier & Guariglia (2012), Degryse & De Jong (2006), Fazzari et al. (1988), Firth et al. (2012) and Guariglia (2008). These investments are obviously related to the investment opportunities of the firm (Fazzari et al., 1988; 2000; Kaplan & Zingales, 1997; 2000). These are inherently connected to each other. In the model (equation 1), introduced by Kaplan & Zingales (1997), investment is exclusively explained by the availability of finance, internally and externally. The unobserved investment opportunities are excluded in this model. The following baseline model is used to a large extent of the researchers (such as Almeida & Campello 2007; Fazzari et al. 1988; Hoshi, Kashyap, & Scharfstein, 1991; Silva & Carreira, 2010) studying the investment-cash flow sensitivity:

$$Investment = f\ (internal finance, control\ variables) \tag{2}$$

In this baseline model the investment opportunities are included as control variables. Literature is however ambiguous to the application of this control variable. In the following sections three approaches for this application are elaborated.

2.3.2.1 Q-theory

This empirical discussion started with Fazzari et al. (1988), who used Tobin's Q, suggested by Tobin (1969), as a proxy for unobservable investment opportunities. The proxy from this theory is a rate of the market value of an additional investment to the replacement costs of this new investment, i.e. the marginal Q. Investments are exclusively determined by the shadow price of capital, that is the marginal Q. Advantage of Tobin's Q is that it uses market value, and hence, this model allows direct measurement of expected value of future profitability (George et al., 2011). Fazzari et al. (1988) used

for empirical reason the average Q as a control for investment opportunities. However, this reduced-form Q model of investment is questioned by different researchers (e.g. Chen & Chen, 2012; Clearly et al., 2007; Kaplan & Zingales, 1997; Rauh, 2006). First, marginal Q should be used in order to measure investment opportunities, however, this is not directly observable.The average Q is used as an empericial approximation (Hayashi, 1982), which is proxied by the firm's market-to-book vlaue. This proxy is only valid when it meets four assumptions: (1) seperation of investment- and financing decisions, (2) capital is homogenous, (3) linear homogenous production & linear adjustments costs and (4) perfect markets.

Consequences of the emperical use of average Q are the potential measurement problems.[5] Further, the second criticism is that internal finance might contain information about investment opportunities,especially for young and small organizations, due to the high uncertainty about their investment projects (Silva & Carreira, 2010). As a result, a significant cash flow coefficient is not necessarily a signal for financial frictions. It could be the part of the ICFS reflects investment opportunites that was not captured by Tobin's Q, also called the *investment opportunities bias* (Cummings, Hasset, & Oliner, 2006; Gomes, 2001; Hoshi, Kashyap, & Scharfstein, 1991; Hovakimian & Hovakimian, 2009). Even in a model without financial frictions, Alti (2003) showed, after controlling investment opportunities by Tobin's Q, that firms still have a positive and significant investment-cash flow sensitivity. Moreover, Kaplan & Zingales (1997) emperically proved the exact contrary compared with Fazzari et al. (1988) based on the same data. The former proved that financially unconstrained firms showed a high sensitivity of investment to cash flow. Only when the investment opportunities are captured in an appropriate proxy, the method of Fazzari et al. (1988) is valid and a significant cash flow coefficient signals financing constraints.

Due to the *investment opportunities bias*, researchers used alternative proxies for investment opportunities. Most of them have difficulties with the determination of an adequate proxy for the marginal Q. Gilchrist & Himmelberg (1995) proposed the use of fundamental Q. In contrast to the use of average Q, they use a set of vector autoregressive (VAR) forecasting techniques in order to estimate the expected value of marginal Q. Carpenter & Guariglia (2008) constructed a new proxy for investment opportunities, the alongside Q. In order to capture information that is not captured by Tobin's Q, the contracted capital expenditure is included. These are the contractual obligations for future new investment projects. However, for constructing this variable, the use of insider information, i.e. managers' forecast of investment opportunities, is necessary. Erickson & Whited (2000) use Tobin's Q as well, however, they propose a class of measurement error-consistent GMM in order to estimate marginal Q. Ağca & Mozumdar (2008) applied the same error correction estimations to manufacturing firms in the US and they find a significant relation between investment and cash flow. Furthermore, Bond & Cummins (2001), Bond, Klemm, Newton-Smith, Syed & Vlieghe (2004) and Cummins et al. (2006) use forecasts from securities analysts in order to construct a more accurate measure for the expected value of marginal Q. These firm-specific earnings forecasts, i.e. the Institutional Brokers Estimate System (I/B/E/S), results according to Cummins et al. (2006) in the 'real Q'.

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[5] See for a discussion Chrinko (1993) and Hubbard (1998).

Nevertheless, in all of the above controls for investment opportunities market information is included. In the model used by Honda & Suzuki (2000) marginal Q is specified as the ratio of profit per unit of capital to the cost of capital, that is:

$$Q_{it} = \frac{\pi_{it} / K_{it-1}}{p_t (r_t + d)} \tag{3}$$

Where subscript *i* describe to the *i-th* organization and subscript *t* refers to the *t-th* period

π gross profit, defined as ordinary profit minus taxes plus depreciation and interest expenditure;

K is the level of real capital stock, proxied by all beginning tangible fixed assets;

p deflator of investment goods price;

r cost of debt;

d average of the total sample depreciation rate.

This model is based on the assumption that there are constant returns to scale of production and static expectations (Harada & Honjo, 2005). The study of Honda & Suzuki (2000) is based on listed Japanese firms. Yet, their proxy for investment opportunities is also a suitable proxy for unlisted firms, whereas it is not based on market information.

2.3.2.2 Euler equation

Related to the Q-theory is the Euler equation investment model, however this model avoids the *investment opportunity bias* by excluding marginal Q. These models are both derived from the same dynamic optimization problem. This model is introduced by Abel (1980) and specified by Whited (1992) in a regression equation. The relation between current investment in successive periods is created by past investment, total output and cash flow. Advantage of this model is that it determines current investment decision, based on the current expectations of future profitability and therefore avoid the use of marginal Q. The model controls all influences on investment decisions. Disadvantage is that misspecification associated with the role of financial variables in this model is less easily explained away as merely capturing an exceptional influence (Quader, 2013).

The Q-theory and the Euler equation investment model are based on the same theory and therefore on the same dynamic optimization problem, due to investment in the present will influence the availability of capital in the future. Both the models are static models. A comparison between this outlay in the present and the expected revenues in the future is needed, so these models involve intertemporal[6] allocation of resources. Also identical to the Q-theory are the simplifying assumptions of the model such as the capital homogeneity, linear marginal adjustment costs, the complete perfect capital markets and that investment is fully reversible. Nevertheless, the results of these models can be considerably different (Whited, 2006). Also, Whited (1992) and Oliner, Rudebusch & Sichel (1995) showed that these models are outperformed by the relative simple sales accelerator models. This is due to the relative weak empirically power of the Euler equation (Whited, 1998). Gilchrist (1990) showed that the Euler equation hold for a sample with firms that pay low dividend in contrast to a sample with high-dividend firms, both in a world in absence of financial market imperfections.

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[6]Different moments in time.

2.3.2.3 Sales accelerator

Market information is necessary in order to use the different proxies of the Q-theory, e.g. the market-to-book value, earning forecast and fundamental Q. This information is not available for every firm, this is exclusively available for listed organizations. The sales accelerator model is designed in such a way that market-information is not necessary. This proxy is based on the rationale that investment opportunities are captured due to the expected profitability. This expected profitability is the result of the growth of sales (Scellato, 2007). Researchers that used this basic sales accelerator models are e.g. Bakucs et al. (2009), Guariglia (2008), Kadapakkam et al. (1998), Konings et al. (2003) and Scellato (2007). This model is interesting due to the empirically strength (Angelopoulou, 2005; Whited, 2006). Moreover, this method is widely used in studying financing constraints in developed economies (Chow & Fung, 2000).

2.4 Financial constraints

This section contains the theoretical considerations about financial constraints, i.e. the determination of the most appropriate definition for the concept. Further, the empirical approaches of financial constraints are discussed.

2.4.1 Theoretical considerations

Since financial constraints are not directly observable, it is an abstract concept and it is hard to give a distinct definition. Kaplan & Zingales (1997, p. 172) used a precise, yet meanwhile broad definition: *'financial constrained firms face a wedge between the internal and external costs of funds.'* This wedge can be caused by the asymmetric information theory and the managerial agency theory.[7] Drawback of this definition is that practically every firm is classified as constrained, due to the transaction costs of raising external finance. To prevent this generalization, Carreira & Silva (2010, p. 732) define financial constraints as: *'the inability of a firm or a group of firms to raise the necessary amounts (usually due to external finance shortage) to finance their optimal path of growth.'* This definition is rather abstract (e.g. what is the optimal path of growth for an organization?). Comparable is the definition used in Guariglia (2008), which is also abstract. He defines as internally financially constrained those firms whose activities are constrained by the amount of internally generated funds they have. According to Silva & Carreira (2010), this concept ensures that researchers have difficulties with the quantification of this unobservable variable. Researchers still devote their time in finding a method to measure financial constraints.

2.4.2 Empirical approach

There are a number of specifications associated with a proper measure of financial constraints (Silva & Carreira, 2012). Due to the expectation of highly heterogeneous levels of access to external funds, the first characteristic is that financial constraints are *firm-specific*. Furthermore, it is possible that a firm which was previously financially unconstrained, but for example due to idiosyncratic shocks or a change in investment opportunities, the firm had difficulties to receive a loan. The opposite is also possible, due to new and better investment opportunities or a stronger relationship between the firm and the external financier. Hence, the measure for financial constraint should also be *time-varying* (Cleary, 1999). According to Musso & Schiavo (2008), it is not definite when a firm is

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[7] More information about these theories is in paragraph 2.5.1.

financially constrained or unconstrained. They argue that there are different degrees of constraints and firms can have different scales of constraints, and hence, *continuous*.

Besides the theoretical considerations, these specifications ensure that it is rather complicated to find an appropriate measure for financial constraints. This measure should be objective, firm-specific, time-varying and continuous in order to be optimal, and according to Silva & Carreira (2012) such a measure does not already exist. Nevertheless, subsequent paragraphs are about the approaches to measure financial constraints with their primary benefits and drawbacks.

2.4.2.1 Indirect measures

The *investment-cash flow sensitivity* is the first empirical measure for financial constraints, which is introduced by Fazzari et al. (1988). According to this study, financially unconstrained firms can easily obtain external funds to finance their investments. Hence, no positive and significant cash flow coefficient should be found. Contrary, for constrained firms, who use internal funds for financing investments, there should be investment-cash flow sensitivity. Firms are a priori distinguished by dividend payout ratio and classified as either constrained or unconstrained firms. Firms with a low-dividend payout ratio were classified as financially constrained, since that these firms use most of the internal funds to finance their investments. Financially constrained firms showed higher investment-cash flow sensitivity in comparison to firms with a high-dividend payout ratio. And hence, the ICFS could be a convenient measure of financial constraints. Several other studies supported this conclusion (Almeida & Campello, 2007; Audretsch & Elston, 2002; Benito, 2005; Guariglia, 2008; Silva & Carreira, 2012).

Nevertheless, this approach has been extensively challenged. Starting with Kaplan & Zingales (1997), who argued that certain assumptions of the classification scheme were deficient. A low-dividend payout ratio can be caused not only through financial constraints, but also due to potentially risk adverse management or precautionary savings (Lins et al., 2010). Besides, it could be that part of the ICFS reflects investment opportunites that were not captured by Tobin's Q, also called the *investment opportunities bias* (Cummings, Hasset, & Oliner, 2006; Gomes, 2001; Hoshi, Kashyap, & Scharfstein, 1991; Hovakimian & Hovakimian, 2009). Even in a model without financial frictions, Alti (2003) showed, after controlling investment opportunities by Tobin's Q, that firms still have a positive and significant investment-cash flow sensitivity.

Lastly, Clearly et al. (2007) argue that the relationship between investment and cash flow is positive everywhere. In their research they show that this relationship is U-shaped due to the interaction between the cost and revenue effect of investment and thus, the ICFS relationship is non-monotonic.

Almeida, Campello & Weisbach (2004) use a different model of demand for liquidity compared with the ICFS. They argue that the cash policy of a firm is leading for the classification of constraints. When the internal funds are insufficient to finance all investment opportunities, the firm has to pass up some projects in order to be able to finance future opportunities or hedge against future shocks. For these financially constrained firms there is a positive relation between the cash stocks and cash flow, i.e. the *cash-cash flow sensitivity* (CCFS). This is in contrast with unconstrained firms, who can obtain external funds for financing all investment opportunities. The research of Han & Qiu (2006) showed evidence comparable with Almeida et al. (2004) for public traded firms in the US.

Recently, however, researchers found conclusion contrary to the CCFS. Lin (2007) showed a positive and significant cash-cash flow sensitivity for both constrained and unconstrained Taiwanese firms. Likewise, Pál & Ferrando (2009) presented that firms in the Euro-area had a positive CCFS. Riddick & Whited (2009)showed that the CCFS is negative for most sub-samples. They argue that the cash-cash flow sensitivity is not driven by cost of external finance, but more importantly, it is driven by uncertainty and fluctuations in income. Moreover, Acharya, Almeida & Campello (2007) showed that financially constrained firms saved cash from cash flow when hedging needs are high. When the hedging needs are low, firms use excess cash flow to reduce debt. This implies that a positive and significant cash-cash flow sensitivity is not a signal for financial constraints. Compared to this conclusion, D'Espallier, Huybrechts & Schoubben (2013) found that firms with a high CCFS are attractive to external financers due to the association with a higher liquidity, profitability and more dividends. Related to the Q-theory, used by inter alia Fazzari et al. (1988), is the *Euler equation investment model*. This model excludes marginal Q and therefore avoids the investment opportunity bias. Disadvantage of this model is that it is based on a large number of assumptions[8], a highly parametric model (Coad, 2010) and that the empirical power is weak (Gilchrist, 1990; Quader, 2013; Whited, 1998).

Drawback of all of these models is that they are not firm-specific and not time-varying. Additionally, another disadvantage of these indirect measures of financial constraints is the *ex ante* classification in constrained or unconstrained firms. Kaplan & Zingales (1997) and Clearly et al. (2007) discussed already two pitfalls of these methods. Respectively, if the segmenting variable correctly distinguishes between the different groups and that the relationship may in fact be U-shaped. Moreover, it is possible that the proxies[9] for constraints are affected by financial constraints (Silva & Carreira, 2012).

2.4.2.2 Direct measures
In order to avoid the theoretical and empirical problems related to the indirect measures of financial constraints, direct measures can be an alternative. Public traded companies are obligated to provide an annual report, including the financial statements. This company report can be used as an indicator for financial constraints for each firm (Hadlock & Pierce, 2010; Kaplan & Zingales, 1997). In order to classify firms into different groups of financially constrained, the researchers used some keywords associated with financial constraints. For example, Hadlock & Pierce (2010, p. 1914) uses the following expressions: '*financing, finance, investing, invest, capital, liquid, liquidity, note, covenant, amend, waive, violate, and credit.*' Subsequently, the statements that are found are assigned a code from 1 to 5 of financing constraints. These codes are aggregated to derive the level of a firm's financial constraints. Kaplan & Zingales (1997) combine this qualitative data with quantitative data in order to create a final score.

Benefit of this measure is the accuracy and richness of qualitative information. Nevertheless, the use of qualitative information is largely limited to public traded companies, and hence, sampling bias[10] can occur. Further, due to the detailed examination of the company reports, analyzing involves a considerable amount of effort and time.

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[8] See for information about these assumptions paragraph 2.3.2.2.
[9] The coefficient of ICFS and CCFS.
[10] Public traded firms are expected to be less financially constrained than SMEs.

An alternative, to prevent this amount of effort and time, is merely ask firms about their financial constraints. These self-evaluation by the businesses utilizing surveys is used by inter alia Beck, Demirguc-Kunt & Maksimovic (2008), Campello et al. (2010a; 2010b) and Savignac (2009), whereas the former use a single question in order to classify firms and the other researchers use a combination of various questions. For these different questions it is necessary to construct a score in order to combine them and determine the level of a firm's financial constraints (Silva & Carreira, 2012). The benefit of surveys is that financial constraints with investments opportunities are directly taking into account, due to the fact that the surveys are answered by the firm itself. Nevertheless, major drawback is the subjective character of the variables which can lead to a perception bias. Respondents can judge financially constrained different, whereas two firms in the same financial condition can be assessed both financially constrained and unconstrained. Furthermore, to prevent the amount of effort and time necessary for field research, data should be available. However, data with this type of information is scarce and usually limited in the details (Claessens & Tzioumis, 2006).

Direct measures have the benefits that they are firm-specific and time-varying[11] compared to indirect measures of financial constraints. However, due to the subjective and qualitative character, it is recommend to combine it with quantitative data (Kaplan & Zingales, 1997; Silva & Carreira, 2012). The combination of these types of data is frequently referred to as indexes.

2.4.2.3 Indexes

Indexes are suitable for analyzing financial constraints, due to the combination of several variables and the use of qualitative and quantitative information. They are firm-specific, time-varying and can be used as a dependent variable, due to their continuous character. Indexes are applied only recently, starting with Lamont, Polk & Saa-Requejo (2001) which used the KZ-index[12] in order to measure financial constraints. Building on Kaplan & Zingales (1997) classification of financial constraints based on direct measures and company reports, an index is created based on regression coefficient of variables. These variables are accounting ratios, specifically cash flow, total debt, dividend, cash and Tobin's Q. The use of Tobin's Q[13] is a major disadvantage of this index, due to the use of average Q instead of marginal Q.

Whited & Wu (2006) therefore constructed their own index, namely the WW-index[14]. Nevertheless, there is still much overlap between components in the indexes, but according to Whited & Wu (2006) the correlation is approximately null. Compared to the KZ-index, new firm characteristic is added to the WW-index. The index is presuming that the shadow cost of external funds is a function of observable firm characteristics. Firms are considered financially constrained if the outcome from the WW-index is high. Hennessy, Levy & Whited (2006) used the WW-index also as a proxy for financial constraints. Nonetheless, Hennessy & Whited (2007) argued that this index is not a proxy

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[11] When the data is collected every period.

[12] KZ-index: $KZ_{it} = -1{,}002CF_{it} + 3{,}139 B_{it} - 39{,}368D_{it} - 1{,}315C_{it} + 0{,}283Q_{it}$, where CF is cash-flow over total assets, B is long-term debt over total assets, D is total dividends over total assets, C is liquid assets over total assets and Q is Tobin's Q. This method is also used by Baker, Stein & Wurgler (2003) and Malmendier & Tate (2005).

[13] More information about Tobin's Q in paragraph 2.3.2.1.

[14] WW-index: $WW_{it} = -0{,}091CF_{it} + 0{,}021 B_{it} - 0{,}062D_{it} - 0{,}044A_{it} - 0{,}035Y_{it} + 0{,}102IY_{it}$, where CF is cash flow over total assets, B is long-term debt over total assets, D is a dummy variable if a firm pays dividend, A is logarithm of total assets, Y is sales growth and IY is industry sales growth.

for the shadow cost of external funds, but for the need for external funds. Benefit of this index is the availability of data, which are obtained easily through financial statements and market information. The main drawback is that the index is highly parametric. The large amount of parameters ensures a complicated implementation. Further, the index is sample-specific, and thus, not firm-specific.

An alternative, introduced by Musso & Schiavo (2008), is to sort firms in a certain class, e.g. cross-industry. This ranking is based on seven variables; size, profitability, liquidity, cash flow generating ability, solvency, trace credit over total assets and repaying ability. Each variable received a score between 1 to 5 and this results in an ordinal score for the level of financial constraints of a firm. Consequently, this index is not a continuous variable due to the ordinal data. Moreover, benchmarking between the different classes is impossible, due to the ordinal data, and hence, the relative rankings in the classes.

Hadlock & Pierce (2010) argue that the measure for financial constraints should contain exogenous firm characteristics. According to them, most of the methods for measuring financial constraints are based on endogenous variables, which do not have a straightforward relation to constraints due to certain theoretical or empirical assumptions. They showed that only leverage and cash flow predict the financial constraints for a firm, after controlling for size and age. However, they do not recommend to include these variables due to the endogenous nature. In order to identify financial constraints, a measure should solely rely on the two most relative exogenous variables, firm size and age.

According to Hovakimian & Titman (2006) is size one of the most widely used proxy for measuring financial constraint due to (1) transaction costs decrease with size and therefore, external finance is more expensive for small firms, (2) due to the adverse selection problem (Myers & Majluf, 1984), small firms have limited access to external finance and (3) for large firms it is easier to raise more debt sine that they are more diversified and have less bankruptcy risk. Resulting in that the size of the firm is important for the degree of financial constraints of a firm. Firm size is important, since smaller firms are likely to be more affected by information asymmetric, as they are more likely to face idiosyncratic risk, lower collateral values compared with their liabilities and higher bankruptcy costs (Schiantarelli, 1995). Also Petersen & Rajan (1994) argued that smaller firms incline to be more financially constrained as a result of the lower reach or visibility. Resulting in difficulties for investors in assessing the quality of projects. Large traded companies are obligated to provide extra information, and hence, suffer less from asymmetric information problems, thus, from financial constraints (Carreira & Silva, 2010; Hughes, 1994; Lopez-Gracia & Aybar-Arias, 2000). Firm age is also important due to the short track records of younger firms and information is limited for potential investors (Schiantarelli, 1995). Relationships with investors are built over time, allowing firms to easier obtain external funds (Silva & Carreira, 2010).

Hadlock & Pierce (2010) performed an *a priori* classification of the level of financial constraints using the SA-index. Drawback of this measure of financial constraints is that it can suffer from omitted variables. If the non-linear regression does not have a good fit, the *omitted variable bias* can occur. The index should correspond to the economic reality in order to be a correct measure for financial constraints (Silva & Carreira, 2010). Advantages of the index is that it is based on two relatively exogenous variables and thus, independent of several theoretical assumptions. Besides, it allows for a non-monotonic relationship, which is also recently concluded through several researchers (e.g. Clearly et al., 2007; Firth et al., 2012; Guariglia, 2008; Hovakimian , 2009). Furthermore, the SA-index is relative simple to implement.

2.4.2.4 Single proxy

Even more practical than the SA-index is the use of one variable (single proxy) in order to measure the level of financial constraints. In case that a variable is highly correlated with financial constraints, this proxy can be a good measure. This method is commonly used. Rauh (2006) used five different variables for measuring financial constraints, namely; age, S&P[15] credit rating, dividend, cash and capital expenditures. Denis & Sibilkov (2010) use dividend payout ratio and the S&P credit rating as well, completed with firm size and paper rating, the S&P short-term debt rating. According to Clearly et al. (2007) a good variable is rather hard to find, due to weak correlation with financial constraints. This is also as a result of the devised relationship between constraints and the variable. Furthermore, it do not allows for a non-monotonic relationship (Silva & Carreira, 2012).

2.5 Investment-cash flow sensitivity

In this section the relation between investment and cash flow is discussed. First, the theoretical relation is elaborated. Further, the extensive quantity of empirically studies which researched the investment-cash flow sensitivity is discussed.

2.5.1 Theoretical relation

As argued by Modigliani & Miller (1958) in their seminal work, the value of the levered firm[16] is the same as the value of the unlevered firm[17]. Under certain assumptions the financial policy and structure is irrelevant for real investments. Thus, in a perfect capital market the capital structure cannot influence the firm value. The value of a firm is based on the present value of its future cash flows, which are generated through the execution of investments with a positive net present value. The investments of a firm should be driven only by the expected future profitability and it should not be affected by the availability of internal funds. Holding cash in a perfect capital market is insignificant, it is considered as a zero net present value investment. These perfect capitals market, based on drastic simplifications, exist without financing frictions, e.g. agency costs, information asymmetry, accessibility of the capital market or the tax system. Investment decisions of firms are not affected by their financing decisions in the perfect capital markets; firms have complete financial flexibility and can adjust their financial structure costless to meet unexpected needs.

However, in the presence of financing frictions, corporate finance becomes interesting (Denis, 2011). Without the assumption of the perfect capital market, it can no longer be assumed that external capital is a costless substitute for internal capital. Hence, firms with growth opportunities invest less

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[15]Abbreviation of Standard & Poor's.
[16]Firms which are financed with equity and debt.
[17]Firms which are financed exclusively with equity.

than the first-best optimum, resulting in a decreased growth and reduced firm value. Financially constrained firms, i.e. firms with high costs of external finance, will rely more on internal capital in order to mitigate these adverse effects (Denis & Sibilkov, 2010). Subsequently, the financial frictions can affect the company's ability to undertake investments with a positive net present value (Almeida et al., 2011; Campello et al., 2010a). This wedge between internal capital and external capital can be explained by different theoretical approaches. Both theories result to the same approach for firms in their choice for internal or external capital.

2.5.1.1 Managerial agency theory

To effectively control the organizations with a significant number of shareholders, the management represents the interest of them. This relationship is called an agency relationship (Hillier et al., 2010). In the classical agency theory, the person who personifies the firm is besides manager (agent) also he who bears the financial risk (principal) (Fama, 1980), and who single-mindedly operates the firm to maximize profits. However, managerial agency problems can arise when managers who control the firm, are not the principals, e.g. the owners of the firm (Jensen, 1986). Jensen & Meckling (1976) compared the behavior of managers who are also owner to the behavior of managers who are not the equity holders. They showed that the effort of the manager can impact the investments of a firm.

Managers would tend to maximize grow beyond the optimal size, resulting an increase in their power through an increase in the resources under their control. Due to positive association between growth in sales and their compensation, managers are inclined to maximize the amount of resources over which they have control, according to Murphy (1985). Thus, external investors suspect that managers invest in projects to their own interests rather than perform to the interests of the shareholders (Kadapakkam, Kumar, & Riddick, 1998). Due to the increased risk for external investors, there is a premium on the costs of external finance. Besides, due to the increase in costs for monitoring the investments, a higher return is expected for compensation for these costs (Jensen, 1986; Stulz, 1990). Jensen (1986) advanced the managerial agency theory with his free cash flow theory, which is modeled by Stulz (1990). Free cash flow is defined as (Jensen, 1986, p. 323): *'Cash flow in excess of that is required to fund all projects that have positive net present values when discounted at the relevant cost of capital.'*

In order to mitigate the managerial agency problem that managers could tend to act in their own interest, equity holders limited managers' access to free cash flow. However, in this limitation there is a tradeoff: managers should have sufficient internal capital in order to fund all projects with a positive net present value, while not providing excess internal funds to overspend on unprofitable projects (Jensen, 1986; Stulz, 1990).

However, focusing on the relation between investment and internal finance, the managerial agency theory can explain a differential cost of external and internal finance, due to the compensation for the increased monitoring costs for investments, and hence, higher expected return. Furthermore, due to the possibility of managers pursuing their own interest, rather than perform to the interest of shareholders, the costs of external finance surpass the costs of internal finance. Consequence is that accessibility to external financing for managers is restricted and they have to rely more on internal finance (Jensen, 1986; Stulz, 1990), which can cause a firm to forgo investment projects.

2.5.1.2 Information asymmetry theory

In the presence of the perfect capital market, without taxes and the same accessibility for individuals and firms, the cost of capital for external and internal funds are similar.[18] However, asymmetric information can lead to a difference in the costs, thus these are not perfect substitutes. Asymmetric information is based on the availability of detailed information of investments decisions for insiders in contrast with outsiders. It implies that not all market participants have the same access to information (Kadapakkam et al., 1998). Due to information and contracting problems[19] there is a premium on external capital. This is as a result of that external investors will underprice risky securities (Myers & Majluf, 1984). Information asymmetry is positively associated with the cost of external finance (Brennan & Subrahmanyam, 1996; Easley & O'Hara, 2004; Myers, 1984). Greenwald, Stiglitz & Weiss (1984) argue that asymmetry of information in competitive markets will be characterized by credit rationing. In these circumstances the investments of a firm will be dependent on the availability of capital and not its costs. Ascioglu, Shantaram & McDermott's (2008) main conclusion is that firms with high information asymmetry have greater investment-cash flow sensitivity. Smaller firms are likely to be more affected by information asymmetry, as they are more likely to face idiosyncratic risk, short track records, lower collateral values compared to their liabilities and higher bankruptcy costs (Schiantarelli, 1995).

The information asymmetry theory consists of two different problems, i.e. adverse selection and moral hazard, which both have a different effect on SMEs (Hyytinen & Väänänen, 2006). Adverse selection is based on the problem that an outsider, e.g. an external financier, cannot differentiate between the diverse firms in need for a loan. The outsider cannot distinguish between a loan to a good or bad firm. The problem occurs in the initial phase of financing. In order to mitigate those possible losses from a loan to a bad firm, the outsider grants a higher rate for compensation (Stiglitz & Weiss, 1981).

Moral hazard is based on the problem that the loan is used in a different way compared to the indicated purpose. Therefore, moral hazard problems occur when the outsider provided a firm with a loan. The firm will not use the money as intended or take unnecessary risks from the viewpoint of the external financier (Bester & Hellwig, 1987). According to Hyytinen & Väänänen (2006), SMEs both face adverse selection and moral hazard problems. However, adverse selection problems are more prevailing then moral hazard problems.

Both information asymmetry theory and managerial agency theory have the same conclusion, i.e. there is a premium on the external costs compared to the internal costs. Thus, firms with difficulties in raising external finance are expected to rely more on their internal finance. However, managerial agency problems arise more by large firms (Kadapakkam et al., 1998) due to their greater flexiblity in timing their investments. Moreover, according to Bernanke, Gertler & Gilchrist (1996) and Carreira & Silva (2010), it is expected that stock traded companies face lower information asymmetry problems, due to the obligation to provide extra information for quoted firms, then SMEs. Furthermore, Hyytinen and Väänänen (2006) showed that SMEs face morzal hazard and adverse selection problems. Since this study is focused on SMEs, the theory of information asymmetry problems is central in this research.

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[18] Transaction costs inclined to be small and thus be neglected (Fazzari et al., 1988).
[19] Lenders do not know how the money is being invested.

2.5.2 Empirical relation

Fazzari et al. (1988) started to empirically examine the influence of financial constraints on corporate investment. Growing literature used the basic assumption of Fazzari et al. (1988), which argued that the sensitivity of investment to internal capital increases with the wedge between internal and external costs of funds. In their cross-sectional research a distinction is made by applying the dividend payout ratio, based on a sample of firms in the United States. Financially constrained firms, i.e. firms with a low-dividend payout ratio, showed a higher investment-cash flow sensitivity in comparison to firms with a high-dividend payout ratio. Several other studies supported this conclusion.

Hoshi et al. (1991) researched this influence based in a sample of firms in Japan. Firms were grouped using the proxy for financial constraints, the closeness with their banking relationship. The closeness is measured by a membership of a firm in a 'keiretsu', a large industrial group. Due to a closely monitoring of the 'keiretsu' by the bank, the information costs of external finance were reduced. Firms with a closer relationship with their bank, e.g. in a 'keiretsu', had a lower investment-cash flow sensitivity. Contrary to this conclusion, George et al. (2011) empirical results showed that there is no significant difference between the sensitivity of Indian group affiliated and independent firms in India. Nevertheless, they showed that there is a positive and statistically significant investment-cash flow sensitivity for all firms. Based on a sample of firms in the United Kingdom, distinguished on age, size and type of industry, Devereux & Schiantarelli (1990) showed that new investments were financed from the retained profits. The results of analysis of firms of the United States by Gilchrist & Himmelberg (1995) showed that small firms showed a higher investment-cash flow sensitivity than large firms. They classified firms by dividend payout ratio and in addition by access to the bonds market, bond rating and size.

Various studies followed, not focusing exclusively on fixed investments, but also on working capital (Fazzari & Petersen, 1993), on investments in inventory (Benito, 2005; Guariglia, 1999; 2000), the effect of assets tangibility (Almeida & Campello, 2007) in growth (Carpenter & Petersen, 2002a; Guariglia, Liu, & Song, 2011), the influence of corporate governance (Francis, Hasan, Song, & Waisman, 2012) and in research & development decisions (Carpenter & Petersen, 2002b). Hubbard (1998) provides a critical review of the classification of financial constraints in prior research.

Nevertheless, there are various studies which provided opposite evidence with Fazzari et al. (1988). Kaplan & Zingales (1997) challenged their seminal study extensively. They questioned the validity of the measure of financial constraints, a positive and statistically significant relationship between investment and cash flow used by Fazzari et al. (1988). The approach of the latter is also criticized for failing to adequately control for the investment opportunities of the firm[20], which could create invalidate results (Alti, 2003; Erickson & Whited, 2000). In contrast with the assumption of Fazzari et al. (1988), Kaplan & Zingales (1997) proved that a firm with a low-dividend payout ratio is not necessarily financially constrained, and vice versa. In addition, based on the same database complemented with the firm's annual reports, they proved that the investment-cash flow sensitivity is the highest for firms which seem to be the least financially constrained. As a proxy for degree of

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[20] See for more information paragraph 2.3.2.1.

financial constraints they used several variables strongly related to firms' liquidity.[21] Based on these variables Kaplan & Zingales (1997) constructed a classification scheme. For constructing this index, qualitative information in the annual report is used as well quantitative information in the firm's financial statements and notes.

Similar, Cleary (1999) constructed an index of the firms' financial status, based on traditional financial ratios, which are strongly related to a firm's internal funds, such as current ratio, quick ratio and interest coverage ratio. Main conclusion is that the investments of financially unconstrained firms, i.e. firms with a strong financial status, are more sensitive to internal capital. This conclusion is comparable with the conclusion of Kaplan & Zingales (1997). After publishing preceding studies an intensive debate[22] followed between Fazzari, Hubbard & Hubbard (2000) and Kaplan & Zingales (2000). Fazzari et al. (2000) argued that financial distress caused a low investment-cash flow sensitivity for the most constrained firms. Besides, they debated that the cross-sectional sample used by Kaplan & Zingales (2000) is insufficient heterogeneity. The latter responded to the criticism, that the sample is too small and homogeneous, citing Cleary (1999), which research used a large and heterogeneous sample. According to them, the distinction between financial distress and financial constraints is unimportant.

The conclusions of Kaplan & Zingales (1997; 2000) and Cleary (1999) are confirmed by several other studies. Gilchrist & Himmelberg (1995), which also found empirical evidence, based on firm size, similar with Fazzari et al. (1988), used, among other variables, dividend payout ratios as a proxy for financial constraints. Based on this proxy, they concluded that firms with a higher payout ratio showed a higher investment-cash flow sensitivity than firms with low payout ratios. Lamont et al. (2001) constructed an index as a degree for financial constraints and they showed that firms with high dividend payments and low market-to-book value have fewer investment opportunities and growth alternatives. Resulting in a lower need for financing. Allyannics & Mozumdar (2004) used a sample including firms with a negative cash flow, i.e. these firms were financially distressed. Based on this sample, they concluded that the investments of these firms were not sensitive to internal cash flows. Similar to Fazzari et al. (1988), financing constraints is measured by payout ratio. Nevertheless, when firms that are financially distressed are excluded, the overall results of Allyannics & Mozumdar (2004) are much closer to the studies of Fazzari et al. (1988; 2000). Besides, they provided that there is a decline in the sensitivity of investments to cash flow due to capital market imperfections. Similar, the findings of Ağca & Mozumdar (2008) indicate that there is a steady decrease, due to a reduction of these imperfections, of this sensitivity based on manufacturing firms in the United States. These capital market imperfections exist of an increased fund flows, institutional ownership, analyst following, antitakeover amendments and with the existence of a bond rating. Further, Rauh (2006) presents strong evidence that investments and internal funds are possibly related. In order to overcome the endogeneity problem[23], Rauh (2006) uses a different approach and showed that mandatory pension contributions, i.e. plausible

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[21] Liquidity is strongly correlated with the availability of a firms' internal funds.

[22] 'One memorable example mentioned by Kaplan & Zingales (2000) is that, in 1997, Microsoft would have been labeled as 'financially constrained' according to the classification schemes of Fazzari et al. (1988; 2000) even though it had almost $ 9 billion in cash, corresponding to eighteen times its capital expenditures!' (Coad, 2010, p. 210).

[23] According to Rauh (2006), there is causality between cash flow and investment opportunities.

exogenous shocks to a firm's cash flow, affect a firm investments. In order to prevent the endogeneity problem, the cash flow of a firm is separated into pension- and non-pension related components.

Also according to Rauh (2006), the findings from Gomes (2001), Alti (2003) and Moyen (2004) displayed cash flow effects, however, these effects are due to the empirical misspecification[24]. Gomes' (2001) main results is that a positive and significant cash flow coefficient neither is sufficient nor necessary for the existence of finance constraints, the relationship arise in absence of financial market imperfections. This research shows that a proxy for marginal Q, that not perfectly captures investment opportunities, can cause an investment-cash flow sensitivity. Even in a model without financial frictions, Alti (2003) showed, after controlling investment opportunities by Tobin's Q, that firms still have a positive and significant investment-cash flow sensitivity. Both studies are based on the same question; wether a positive and significant cash flow coefficient is a good measure of finance constraints. Also Moyen (2004) focused on this question. The outcome of this study is that constrained firms showed a higher ICFS than unconstrained firms. Nevertheless, firms that pay low dividend[25] showed a higher sensitivity than firms that pay high dividend.

Researchers devoted much attention to the influence from financial constraints on the relationship of internal finance and investment. However, literature is ambiguous whether this influence has a positive or a negative effect on the relationship. Studies comparable with Fazzari et al. (1988; 2000) conclude that investment-cash flow sensitivity for financially constrained firms is higher compared to lower financially constrained firms. However, studies comparable with Kaplan & Zingales (1997; 2000) and Cleary (1999), conclude the contrary, i.e. that lower constrained firms displayed a higher sensitive of cash flow to investment than higher constrained firms.

According to Clearly et al. (2007), the cause of these contradictory conclusions is the lack of a precise empirical proxy for financial constraints. They argue that the relationship between investment and cash flow is positive everywhere. Their research shows that this relationship is U-shaped due to the interaction between the cost and revenue effect of investment. Contrary to prior literature, Clearly et al. (2007) believed that at some intermediate point where internal finance is sufficiently low and is further decreasing that investment starts to increase. According to them, investment increases if internal funds are also large. However, when the internal funds are low, investments starts to increase as internal funds decrease further. They argued that this non-monotonic behavior if investment is caused by a trade-off between two effects. These effects are (1) the risk of default and liquidation and (2) the need to generate revenue to repay debt. Assuming that higher levels of investment involves higher repayments costs, and hence, a higher risk of default, there is a positive relation between investment and cash flow. On the contrary, when internal funds is low, the company needs fund to repay their debt. As a result, the company invests in order to generate revenue to repay their debt. Hence, there is a positive relation between investment and cash flow. Clearly et al. (2007) showed that this results in a U-shaped ICFS. The non-monotonic investment-cash flow relation is also studied by Firth et al. (2012) for China's listed companies, Guariglia (2008) for firms in the UK, Hadlock & Pierce (2010) and Hovakimian (2009) for manufacturing firms in the US.

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[24] See for more information paragraph 2.3.2.1.
[25] According to Fazzari et al. (1988) firms that are financial constraint.

Recently, more researchers studied the influence from the financial crisis, the cause of a decline in the availability of internal finance, on to investments. Campello et al. (2010b) surveyed CFO's in North America, Europe and Asia to investigate the impact of the financial crisis, on real investment spending. Chief financial officers were questioned if the accessibility of external and internal finance had influence on investment decisions. Moreover, the authors inquired whether the respondents sell existing assets to prevent to get financial constraint. The finding of this study is that financially constrained firms plan to cut more investment, marketing, technology and employment compared to financially unconstrained firms during the crisis. The propensity to sell off assets in order to generate funds is also significantly higher for constrained firms. Campello et al. (2010a) collected data through surveys during the financial crisis. The results show the importance of credit lines for corporate decisions. The lines of credits ease the impact of the financial crisis on investments. Dunchin, Ozbas & Sensoy (2010) studied the effect of the financial crisis on corporate investments. Main conclusion is that there is a significant decline in corporate investment following the onset of the crisis. The conclusions of Khramov (2012) are comparable with these findings. However, the findings of Khramov (2012) are not uniform across firms' sizes and industry-specific effects.

Practically all researchers focused on large listed companies, although SMEs are more likely to suffer from financial constraints (Becchetti et al., 2009; D'Espallier & Guariglia, 2012; Guariglia, 2008; Silva & Carreira, 2010). Guariglia (2008) used a database where 99% of the firms[26] are not traded on the stock market and concluded that the investment-cash flow relation is non-monotonic. Silva & Carreira (2010) emperically investigated Portuguese firms which were financially constrained. In general the Portugues firms were constrained, especially smaller firms. The database included firms with more than 100 employees, but importantly, also a random sample of firms with the amount of employees between 20 and 100, which can be indicated as SMEs. Becchetti et al. (2009) classified firms based on number of employees, with the smallest firms between 11 and 20 employees and the largest firms with more than 500 employees. D'Espallier & Guariglia (2012) uses a database which include only Belgian SMEs[27] and showed that a significant ICFS do not reflect investment opportunities, but indicates that a firm is financially constrained.

Carpenter & Petersen (2002a) focused their research on the growth of small firms and concluded that the growth of small firms is constrained by internal finance using a panel of small US firms. Comparable, Oliveira & Fortunato (2006) find that for smaller Portuguese manufacturing firms growth is more sensitive to cash flow, which implies the existence of financial constraints for such firms. Honjo & Harada (2006) find a higher growth-cash-flow sensitivity for younger SMEs in Japan. Also, Becchetti & Trovato (2002) for Italian manufacturing firms and Bhaduri (2008) for Indian manufacturing firms, reaches the same conclusion; small firms face a larger impact of cash flow on growth than larger firms. Egeln, Licht & Steil (1997) showed that smaller and younger firms in Germany are more constrained than their larger counterparts. In their study with German firms, Audretsch & Elson (2002) concluded that smaller firms are more sensitive for financial constraints. However, due to the specialized institutional structure in Germany, small firms in Germany have relatively less financial constraints in comparison with small firms from Anglo-Saxon. Finally, using a sample with Bulgarian firms, Budina, Garretsen & De Jong (2000) concluded that financial constraints are more severe for smaller firms.

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[26] The database consists of firms from the United Kingdom.

2.6 Hypotheses

Modigliani & Miller (1958) showed in their classic paper that the cost of capital for an organization is independent of the capital financial structure. Therefore, the market value of any firm is independent of its capital structure. The value of a firm is based on the present value of its future cash flows, which are generated through the execution of investments with a positive net present value. The investments of a firm should be driven only by the expected future profitability and it should not be affected by the availability of internal or external funds. Hence, in a perfect capital market the capital financial structure cannot influence the firm value. These perfect capital markets, based on drastic simplifications, exist without financing frictions, e.g. agency costs, information asymmetry, accessibility of the capital market or the tax system. Investment decisions of firms are not affected by their financing decisions in the perfect capital markets; firms have complete financial flexibility and can adjust their financial structure costless to meet unexpected needs. Consequently, investment decisions are not affected by their financing decisions. Hence, the only determinant of investments is the investment opportunities of an organization (Ağca & Mozumdar, 2008).

However, capital markets are not perfect due to the presence of financing frictions and hence, corporate finance becomes interesting (Denis, 2011). Due to captial market imperfections, the costs of external finance surpasses the costs of internal finance.Thus, it is expected that the investments of SMEs in a develop country, likewise for large listed companies in these western-countries, are generally financed with internal funds. This leads to the following hypothesis:

> **Hypothesis 1:   Internal finance is positively related with investments for Dutch SMEs.**

Fazzari et al. (1988) pioneering paper intensified the debate on the sensitivity of investment to internal finance. Under the assumption that external financing is more costly than internal financing, changes in cash flow, used as a proxy for internal finance, is an important determinant of marginal capital spending for constrained firms. Due to captial market imperfections, such as asymmetric information problems, the costs of external finance surpasses the costs of internal finance. They proved that the sensitivity of investment to cash flow is higher for firms that face a larger wedge between the costs of external and internal funds. This conclusion is generally supported through different other studies (Bond et al., 1999; Carpenter et al., 1994; Nickell & Nicolitsas, 1999). The unit of analysis of these studies was large listed companies in developed countries, like the Netherlands. Compared to these companies, SMEs are more likely to suffer from asymmetric information problems, and so from financing constraints. The large listed companies are obligated to provide extra information (public disclosure annual report) due to that fact that they are quoted on the stock market (Carreira & Silva, 2010; Hughes, 1994; Lopez-Gracia & Aybar-Arias, 2000). Consequently, the conclusion that large listed companies which are financially constrained have stronger investment-cash flow sensitivity than financially unconstrained large listed companies should be the same for SMEs. Thus, it is expected that the investments of financially constrained SMEs rely more on internal finance compared to financially unconstrained SMEs. This leads to the following hypothesis:

> **Hypothesis 2:   Financially constrained Dutch SMEs have a stronger investment-cash flow sensitivity compared to financially unconstrained Dutch SMEs.**

3. RESEARCH METHODOLOGY

This chapter contains the research methodology used for the empirical study of the relationship between internal finance and investment and the influence of financial constraints on this relation. First, the quantitative analyses are elaborated. In this section the methodology to test the hypotheses is described. Then the variables are operationalized and the empirical method is established. Lastly, the research sample is described.

3.1 Quantitative analyses

This section contains the research method used in prior literature and the method used in this research. This includes the method for detecting multicollinearity. Further, the research model is elaborated. Lastly, there is a description about the interpretation of the results.

3.1.1 Research method

An appropriate measure of association between variables is the Pearson's product-moment correlation coefficient, denoted as ' r ' (Babbie, 2007; Saunders et al., 2011). Other researchers used the Pearson's product-moment correlation coefficient (PMCC) as well in order to reveal any assocation between variables (such as D'Espallier & Guariglia, 2012; Firth et al., 2012; Silva & Carreira, 2010). The value of the PMCC is between -1 and 1. A negative value signify a negative association between the variables, whereas a positive value signifies the contrary. A score of 0 means that the variables are perfectly independent of eachother. The PMCC is a lineaire assocation since the change of the variable is constant (Saunders et al., 2011). The strength of the linear association of internal finance on investment is therefore calculated by the Pearson's product-moment correlation coefficient, similar with prior research (e.g. D'Espallier & Guariglia, 2012; Firth et al., 2012; Silva & Carreira, 2010). However, causality between the variables is disregarded with this method.

In order to test the causality and to determine the nature of the relation between internal finance and investment a regression model is performed. Nevertheless, there is no consensus in which form of linear regression best predict investment. Generally, the methods used in research exist of ordinary least square (OLS) method or the generalized method of moments (GMM) approach. A number of researchers use both types of regression analyze in their study (such as Ağca & Mozumdar, 2008; Firth et al., 2012; George et al., 2011; Guariglia, 2008; Hadlock & Pierce, 2010).

Linear regression is one of the most important techniques in order to study the relation between two or multiple variables (Koop, 2005). It provides insight into how the independent variables influence the dependent variable and the correlation coefficient indicates the degree of linear relationship between them. And hence, give an answer to the research question. It is common to work with standards for the level of significance, the statistical variable t (t-test) (Saunders et al., 2011). It is only useful if the regression coefficient is sufficiently far from zero. A significance level of 5% is used in this research. A P-value of less than or equal to 0,05 indicates a significant result. The probability that the test procedure the hypothesis $\beta \neq 0$[28] wrongly accepted is maximum 5%. This standard for significance is widely used, according to Koop (2005).

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[28] This means that the regression coefficient of cash flow has explanatory power on investment.

An assumption for the use of the t-test is a normal distribution of the data. This assumption can be easily ignored, even for data samples smaller than 30 elements (Hays, 1994). Another assumption is that groups should have the same variance. However, this can also be easily disregarded, on condition that the groups are equally sized (Hays, 1994).

The OLS regression analysis is a frequently used method in studies focusing on the ICFS (e.g. Cleary, 2006; Fazzari & Petersen, 1993; Francis et al., 2012; Hadlock, 1998; Lewellen & Lewellen, 2009). This method uses the residuals in order to estimate the line of the best fit resulting in an equation. Through the use of this equation the effects of the independent variables on the dependent variable is explained. With the use of the sum of the squared residuals, the parameters are estimated. The estimation is only consistent when there is no perfect multicollinearity and the regressors are exogenous (De Veaux, Velleman, & Bock, 2008). Major benefit of this estimation is the limited neceserrity of the quantity of data, since it exist exclusively out of variables from one time period.

The regressors are expected to be endogenous in the investment equation, according to Bond et al. (2003), D'Espallier & Guariglia (2012) and Erickson & Whited (2000). Resulting in a biased and inconsistent OLS estimation. In order to prevent the possiblity of endogenous regressors, the generalized instrumental variables estimation procedure is used. Lagged values of current period regressors are used as instruments to control for endogeneity, known as the two-stage least squares (2SLS) estimation. This is a special case of the GMM method (Verbeek, 2004). This method is developed by Arellano & Bond (1991) and used by a substantial amount of researchers (such as Audretsch & Elston, 2002; Becchetti et al., 2009; Chen & Chen, 2012; Degryse & De Jong, 2006; Fazzari & Petersen, 1993). 2SLS is a simultaneous equation method which changes the dependent and independent variable in two models in order to measure the occurrence of endogeneity.

Both regression methods have advantages and disadvantages. In order to increase the level of robustness of this research both types of regressions are used in this research. This is in alingment with prior literature such as Ağca & Mozumdar (2008), Degryse & De Jong (2006), Firth et al. (2012), George et al. (2011), Guariglia (2008) and Hadlock & Pierce (2010). An assumption for both methods is the absence of multicollinearity.

3.1.2 Multicollinearity

Multicollinearity is a statistical issue and can arise if the independent variables are highly correlated with one another (Koop, 2005). In the presence of multicollinearity, the regression model has difficulty telling which independent variable is influencing the dependent variable. According to Schroeder, Sjoquist and Stephan (1992) there is no statistical test that can determine whether or not multicollinearity is a problem. There are only methods for detecting multicollinearity (Berry & Feldman, 1985). Prior literature provides numerous suggestions to detect multicollinearity. One of the most widely used procedures is the variance inflation factor (Mason & Perreault, 1991). Variance Inflation Factor (VIF) provides a reasonable and intuitive indication of the effects of multicollinearity on the variance of the regression coefficient (O'Brien, 2007). It measures to what extent the variance of the estimated coefficient of the independent variable is increased (Mason & Perreault, 1991). A VIF-value of 1 indicates that the independent variables are not correlation with one another. According to Kutner, Nachtsheim & Neter (2004) a value of approximately 5 indicates on multicollinearity and a VIF-value of 10 and above is a serious cause of concern.

3.1.3 Research model

The Pearson's product-moment correlation coefficient is used in order to measure the association of the variables. However, causality between the variables is disregarded with this method. The coefficient do not reveal the determination of the nature of the relation between internal finance and investment. In order to test the causality and to determine the nature of the relation between internal finance and investment two regression models are performed (in alignment with Ağca & Mozumdar, 2008; Firth et al., 2012; George et al., 2011; Guariglia, 2008; Hadlock & Pierce, 2010). Both regression models use the same equation, which is:

$$\textbf{Investment}_t = \boldsymbol{\beta_0} + \boldsymbol{\beta_1} \textit{Cash flow}_t + \boldsymbol{\beta_2} \textit{control variables}_t + \boldsymbol{\epsilon}_{\textbf{it}} \qquad (4)$$

3.1.4 Results interpretation

In order to answer the research question, two hypotheses are formulated. Hypothesis 1 is supported if there is correlation between investment and cash flow. The correlation disregard the causality, thus also a regression is performed. If the estimation of the regression model showed a significant and positive cash flow, hypothesis 1 is accepted. The sensitivity of investments to cash flow is reflected by coefficient β_1 in this model. In order to accept hypothesis 2, a distinction is made between the level of financial constraints of the firms. Financially constrained firms should show a positive and significant cash flow (coefficient β_1) in contrast to financially unconstrained firms. They should show a small and insignificant cash flow. Hypothesis 2 supported by the data if that is the case.

3.2 Variables

In the conceptual model are three variables distinguished: de explanatory variable internal finance, the dependent variable investment and the moderating variable financial constraints. Further, control variables are used to exclude idiosyncratic factors. In this section these variables are defined and it contains the operationalization.

3.2.1 Investment

In this research the definition of Keynes (2006) is limited to tangible fixed capital. Mostly every researcher who studied the ICFS focused only on tangible fixed capital (Audretsch & Elston, 2002; Bassetto & Kalatzis, 2011; Guariglia, 2008; Kaplan & Zingales, 1997; Rauh, 2006). The definition of investment in this study is: the increment of tangible fixed capital. In alignment with prior studies investment is measured as the change in tangible fixed assets between the beginning and the end of a year plus the depreciation in the same year (such as D'Espallier & Guariglia, 2012; Degryse & De Jong, 2006; Fazzari et al., 1988; Firth et al., 2012 and Guariglia, 2008). A negative value indicates that the firm did not invest, and hence, these values are excluded in the sample.

Investment = Change in tangible fixed assets plus depreciation (5)

3.2.2 Internal finance

Internal finance is defined as the earnings of the firm which subsequently plows back into the business (Jordan et al., 2011). Examples of internal finance are retained earnings or depreciation. Internally generated finance is important for investment due to the premium on the external costs compared with the internal costs. According to Keynes (1936), there are two motives to holding cash. This research will focus on the precautionary motive of holding liquid assets. This motive is based on the theory that firms accumulate cash if the costs of external finance are prohibitively high or in the case of a shortfall of the cash flow. This accumulation of cash is attained by internal finance Hence, with this motivation of holding liquid assets, companies are able to continuous anticipate on investment opportunities.

Internal finance is traditionally measured by cash flow. Practically every researcher uses this variable and is typically measured as (e.g. Ağca & Mozumdar, 2008; Fazzari et al., 1988; Guariglia, 2008; Kaplan & Zingales, 1997):

$$\textbf{Cash flow = Net income before extraordinary items + depreciation} \qquad (6)$$

This operationalization of cash flow is in compliance with the definition of internal finance. Therefore this operationalization is used in this research.

3.2.3 Financial constraints

There is still no consensus in the definition of financial constraints. Empirically are financial constraints not directly observable, it is an abstract concept and it is hard to give a distinct definition. Kaplan & Zingales (1997, p. 172) used a precise, yet meanwhile broad definition: '*financial constrained firms face a wedge between the internal and external costs of funds.* 'Result of using this definition is that every firm is classified as constrained, due to the transaction costs of raising external finance. To prevent this generalization, Carreira & Silva (2010, p. 732) define financial constraints as: '*the inability of a firm or a group of firms to raise the necessary amounts (usually due to external finance shortage) to finance their optimal path of growth.*' This definition is also used in this research.

The most used empirical assessment of financial constraints is the investment-cash flow sensitivity, introduced by Fazzari et al. (1988). This indirect measure is also used by several author researchers such as Almeida & Campello (2007), Audretsch & Elston (2002), Bond et al. (2003), Guariglia (2008) and Silva & Carreira (2012). Kaplan & Zingales (1997) argued that the classification scheme used by Fazzari et al. (1988) were deficient, resulting in a flawed measure for financial constraints. In order to be a meaningful measure, certain assumptions are necessary. Based on the same database, only complemented with firm's annual reports, they proved the opposite of Fazzari et al. (1988). Besides, it could be that part of the ICFS reflects investment opportunites that were not captured by Tobin's Q, also called the investment opportunities bias (Cummings et al., 2006; Gomes, 2001; Hoshi et al., 1991; Hovakimian & Hovakimian, 2009).

As an alternative, Almeida et al. (2004) introduced the cash-cash flow sensitivity. This model is questioned by several researchers and they proved contradicting evidence (inter alia Acharya et al., 2007; D'Espallier et al., 2013; Lin, 2007; Pál & Ferrando, 2009; Riddick & Whited, 2009). Another alternative is the Euler equation investment model. This model excludes marginal Q and therefore

avoids the investment opportunity bias. However, the empirical power is weak (Gilchrist, 1990; Quader, 2013; Whited, 1998), the model is based on a large number of assumptions[29] and is a highly parametric model (Coad, 2010). Valid for all these models is that they are not firm-specific and not time-varying. Additionally, another disadvantage of these indirect measures of financial constraints is the *ex ante* classification of firms in constrained or unconstrained.

To avoid these problems, direct measures can be an option. Annual reports can be used as in indicator for financial constraints for each firm (Hadlock & Pierce, 2010; Kaplan & Zingales, 1997). The usability is however limited to listed companies and it involves a considerable amount of time and effort. To prevent this amount of effort and time, is merely ask firms themselves to their financial constraints. Major drawback of this method is the subjective character of the variables which can lead to a perception bias.

Hadlock & Pierce (2010) argue that the measure for financial constraints should contain exogenous firm characteristics. They created an index using the two most relative exogenous variables, firm size and age, the SA-index. It can be measured for each firm and thus, this measure of financial constraints is firm-specific. Besides, it is possible that a firm altered from the degree of financial constraint during a given period (Cleary, 1999). The SA-index can cope with this time-varying changes, while it is also continuous and it is relative simple to implement.

The empirical variable to measure the degree of financial constraints used in this research is the SA-index of Hadlock & Pierce (2010):

$$SA_{it} = -0,737S_{it} + 0,043S_{it}^{2} - 0,040A_{it} \qquad (7)$$

Where subscript *i* describe to the *i-th* organization and subscript *t* refers to the *t-th* period
S firm's size
A firm's age

The size of the firm is defined as the natural logarithm of book assets, but it can also be measured as the natural logarithm of sales. Hadlock & Pierce (2010) define the age of the firm as the number of years the firm is listed with a non-missing stock price on Compustat. In this research the unit of analysis is SMEs, and thus, these firms are not listed. Therefore the age is defined by the number of years in activity (Silva & Carreira, 2010).

Firm size$_1$ = Natural logarithm of book assets   (8)

Firm size$_2$ = Natural logarithm of sales   (9)

Firm age = Number of years in activity   (10)

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[29]See for information about these assumptions paragraph 2.3.2.2.

Hadlock & Pierce (2010) argues to use for both variables a cutoff at approximately 95%. According to them, the relation between these firm characteristics and constraints are flat. Whereas below the cutoffs the relation is quadratic and thus, non-monotonic. In this research these cutoffs are not used for the reason that too much information is lost. Moreover, their unit of analysis are generally larger and older firms compared with our unit of analysis.[30] Both variables are winsorized at the top 2% approach to use an approximation of the variables (Silva & Carreira, 2010).

The index is used to perform an *a priori* classification of the degree of financial constraints. The sample is divided into mutually exclusive groups with the use of tertiles. Firms are classified by the outcome, whereas the top is financially constrained and the bottom as financially unconstrained. The group in the middle is neither constrained nor unconstrained.

3.2.4 Control variables

Control variables are used to exclude idiosyncratic factors, other than the factors which are tested, which may influence the independent or dependent variables and hence, indirectly the relationship between internal finance and investment (De Veaux et al., 2008). Babbie (2007, p. 435) use the following definition of control variable: 'A *variable that is held constant in an attempt to clarify further the relationship between other variables.'* In order to control for biases and to increase the robustness of the results it is imperative to include control variables. In alingment with prior studies four control variables are used in this research. The control variables are investment opportunities, industry, past investments and size.

In alignment with prior literature (Bassetto & Kalatzis, 2011; D'Espallier & Guariglia, 2012; Guariglia, 2008; Silva & Carreira, 2010), past investments are also taking into account in the determination of investments. The past investments are measured identically with the present investments; the change in tangible fixed assets between the beginning and the end of a year plus the depreciation in the same year. Only the period differs one year.

Also a large investment literature (Fazzari et al., 1988; 2000; Kaplan & Zingales, 1997; 2000; Rauh, 2006) scales the ratio variables to control for possible heteroscedasticity due to differences in firm size. In order to eliminate these size effects, the investments are scaled by the level of capital stock. A substantial part of researchers used another measure for size, since not every company is listed. These researchers used the tangible fixed assets in the beginning of the year as a proxy for firm size (D'Espallier & Guariglia, 2012; Degryse & De Jong, 2006; Firth et al., 2012; Silva & Carreira, 2010).

Capital stock = Tangible fixed assets in the beginning of the year (11)

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[30]They use stock listed companies and in this research SMEs.

3.2.4.1 Investment opportunities

A substantial part of the literature containing the ICFS is based on the most important control variable, the investment opportunities. Prior literature is ambiguous about an appropriate measure for investment opportunities. A large body of literature is devoted in this methodology issue.

The most commonly used approaches to capture the investment opportunities involves two types of investment models, namely the Q-theory and the Euler equation model (George et al., 2011). The Q-theory uses marginal Q, the rate of the market value of an additional investment to the replacement costs of this new investment. Investments are exclusively determined by these shadow price of capital. Due to that marginal Q is not directly observable, average Q is used as an empirical approximation. However, this can lead to potential measurement problems. Carpenter & Guariglia (2008), Cummins et al. (2006), Erickson & Whited (2000), Gilchrist & Himmelberg (1995) used alternative proxies for average Q, but in all of their controls for investment opportunities is market information included. Due to that SMEs are typically not followed by analysts, these market information is not available for SMEs (D'Espallier & Guariglia, 2012). In the model used by Honda & Suzuki (2000), building on the work by Yoshikawa (1980). These market information is not necessary. Nevertheless, it seems improbable that this proxy capture the investment opportunities. The proxy neither uses forecasts or estimations, unlike all of the other proposed proxies. It is merely based on the ratio of profit per unit of capital to the costs of that capital. Moreover, assumption is made for the overall depreciation rate. As a result, this proxy is hardly used in empirical research.

The other approach is the Euler equation investment model, whereby this model deviate from the Q-theory by excluding marginal Q. There are also several similarities. The Q-theory and the Euler equation investment model are based on the same theory and therefore on the same dynamic optimization problem. Also identical as the Q-theory are the simplifying assumptions of the model such as the capital homogeneity, linear marginal adjustment costs, the complete perfect capital markets and that investment is fully reversible. The assumption are not entirely realistic (Coad, 2010). Further, analyzing the results based on these mathematical models are only open to identification and interpretation within the restrictive context (Coad, 2010). Nevertheless, the results of these models can be considerably different (Whited, 2006). Also, Angelopoulou (2005), Oliner, Rudebusch & Sichel (1995) and Whited (1992) showed that these models are outperformed by the relative simple sales accelerator models. This is due to the relative weak empirically power of the Euler equation (Whited, 1998). Gilchrist (1990) showed that the Euler equation hold for a sample with firms that pay low dividend in contrast with a sample with high-dividend firms, both in a world in absence of financial market imperfections. Oliner et al. (1995) showed that the mean squared forecast errors numerous times larger are than those of accelerator model. The main conclusion of that research was that due to the invalid dynamic structure of the data, the Euler equations poorly forecasts. Another disadvantage is that misspecification associated with the role of financial variables in this model is less easily explained away as merely capturing an exceptional influence (Quader, 2013). Both the Q-theory and the Euler equation are static models. According to Bond & Van Reenen (2007) the capital of the firm cannot be adjusted immediately and costless, whereby the use of statics models is inappropriate. Therefore, a possibility is to rely on dynamic econometric specifications which are not explicitly derived as optimal adjustment behavior. They argue that reduced form models, such as the sales accelerator, represent an empirical approximation to some complex underlying process that generate the data.

The investment model used in this research is the sales accelerator model. The rationale of this proxy is that investment opportunities are captured due to the expected profitability, resulting from the growth of sales (Scellato, 2007). Market information is excluded in this model, which is an advantage since that is exclusively available for listed organizations. Moreover, this model is interesting due to the empirically strength (Angelopoulou, 2005; Whited, 2006). The percentage change of sales is measured as the change in sales between a year and its previous year divided by the sales in the previous year (in alignment with Bakucs et al., 2009; Bloom, Bond & Van Reenen, 2007; Guariglia, 2008; Kadapakkam et al., 1998; Konings et al., 2003; Scellato, 2007 and Vermeulen, 2002).

Investment opportunities = Percentage change in sales (12)

3.2.4.2 Industry

Another variable which proved to be an influential factor in the relation between internal finance and investment is the industry where the firms operate in. Various studies include the industry effects as a control variable (such as Brown, Fazzari, & Petersen, 2009; Clearly et al., 2007; Guariglia, 2008; Hoshi et al., 1991; Lyandres, 2007; Richardson, 2006 and Shin & Park, 1999). It is plausible that internal finance is positively correlated with the value of growth opportunities. According to Lyandres (2007), the ICFS would be nonzero even in the absence of financial constraints in the presence of such correlation. The strength of the relation between internal finance and the investment opportunies may vary across industries. It can lead to a biased conclusion when the industry is not taking into account. Thus, this control variable is included in order to control for variation across industries in capital intensity and growth during the sample period (Minton & Schrand, 1999). The relationship between the orginials variables is recomputed separately for each of the subsamples. The initial tables can be compared with the tables were the control variables are taking into account. The latter tables are called the partial tables (Babbie, 2007).

A well-established system for classifying industries is the Standard Industrial Classification (SIC)[31]. This system uses a code in order to classify organizations into a group. This is in alignment with prior studies (Brown et al., 2009; Clearly et al., 2007; Guariglia, 2008). The SIC-codes are constructed to group organizations into a broader classification, whereas the largest distiction is made on the level of divisions. In total there are five division. [32] The industry is measured by the SIC-code of the division where the firm is operating in .

Industry = Division where the firm operate classified by the SIC-code (13)

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[31] Dutch denomination is Standaard Bedrijfsindeling (SBI).
[32] Source: www.kvk.nl

3.2.5 Overview variables

In table 1 is an overview of all the variables used in this research included with the definitions of the variables.

Variable	Definition
1. Investment (I)	Change in tangible fixed assets between periods t and $t-1$ plus depreciation
2. Cash flow (CF)	Net income before extraordinary items plus depreciation
3. Firm size$_1$ (S_1)	Natural logarithm of book assets
4. Firm size$_2$ (S_2)	Natural logarithm of sales
5. Firm age (Age)	Number of years in activity
6. SA-index$_1$ (SA_1)	Level of a firm's financial constraints = $-0{,}737S_1 + 0{,}043\ S_1^2 - 0{,}040A$
7. SA-index$_2$ (SA_2)	Level of a firm's financial constraints = $-0{,}737S_2 + 0{,}043\ S_2^2 - 0{,}040A$
8. Capital stock (K)	Tangible fixed assets in the beginning of the t
9. Investment opportunities ($\%\Delta S$)	Change in sales between periods t and $t-1$ in percentages of $t-1$
10. Industry (SIC)	Division where the firm operate classified by the SIC-code

Table 1: Overview variables and definitions.

3.3 Empirical research model

The research model can be transformed in the empirical research model used for both research methods. Based on the research model and the operationalization of the variables the empirical model used in this research is:

$$\left(\frac{I}{K}\right)_{it} = \beta_i + \beta_1 \left(\frac{I}{K}\right)_{i,t-1} + \beta_2 \left(\frac{\%\Delta S}{K}\right)_{i,t} + \beta_3 \left(\frac{CF}{K}\right)_{i,t} + \epsilon_{it} \tag{14}$$

The subscript *i* describe to the *i-th* organization and subscript *t* refers to the *t-th* period.[33] The 2SLS method use instrumental variables in order to cope with endogenous regressors. Lagged values of current period regressors are used as instrumental variables. The sensitivity of investments to cash flow is reflected by coefficient β_3 in this model.

3.4 Research sample

The empirical research on the relation between internal finance and investment is performed based on secondary research strategy. This desk research contains that data is collected for some kind of other purpose and someone other than the user[34] (Saunders, Lewis, Thornhill, Booij, & Verckens, 2011). The main advantage of this method is the simple accessibility to large amount of data. The variables internal finance and investment can be derived from annual reports publish by the companies. These annual reports are scientifically sufficient reliable since that the reports are tested and audited (Verhoeven, 2007). Moreover, secondary data is substantially used in previous studies which aimed at the ICFS (such as Bakucs et al., 2009; D'Espallier & Guariglia, 2012; Fazzari et al., 1988; Kaplan & Zingales, 1997; Konings et al., 2003). This research aims to correspond as closely as possible to the methods used preceding research. Consequently, the validity of the hypotheses, which are used in multiple conceptual models, can be judged.

This research is using the database 'Reach' from ´Bureau from Dijk' containing annual reports of various organizations. In this database is information included from 3,6 million Dutch companies, as well as 800.000 annual reports. 'Bureau from Dijk' is one of the largest publishers in the world of business information. All the data is derived from the annual reports of the organizations.[35] In alignment with prior studies (such as D'Espallier & Guariglia, 2012; Fazzari et al., 1988; 2000; Firth et al., 2012; George et al., 2011 and Kaplan & Zingales, 1997; 2000) this study is longitudinal, since it is focused at understanding a causal process that occurs over time. The sample period covers the period 2009-2012. Compared with Cleary et al. (2007) and Guariglia (2008), the firms in the data sample operate in a broad range of industrial sectors, which are agriculture & mining, manufacturing, wholesale- & retail trade, transportation & public utilizes and services. Sectors with less than 5 observations are excluded in the sample. Identical with prior studies, utility companies (SIC-code starting with 43XX, 48XX and 49XX) financial companies (SIC-code starting with 6XXX) and public administration companies (SIC-code starting with 9XXX) are excluded in the sample in order to increase the comparability with previous research.

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[33] The other operationalization can be found in paragraph 3.2.5.
[34] Except the original user.
[35] Source: www.bvdinfo.com

The unit of analyses in this research is small and medium-sized enterprises. There are however a number of definitions of SMEs, coming from different sources like governmental institutions, SME agencies or European commission. The definitions of SMEs are used to limit the firms that should be included in policy reports. These are offered by national governments or regions which collaborate, such as the EU in Europe. The definitions are defined using one or a combination of the following criteria (Sendorvitz, 2009):

- Number of full-time employees
- Amount of total assets in the firm
- Amount of yearly sales

Table 2 shows the definitions of consecutively the European commission, the small business administration (SBA) from the United States (US) and the Australian bureau of statistics. The commission of the European Union and the Australian bureau of statistics use both definitions that are the same for all industries. Contrary, the SBA definition in the US defines small firms depending on which type of industry they belong (Sendorvitz, 2009).

European commission	Small business administration, United States	Australian bureau of statistics
Definition of SMEs: - Micro firms: up to 10 full-time employees *and* an annual turnover or balance sheet of max. € 2 million. - Small firms: up to 50 full-time employees and an annual turnover or balance sheet of max. € 10 million. - Medium-sized firms: up to 250 full-time employees and an annual turnover of max. € 50 million or balance sheet of max. € 43 million.	Definition of small firms: - Manufacturing firms: max. 500 employees. - Wholesale trade firms: max. 100 employees. - Agriculture: max. $ 750.000 in average annual receipts. - Retail trade and most service firms: max. $ 6.5 million in average annual receipts. - General and heavy construction (except dredging): average annual receipts of max. $ 31 million.	Definition of SMEs: - Micro firms: less than 5 employees. - Small firms: between 5-19 employees. - Medium-sized firms: between 20-200 employees. - Large firms: more than 200 employees.

Table 2: Official definition of small and medium-sized enterprises (Sendorvitz, 2009, p. 985).

The definition of the European commission is used in this research, since the sample exist of Dutch firms. The focus of the definition is on the number of employees, since that is the distinction between the definition of the European commission, the small business administration and the Australian bureau of statistics. The annual turnover and the balance sheets are only taking into account with their maximum in order to increase the sample size (D'Espallier & Guariglia, 2012). The micro firms, with employees in the range from zero till ten, are excluded in the sample due to the lack of quality of information reported by such firms (Silva & Carreira, 2010). The criteria of the

definition of the EU is used in order to filter the data. In according with Guariglia (2008) and Silva & Carreira (2010), companies without complete records[36] are disregarded in the sample due to time limitation. This research is focused on Dutch SMEs, since the Dutch economy is an established market and there is a lack of empirical evidence on the ICFS of SMEs in established markets. Moreover, the SMEs in Netherland are responsible from 50% of the gross value added and 99% of the companies are SMEs (EIM, 2011).

Outliers in the data could lead to outcomes which are biased. In order to control for these potential influence of outliers, Cleary (1999) and George et al. (2011) applied certain rules. These rules exist of winsorizing data above (under) a maximum (minimum). An example of one of the rules is: assign a value of 5 (-5) if cash flow / capital ratio is greater (lower) than 5 (-5). Another possibility to control for the potential influence of outliers is to excluded the observations in the 2% tails of each continuous variables. These cut-offs are used for preventing biased outcomes. According to Bhagat, Moyen & Suh (2005), this is a standard procedure on financial constraints (among others Bond et al., 2003; Cummings et al., 2006; D'Espallier & Guariglia, 2012; Guariglia, 2008). Moreover, it enhance the comparability with previous work. However, this research winsorize the first, second, 99th and 100th percentiles for the reason that otherwise too much information is lost. This method is identical with Denis & Sibilkov (2010) and Firth et al. (2012). Moreover, observations with sales growth exceeding (-) 100% are excluded to avoid distortions arising from mergers and acquisitions (Almeida et al., 2004 and Clearly et al., 2007).

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[36]See paragraph 3.2.5 for all the variables.

4. RESULTS

This chapter contains the empirical results of this study. First, by using the descriptive statistics of the variables and based on the hypotheses, the variables are discussed. The variables were tested to reveal any relationship by performing the Pearson Correlation Analysis. In order to test the causality and to determine the nature of the relation between internal finance and investment a regression model is performed. The results of the regression analysis are used to test the hypotheses. Finally, the results are checked for robustness and multicollinearity.

4.1 Descriptive analysis

The final dataset consists of an unbalanced panel of 269 unique firms and 531 firm-year observations. The division of agriculture & mining is excluded, since there were only 4 firm-year observations. Table 3 provides an overview of the amount of firm-year observations per division.

Division	Frequency
Manufacturing	95
Wholesale- & retail trade	281
Transportation	81
Services	74
Total	**531**

Table 3: Frequency table per division.

All proportions are comparable with the proportion of all the Dutch SMEs (EIM, 2011).

The descriptive statistics of the variables used in this study are presented in table 4. The variable which indicates the division of the firms is excluded in this table, since it does not add value to the descriptive analysis.

Variable	Minimum	Q1	Median	Q3	Maximum	Mean	St. dev
$\left(\dfrac{I}{K}\right)$	0,0047	0,0787	0,2148	0,5535	9,8481	0,8162	1,8636
$\left(\dfrac{I}{K}\right)_{t-1}$	0,0095	0,0930	0,2514	0,6149	9,3506	0,7817	1,6933
$\left(\dfrac{\%\Delta S}{K}\right)$	-86,0067	-0,7917	-0,0001	0,5430	45,1938	-1,7008	18,2472
$\left(\dfrac{CF}{K}\right)$	-8,3363	0,1537	0,5819	1,8747	19,4603	2,0294	5,0867
(Age)	4	16	25	38	330	34,14	31,019
S_1	22	5.207,58	9.807,21	20.916,86	91.810,00	14.429,37	12.800,389
S_2	189	11.200,36	20.366,85	37.916,07	115.919,00	24.699,52	16.794,598

Table 4: Overview descriptive statistics all variables of the full sample(531 firm-year observations of 269 unique firms).The subscript i describe to the i-th organization and subscript t refers to the t-th period, were t = 2009-2012. I represents the firm's investment expressed in Euro's; K, the tangible fixed assets expressed in Euro's; %ΔS is change in sales in a percentage; CF, its cash flow expressed in Euro's; Age is expressed in years since incorporation; S₁, its size measured by the book assets expressed in Euro's and S₂, its size measured by the sales expressed in Euro's.

There are a number of notable aspects of the descriptive statistics from the full sample. First, the median investment (I/K) variable of 21,48% is comparable with other researchers. Chen & Chen (2012) reports a median investment (I/K) variable between 15% and 23%, Cleary et al. (2007) found 21% for all their balanced observations and Fazzari & Petersen (1993) reports a median variable of 16,1%. Degryse & De Jong (2006) also studied firms in the Netherlands and they report a median variable of 16,1%. The mean investment (I/K) variable of 81,62% is rather high compared with other studies. Cleary (2006) reports a mean variable of 44% for the sub sample of France and Bassetto & Kalatzis (2011) reports for a sample with Brazilian firms a variable of 44,2%. However, focusing on sample which consist of SMEs, Bechetti et al. (2009) showed a mean variable between 66% and 507% and D'Espallier & Guargilia (2012) showed a mean variable of 18,07% for a sample with Belgian SMEs.

Second, the difference between the size measured by the total book assets (S_1) and by total sales (S_2). The differences between the descriptive statics are negligible, especially when the use of these variables is considered. The natural logarithm is used, and hence, the differences between the two variables are decreasing.

Third notable aspect is that the change in sales-to-capital ratio shows a large range, the minimum is more than five standard deviations from the mean and the maximum approximately three standard deviations.

Since this research is focused on the difference between financial constrained and unconstrained SMEs the full sample is divided with the use of tertiles based on the SA_1-index. The SA_2-index is used to improve the robustness of this research. All the groups contain 177 firm-year observations. The descriptive statistics for the three sub-samples are presented in table 5.

Variable	Unconstrained			Neither			Constrained		
	Median	Mean	St. dev	Median	Mean	St. dev	Median	Mean	St. dev
$\left(\dfrac{I}{K}\right)$	0,1355	0,4261	1,0618	0,2359	0,9258	1,9926	0,2585	1,0969	2,2621
$\left(\dfrac{I}{K}\right)_{t-1}$	0,1787	0,3425	0,5085	0,2847	0,8445	1,7227	0,3004	1,1581	2,2510
$\left(\dfrac{\%\Delta S}{K}\right)$	-,0001	0,2999	16,101	-0,0001	-3,173	19,159	-0,0001	-2,229	19,2309
$\left(\dfrac{CF}{K}\right)$	0,5688	1,5973	3,6891	0,6334	2,2308	5,5618	0,5912	2,2601	5,57526
(Age)	49,0	63,56	38,473	25,0	25,63	3,798	13,0	13,22	4,384
S_1	11.799	16.762	13.254	9.556	13.608	12.314	8.323	12.916	12.555
S_2	23.567	26.772	14.176	18.685	23.995	18.173	17.373	23.380	17.657
Obser-vations	177			177			177		
Number of firms	115			114			112		

Table 5: Overview descriptive statistics all variables of the sub-samples (per subsample 177 firm-year observations).The subscript i describe to the i-th organization and subscript t refers to the t-th period, were t = 2009-2012. I represents the firm's investment expressed in Euro's; K, the tangible fixed assets expressed in Euro's; %ΔS is change in sales in a percentage; CF, its cash flow expressed in Euro's; Age is expressed in years since incorporation; S$_1$, its size measured by the book assets expressed in Euro's and S$_2$, its size measured by the sales expressed in Euro's.

The full sample is divided into three equally sized groups based on the SA_1-index. This index is constructed by Hadlock & Pierce (2010). Various other researchers discussed also the importance of size and age (among others Hughes, 1994; Lopez-Gracia & Aybar-Arias, 2000; Schiantarelli, 1995). The older (younger) and larger (smaller) SMEs are likely to be less (more) financial constrained. Older and larger SMEs should be in the unconstrained group, whereas the young and smaller SMEs should be in the constrained group. This is supported by the data in table 4.

Table 4 shows an interesting pattern that the mean investments decrease with the level of financial constraint. This is in alignment with the theory, since smaller and younger firms relatively invest more than their larger and older counterparts (Bassetto & Kalatzis, 2011; D'Espallier & Guariglia, 2012; Silva & Carreira, 2010). Moreover, the investment opportunities (captured by the sales growth in percentage over tangible fixed assets) is positive for the unconstrained sub-sample and negative for the constrained groups. This indicates that larger / older SMEs tend to have more investment opportunities than smaller / younger SMEs. This is also in alignment with the theory (Bassetto & Kalatzis, 2011; D'Espallier & Guariglia, 2012; Silva & Carreira, 2010).

The cash flow variable of unconstrained SMEs is different compared with both the neither group and the constrained SMEs. Silva & Carreira (2010) showed the same pattern, although their presented a lower variable. The comparability with that research is high, since their sample exist also of SMEs and they use the SA-index as well.

4.2 Correlation analysis

The correlations and its significance levels among the variables are presented in table 5. The model used to measure the association of the ratio variables is the Pearson's product-moment correlation coefficient. This model is used in various studies such as D'Espallier & Guariglia (2012), Firth et al. (2012) and Silva & Carreira (2010).

The two measures of financial constraints are highly positive correlated at a significance level of 1%. This indicates that these two variables are also interchangeable. However, they are not perfect correlated and therefore the second measure of financial constraints (SA_2) is used as a check for robustness.

If above correlation is disregarded, the highest significant association is between investment (over tangible fixed assets) and investment a year earlier (over tangible fixed assets). The Pearson correlation is 0,677. Moreover, the investments and the prior investments have approximately the same associations with other variables. However, the association between the investment and the measure of financial constraints (SA_1) is insignificant at a level of 5%, compared with a significant correlation of the prior investments and the measure of financial constraints.

Further, the correlation between cash flow (over capital stock) and both investments variables (over capital stock) are moderate positive significant correlated, even after controlling for the industry. This entails that, comparable with other studies such as Firth et al. (2012), Guariglia (2008) and Silva & Carreira (2010), that internal finance is postively associated with investments. Hence, hypothesis 1 of this research find support in this sample through the use of Pearson correlation cefficients. This association does not reveal the determiniation of the relationship.

Variables	$\left(\dfrac{I}{K}\right)$	$\left(\dfrac{I}{K}\right)_{t-1}$	$\left(\dfrac{\Delta S}{K}\right)$	$\left(\dfrac{CF}{K}\right)$	SA_1	SA_2
$\left(\dfrac{I}{K}\right)$	1					
$\left(\dfrac{I}{K}\right)_{t-1}$	0,677**	1				
$\left(\dfrac{\Delta S}{K}\right)$	-0,171**	-0,217**	1			
$\left(\dfrac{CF}{K}\right)$	0,219**	0,190**	0,027	1		
SA_1	0,028	0,137**	-0,041	0,063	1	
SA_2	0,028	0,140**	-0,037	0,070	0,996**	1

** = Correlation is significant at 0,05 level (2-tailed)

Table 6: Pearson's product-moment correlation coefficient full sample. Variables defined as in table 1.

The difference in the correlation coefficient after controlling for the industry, based on the SIC-code of the firms, are negligible. The table with the correlation coefficient after controlling for the industry are presented in appendix 1. The causality between the variables is disregarded with this method. The correlation coefficient do not reveal the determination of the nature of the relation between internal finance and investment.

4.3 Regression analysis

In order to test the causality and to determine the nature of the relation between internal finance and investment a regression analysis should be performed. Subsequently, the hypotheses can be tested. First, the results of the regression analysis of the overall sample are discussed in order to test the investment-cash flow sensitivity. Since the focus of the research is on the difference between levels of financial constraints, the second part of this chapter exist of a discussion of the regression results of the sub-samples. Finally, the results are checked for robustness and multicollinearity.

In order to execute a multiple linear regression analysis it is imperative that the population error term is normal distributed (De Veaux et al., 2008). According to Hays (1994) this assumption can be easily ignored if the sample is larger than 30 elements. There are several other options to check of the variables are normal distributed. The first one is to assess the skewness, the kurtosis and the histogram of the variables. The data does not meet the nearly normal condition based on this check. However, according to De Veaux et al. (2008), this condition matters most when sample sizes are small. The central limit theorem can be implied by samples which are larger than 40 and which are simply random sampled. This assumption is met in this research and thus can be assumed that the data is nearly normal. The theory is based on that the sampling distribution of any mean becomes more nearly normal as the sample size grows (De Veaux et al., 2008, p. 446).

4.3.1 Regression result overall sample

In order to estimate the sensitivity of investment to cash flow a regression analysis is performed of the full sample. There are two different regressions models used for this estimation, the Ordinary Least Squares (OLS) method and the Two-Stages Least Squares (2SLS) method. The results of both regression methods are in table 7. Table 7 exist of the estimations and the significance level of that estimation is between brackets.

The model reports a positive and significant investment-cash flow sensitivity based on the OLS regression method. Although, this sensitivity is rather low (3,5%). Except the comparability with Guariglia (2008), Chen & Chen (2012) and Denis & Sibilkov (2010) who respectively discovered an ICFS of 3,8%, 5,0% and 7,1%. Most other researchers found a higher ICFS, such as Degryse & De Jong (2006), George et al. (2011) and Hadlock (1998) who respectively discovered an ICFS of 18,5%, 14,3% and 18,7%.

Dependent variables $\left(\frac{I}{K}\right)$	OLS regression	2SLS regression
$(\textbf{Constant})$	0,178 (0,009)	0,075 (0,359)
$\left(\frac{I}{K}\right)_{t-1}$	0,718 (0,000**)	1,012 (0,000**)
$\left(\frac{\Delta S}{K}\right)$	-0,003 (0,329)	-0,011 (0,581)
$\left(\frac{CF}{K}\right)$	0,035 (0,003**)	-0,034 (0,145)
Industry dummy	Yes	Yes
Observations	531	531
R^2	0,468	0,377

** = Correlation is significant at 0,05 level

Table 7: Results of the OLS and the 2SLS regression of the full sample (531 firm-year observations of 269 unique firms).The subscript i describe to the i-th organization and subscript t refers to the t-th period, were t = 2009-2012. The dependent variable is the investment-to-capital ratio (I/K) of a firm. I represents the firm's investment expressed in Euro's; K, the tangible fixed assets expressed in Euro's; %ΔS is change in sales in a percentage; CF, its cash flow expressed in Euro's; Age is expressed in years since incorporation; S_1, its size measured by the book assets expressed in Euro's and S_2, its size measured by the sales expressed in Euro's.

The estimation of this research indicates that Dutch SMEs, on average, increase their investments in 3,5 cents for each euro of extra cash flow. This indicates on a positive relation between internal cash flow and investments. Hence, hypothesis 1 is supported in this sample. In order to increase the robustness of this research the OLS regression is also made per division. All of these divisions showed a positive significant ICFS except the division manufacturing[37] (see appendix 2 for exact values). This indicates that the results of the divisions are comparable with the results of the full sample.

Based on the 2SLS method investment and cash flow have a negative relationship (-3,4%). Nevertheless, this value is insignificant. And hence, hypothesis 1 is not supported using this method. This could be as a result that the OLS method is only consistent when the regressors are exogenous. It is expected that the regressors are endogenous (Bond et al., 2003; D'Espallier & Guariglia, 2012; Erickson & Whited, 2000). The 2SLS method uses lagged variables in order to prevent the possibility of endogenous independent variables. This is probably also the underlying reason of the difference in the explanatory power of both models. This is depicted by R^2 (Koop, 2005) and is respectively 46,8% and 37,7% for the OLS and the 2SLS method. Lastly, it is notable that the prior investments have a significant relationship with the investments.[38] This is in alignment with prior literature (Chen & Chen, 2012; D'Espallier & Guariglia, 2012; Silva & Carreira, 2010).

4.3.2 Regression results sub-samples

The focus of this research is on differences of the investment-cash flow sensitivity between groups with different levels of financial constraints. The full sample is divided into three mutually exclusive groups using the SA-index. Firms are classified by the outcome of this index, whereas the top is financially constrained and the bottom as financially unconstrained. The group in the middle is neither constrained nor unconstrained. In table 8 are the results of the different groups and from both regressions models. Table 8 exist of the estimations and the significance level of that estimation is between brackets.

Table 8 shows that SMEs that are neither constrained nor unconstrained is the only group which does have a significant investment-cash flow sensitivity, based on the OLS regression. On the contrary, the unconstrained and the constrained SMEs do not show a positive and significant ICFS. These results do not support hypothesis 2, financially constrained SMEs have a stronger investment-cash flow sensitivity compared with financially unconstrained SMEs. The investments of financially constrained firms should be influenced by the amount of internal finance. This influence should be absent for unconstrained firms. However, the investments of the middle group are influenced by the internal finance and the other groups did not show a significant ICFS. These results could be an indication that the investment cash-flow sensitivity is U-shaped, suggested by Cleary et al. (2007), Guariglia (2008), Hadlock & Pierce (2010) and Hovakimian (2009).

The results of the 2SLS regression are all insignificant, except the prior investments. The hypothesis is not supported with the use of this method. This is comparable with the regressions results of the full sample and probably caused by the same reason, the endogeneity of the regressors.

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[37] This group did not showed a significant investment-cash flow sensitivity.
[38] When the control variable industry is taking into account this is also the fact in 65% of the industries.

Dependent variable $\left(\frac{I}{K}\right)$	OLS regression			2SLS regression		
Independent variables	*Unconstrained*	*Neither*	*Constrained*	*Unconstrained*	*Neither*	*Constrained*
(Constant)	0,190 **(0,043**)**	0,101 (0,380)	0,323 **(0,024**)**	0,151 (0,638)	0,021 (0,865)	0,386 (0,247)
$\left(\frac{I}{K}\right)_{t-1}$	0,552 **(0,001**)**	0,706 **(0,000**)**	0,712 **(0,000**)**	0,701 (0,517)	0,778 **(0,000**)**	0,711 **(0,033**)**
$\left(\frac{\Delta S}{K}\right)$	-0,009 (0,067)	0,002 (0,729)	-0,003 (0,687)	-0,010 (0,828)	0,013 (0,479)	-0,119 (0,308)
$\left(\frac{CF}{K}\right)$	0,031 (0,152)	0,105 **(0,000**)**	-0,025 (0,241)	0,024 (0,656)	0,129 (0,008)	-0,167 (0,012)
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	177	177	177	177	177	177
R^2	0,114	0,562	0,506	0,052	0,522	0,253

** = Correlation is significant at 0,05 level

Table 8: Results of the OLS and the 2SLS regression of the sub-samples (total of 531 firm-year observations of 269 unique firms).The subscript i describe to the i-th organization and subscript t refers to the t-th period, were t = 2009-2012. The dependent variable is the investment-to-capital ratio (I/K) of a firm. I represents the firm's investment expressed in Euro's; K, the tangible fixed assets expressed in Euro's; %ΔS is change in sales in a percentage; CF, its cash flow expressed in Euro's; Age is expressed in years since incorporation; S_1, its size measured by the book assets expressed in Euro's and S_2, its size measured by the sales expressed in Euro's.

4.3.3 Robustness check

In this research the natural logarithm of book assets (S_1) is used in constructing the SA_1-index. In order to improve the robustness level of the results, firm size is also measured as the natural logarithm of sales (S_2), used in constructing the SA_2-index. These indexes are highly correlated with each other (0,996). As a result of the different measure of financial constraints, the groups differ slightly from one another. The descriptive statistics hardly diverge from each other. The same applies for the regression results. The results of the OLS regression are comparable, all of the variables which are significant with the SA_1-index are also significant with the SA_2-index. This also applies for the 2SLS regression, except for the neither group where the ICFS is significant. Besides, the explanatory power of this group is deviating between both of the indexes. However, no major differences between both measures of financial constraints exist. Hence, the results of the data analyses are robust.

4.3.4 Multicollinearity

The presence of multicollinearity is checked with the use of the Variance Inflation Factor (VIF). Variance Inflation Factor (VIF) provides a reasonable and intuitive indication of the effects of multicollinearity on the variance of the regression coefficient (O'Brien, 2007). A VIF-value of approximately 5 indicates on multicollinearity, which could lead to biased results. In this research there is no multicollinearity, since the VIF values are around 1 (see appendix 3 for the exact values). A VIF-value of approximately 1 indicates that the dependent variables are not correlation with one another. This entails that the results are not biased.

5. CONCLUSION

The focus of empirical literature on the relation between investment and internal finance is on the influence of financial constraints. However, literature is ambiguous whether this influence has a positive or a negative effect on the relationship. Studies comparable with Fazzari et al. (1988; 2000) conclude that investment-cash flow sensitivity for financially constrained firms is higher compared to lower financially constrained firms. However, studies comparable with Kaplan & Zingales (1997; 2000), conclude the contrary, lower constrained firms displayed a higher sensitivity of cash flow to investment than higher constrained firms. Clearly et al. (2007) combines the results of these studies and proved that the ICFS is U-shaped.

In this paper the influence of financial constraints on the ICFS is studied for a sample of Dutch SMEs, while controlling for industry influences. The data sample exists of SMEs, given that most prior literature focused on large listed companies. Most measures of investment opportunities are based on market information. Therefore, a suitable measure of investment opportunities is identified first, since prior literature is ambiguous for an appropriate measure for firms without market information (Silva & Carreira, 2012). Subsequently, the sample is split according to their level of financial constraints into three mutually exclusive groups. The groups are divided by using the SA-index into financial constrained, financial unconstrained or neither of both. This index is used since older / larger firms are expected to be less financial constrained than younger / smaller firms (Carreira & Silva, 2010; Hughes, 1994; Lopez-Gracia & Aybar-Arias, 2000).

In order to answer the question if financial constraints influence the ICFS, the associations between the independent and dependent variables are calculated first. The strength of these relations is calculated using the Pearson Correlation Coefficient. The correlation between cash flow and investment is moderate positive significant correlated, even after controlling for the industry. This entails that, comparable with other studies such as Firth et al. (2012), Guariglia (2008) and Silva & Carreira (2010), that internal finance is postively associated with investments. In order to test the determination of the nature of the relation between internal finance and investment a regression analyse is performed. This data analyse provide Dutch evidence showing that internal finance is postively related with investment. The focus of this research is however on the influence of financial constraints on this relationship. It was expected that financial constrained firms had a stronger ICFS compared with financially unconstrained firms. The results of the data do not support this expectation. Both the constrained and the financially unconstrained firms did not show a signifiacnt ICFS. This could be an indication that the ICFS is non-monotonic, suggested by among others Guariglia (2008), Hadlock & Pierce (2010) and Hovakimian (2009).

Cleary et al. (2007) started to investigate the non-monotonic relationship between investment and cash flow. In their research they show that this relationship is U-shaped due to the interaction between the cost and revenue effect of investment. According to them, investment increases if internal funds are also large. However, when the internal funds are low, investments starts to increase as internal funds decrease further.

They argued that this non-monotonic behavior of investment is caused by a trade-off between two effects. These effects are (1) the risk of default and liquidation and (2) the need to generate revenue to repay debt. Assuming that higher levels of investment involves higher repayments costs, and hence, a higher risk of default, there is a positive relation between investment and cash flow. On the contrary, when internal funds is low, the company need funds to repay their debt. As a result, the company invests in order to generate revenue to repay their debt. Hence, there is a positive relation between investment and cash flow.

In interpreting the results from the data analysis hypothesis 1 is accepted. The results of the analyses show that nor financial unconstrained firms nor financial constrained firms have a positive ICFS, and hence, hypothesis 2 is not accepted.

Consequently, this study finds evidence that internal finance influence the investments for Dutch SMEs during the period 2009-2012. This conclusion is robust for different measures for sizes and controlled for investment opportunities and industries. The influence of financial constraints on this relationship is not proved.

6. DISCUSSION

The conclusion is that internal finance and investment are related to each other. A notable remark on this conclusion is that it is based on results of the Ordinary Least Squares regression method. This method is only consistent when the regressors are exogenous and it could be that the regressors are endogenous (Bond et al., 2003; D'Espallier & Guariglia, 2012; Erickson & Whited, 2000). The Two-Stages Least Squares model is also used in this research, and this method uses lagged variables in order to prevent the possibility of endogenous independent variables. However, this method did not find any significant results. Thus, it can be questioned if the conclusion are internal valid.

Moreover, the internal validity can also be questioned since difficulties with the quantifying of the unobservable variable financial constraints. Researchers still devote their time in finding a method to measure financial constraints (Silva & Carreira, 2010). In this research the level of financial constraints is measured using the SA-index. The index should correspond to the economic reality in order to be a correct measure for financial constraints (Hadlock & Pierce, 2010). The parameters used in this index calculation appear to be extremely sensitive to different economic realities (Silva & Carreira, 2010). If this non-linear regression does not have a good fit, the *omitted variable bias* can occur.

Further, the conclusion of this research is limited in the generalizability. First, the sample consists exclusively of small and medium-sized enterprises. This sample is restricted, but deliberately chosen since most studies focused on large listed companies. Second, generalization problems could occur due to country differences (Kadapakkam et al., 1998), since the costs of external finance is different in less developed countries and well developed countries. As a result of both these limitations, the external validity of this research restricted and as a consequence, the results can be less useful.

Nevertheless, one can still argue that Dutch SMEs have positive investment-cash flow sensitivity during the period 2009-2012. Therefore this research contributes to the existing literature focused on the investment-cash flow sensitivity by adding new results on the Dutch economy, which is an established market. However, the influence of financial constraints on this relationship is not proved. This conclusion is in alignment with prior studies such as Cleary et al. (2007), Guariglia (2008), Hadlock & Pierce (2010) and Hovakimian (2009). They proved that the ICFS is non-monotonic.

Future research should aim at whether similar results can be found for different countries, characterized by different degrees of financial development. Besides, in order to cope with the limitations of this study, future research could compare results from Dutch listed and unlisted companies. Moreover, researchers should focus on developing more consistent measures of financial constraints since researchers have difficulties with the quantifying of this unobservable variable. The question of whether a firm is financial constrained remains therefore a controversial question. Lastly and probably most important is the question what the influence of financial constraints on the ICFS is. This question will undoubtedly generate future research.

BIBLIOGRAPHY

Abel, A. (1980). Emperical investment equations: An integrative framework. *Journal of monetary economics, 12*(6), 39-91.

Acharya, V., Almeida, H., & Campello, M. (2007). Is cash negative debt? A hedging perspective on corporate financial policies. *Journal of financial intermediation, 16*, 515-554.

Ağca, S., & Mozumdar, A. (2008). The impact of capital market imperfections on investment-cash flow sensitivity. *Journal of banking & finance, 32*, 207 - 216.

Allayannis, G., & Mozumdar, A. (2004). The impact of negative cash flow and influential observations on investment-cash flow sensitivity estimates. *Journal of banking & finance, 28*, 901 - 930.

Almeida, H., & Campello, M. (2007). Financial constraints, asset taingibility, and corporate investment. *The review of financial studies, 20*(5), 1429-1460.

Almeida, H., Campello, M., & Weisbach, M. (2011). Corporate financial and investment policies when future financing is not frictionless. *Journal of corporate finance, 17*, 675-693.

Almeida, H., Campello, M., & Wiesbach, M. (2004). The cash flow sensitivity of cash. *Journal of finance, 59*(4), 1777-1804.

Alti, A. (2003). How sensitive is investment to cash flow when financing is frictionless? *Journal of finance, 58*, 707 - 722.

Angelopoulou, E. (2005). The comparative performance of Q-type and dynamic models of firm investment: Emperical evidence from the UK. *Working paper, 27*.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of economic studies, 58*, 277-297.

Ascioglu, A., Shantaram, P., & McDermott, J. (2008). Information asymmetry and investment-cash flow sensitivity. *Journal of banking & finance, 32*, 1036 - 1048.

Audretsch, D., & Elston, J. (2002). Does firm size matter? Evidence on the impact of liquidity constraints on firm investment behavior in Germany. *International journey of industrial organiation, 20*, 1-17.

Babbie, E. (2007). *The practice of social research* (10th ed.). Belmont: Thomson - Wadsworth.

Baker, M., Stein, J., & Wurgler, J. (2003). When does the market matter? Stock prices and the investment of equity-dependent firms. *The quarterly journal of economics, 118*(3), 969-1005.

Bakucs, L., Ferto, I., & Fogarasi, J. (2009). Investment and financial constraints in Hungarian agriculture. *Economics letters, 104*, 122 - 124.

Bassetto, C., & Kalatzis, A. (2011). Financial distress, financial constraint and investment decision: Evidence from Brazil. *Economic modelling, 28*, 264 - 271.

Bates, T., Kahle, K., & Stulz, R. (2009). Why do U.S. firms hold so much more cash than they used to? *The journal of finance, 64*, 1985-2021.

Becchetti, L., & Trovato, G. (2002). The determinants of growth for small and medium-sized firms: the role of the availability of external finance. *Small business economics, 19*(4), 291-306.

Becchetti, L., Castelli, A., & Hasan, I. (2009). Investment-cash flow sensitivities, credit rationing and financing constraints in small and medium-sized firms. *Small business economics, 1*(31).

Beck, T., & Demirguc-Kunt, A. (2006). Small and medium-sized enterprises: access to finance as a growth constraint. *Journal of banking and finance, 30*, 2931 - 2943.

Beck, T., Demirguc-Kunt, A., & Maksimovic, V. (2008). Financing patterns around the world: Are small firms different? *Journal of financial economics, 89*(3), 467-487.

Benito, A. (2005). Financial pressure, monetary policy effects and investories: Firm-level evidence from a market-based and a bank-based financial system. *Economica, 72*, 201 - 224.

Bernanke, B., Gertler, M., & Gilchrist, S. (1996). The financial accelerator and the flight to quality. *The review of economics and statistics, 78*, 1-15.

Berry, W., & Feldman, S. (1985). *Multiple regession in practice.* London: Sage publications.

Bester, H., & Hellwig, M. (1987). Moral hazard and equilibrium credit rationing: An overview of the issues. *Heidelberg: Springer*, 135-167.

Bhaduri, S. (2008). Investment and capital market imperfections: some evidence from a developing economy, India. *Review of pacific basin financial markets and policies, 11*(3), 411-428.

Bhagat, S., Moyen, N., & Suh, I. (2005). Investment and internal funds of distressed firms. *Journal of corporate finance, 11*, 449-472.

Bloom, N., Bond, S., & Van Reenen, J. (2007). Uncertainty and investment dynamics. *The review of economics studies, 74*(2), 391-415.

Bond, S., & Cummins, J. (2001). Noise share prices and the Q model of investment. *Working paper, 01/22*, Institute of fiscal studies.

Bond, S., & Van Reenen, J. (2007). Microeconometric models of investment and employment. *Handbook of econometrics, 6*, 4417-4498.

Bond, S., Elston, J., Mairesse, J., & Mulkay, B. (2003). Financial factors and the investment in Belgium, France, Germany and the United Kingdom: a comparison using company panel data. *Review of economics and statistics, 85*, 153-165.

Bond, S., Harhof, D., & Van Reenen, J. (1999). Investment, R&D and financial constratins in Britain and Germany. *Institute for fiscal studies discussion paper, 99*(5).

Bond, S., Klemm, A., Newton-Smith, R., Syed, M., & Vlieghe, G. (2004). The roles of expected profitability, Tobin's Q and cash flow in econometric models of company investment. *Working paper, 04/12*, Institute for fiscal studies.

Brennan, M., & Subrahmanyam, A. (1996). Market microstructure and asset pricing: On the compensation for illiquidity in stock returns. *Journal of financial economics, 41*, 441 - 464.

Brown, J., Fazzari, S., & Petersen, B. (2009). Financing innovation and growth: Cash flow, external equity, and the 1990's R&D boom. *Journal of finance, 64*(1), 151-185.

Budina, N., Garretsen, H., & De Jong, E. (2000). Liquidity constraints and investment in transition economies: the case of Bulgaria. *Economics of transition, 8*(2), 453-475.

Campello, M., Giambona, E., Graham, J., & Harvey, C. (2010a). Liqduidity management and corporate investment during a financial crisis. *Working paper*, University of Illinois at Urbana Champpaign, Duke university, university of Amsterdam.

Campello, M., Graham, J., & Harvey, C. (2010b). The real effects of financial constraints: Evidence from a finanial crisis. *Journal of financial Economics, 97*, 470 - 487.

Carpenter, R., & Guariglia, A. (2008). Cash flow, investment and investment opportunities: new tests using UK panel data. *Journal of banking and finance, 32*, 1894-1906.

Carpenter, R., & Petersen, B. (2002a). Is the growth of small firms constrained by internal finance? *Review of economics and statistics, 84*, 298 - 309.

Carpenter, R., & Petersen, B. (2002b). Capital market imperfections, high-tech investment, and new equity financing. *Economic journal, 112*, F54 - F72.

Carpenter, R., Fazzari, S., & Petersen, B. (1994). Inventory (dis)investment, internal finance fluctuations, and the business cylce. *Brookings papers in economic actvity, 2*, 75 - 122.

Carreira, C., & Silva, F. (2010). No deep pockets: Some stylized empirical results on firms' financial constraints. *Journal of economics surveys, 24*(4), 731-753.

Chang, X., Tan, T., Wong, G., & Zhang, H. (2007). The effects of financial constraints on corporate policies in Australia. *Accounting and finance, 47*, 85 - 108.

Chen, H., & Chen, S. (2012). Investment-cash flow sensititity cannot be a good measure of financial constraints: Evidence from the time series. *Journal of financial economics, 103*, 393-410.

Chow, C., & Fung, M. (2000). Small businesses and liquidity constraints in financing business investment: Evidence from Shanghai's manufacturing sector. *Journal of business venturing, 15*(4), 363-383.

Chrinko, R. (1993). Business fixed investment spending: modeling strategies, emperical results, and policy implications. *American economic association, 31*(4), 1875-1911.

Claessens, S., & Tzioumis, K. (2006). Measruing firms' acess to finance. *World bank and brooking conference paper*.

Clearly, S., Povel, P., & Raith, M. (2007). The U-shaped investment curve: Theory and evidence. *Journal of financial and quantitiative analysis, 42*, 1-40.

Cleary, S. (1999). The relationship between firm investment and financial status. *Journal of finance, 54*(2), 673 - 692.

Cleary, S. (2006). International corporate investment and the relationships between financial constraint measures. *Journal of banking & finance, 30*, 1559-1580.

Coad, A. (2010). Neoclassical vs evolutionary theories of financial constraints: Critique and prospectus. *Structural change and economics dynamics, 21*, 206 - 218.

Cummings, J., Hasset, K., & Oliner, S. (2006). Investment behvior, observable expectations and internal funds. *American economic review, 96*, 796-810.

De Haan, L., & Hinloopen, J. (2003). Preference hierarchies for internal finance, bank loans, bond, and share issues: evidence from Dutch firms. *Journal of empirical finance, 10*, 661-681.

De Veaux, R., Velleman, P., & Bock, D. (2008). *Stats - Data and models.* New York: Pearson.

Degryse, H., & De Jong, A. (2006). Investment and internal finance: Asymmetric information or managerial discretion? *International journal of industrial organization, 24*, 125-147.

Denis, D. (2011). Financial flexiblity and corporate liquidity. *Journal of corporate finance, 17*, 667-674.

Denis, D., & Sibilkov, V. (2010). Financial constraints, investment, and the value of cash holdings. *Review of financial studies, 23*(1), 247 - 269.

D'Espallier, B., & Guariglia, A. (2012). Does investment opportunities bias affect the investment-cash flow sensitivities of unlisted SMEs? *The European journal of finance, 1*(25).

D'Espallier, B., Huybrechts, J., & Schoubben, F. (2013). Why do firms save cash from cash flows? Evidence from firm-level estimation of cash-cash flow sensitivities. *Accounting & finance*.

Devereux, M., & Schiantarelli, F. (1990). Investment, financial factors, and cash flow: evidence from U.K. panel data. Asymmetric information, corporate finance, and investment. *National bureau of economic research*, 279 - 306.

Duchin, R., Ozbas, O., & Sensoy, B. (2010). Costly external finance, corporate investment, and the subprime mortgage credit crisis. *Journal of financial economics, 97*, 418 - 435.

Easley, D., & O'Hara, M. (2004). Information and the cost of capital. *Journal of finance, 59*, 1553 - 1583.

Egeln, J., Licht, G., & Steil, F. (1997). Firm foundations and the role of financial constratins. *Small business economics, 9*(2), 137-150.

EIM. (2011). *Kerngegevens MKB.* Zoetermeer: Ondernemerschap.nl.

Erickson, T., & Whited, T. (2000). Measurement error and the relationship between investment and q. *Journal of political economy, 19*(4), 1027 - 1057.

Fama, E. (1980). Ageny problems and the theory of the firm. *Journal of political economy, 88*(2), 288-307.

Fazzari, S., & Petersen, B. (1993). Working capital and fixed investment: new evidence on financing contstraints. *RAND journal of economics, 24*(3), 328 - 342.

Fazzari, S., Hubbard, R., & Petersen, B. (1988). Financing constraints and corporate investment. *Brooking papers on economic activity, 1*, 141 - 195.

Fazzari, S., Hubbard, R., & Petersen, B. (2000). Investment-cash flow sensitivities are useful: A comment on Kaplan and Zingles. *Quarterly journal of economics, 115*, 695 - 705.

Firth, M., Malatesta, P., Xin, Q., & Xu, L. (2012). Corporate investment, government control, and financing channels: Evidence from China's listed companies. *Journal of corporate finance, 18*, 433-450.

Francis, B., Hasan, I., Song, L., & Waisman, M. (2012). Corporate governance and investment-cash flow sensitivity: Evidence from emerging markets. *Emerging markets review*.

George, R., Kabir, R., & Qian, J. (2011). Investment-cash flow sensitivity and financing constraints: New evidence from Indian buiness group firms. *Journal of multinational financial management, 21*, 69 - 88.

Gilchirst, S., & Himmelberg, C. (1995). Evidence on the role cash flow for investment. *Journal of monetary economics, 36*, 541 - 572.

Gilchrist, S. (1990). An empirical analysis of corporate investment and financing hierarchies using firm level panel data. *Board of governors of federal reserve system*.

Gomes, J. (2001). Financing investment. *American economic review, 91*, 1263 - 1285.

Greenwald, B., Stiglitz, J., & Weiss, A. (1984). Informational imperfections on the capital market and macro-economic fluctuations. *Working paper*, Harvard business school, Princeton university, Columbia university.

Guariglia, A. (1999). The effects of financial constraints on inventory investment: Evidence from a panel of UK firms. *Economica, 66*, 43-62.

Guariglia, A. (2000). Inventory investment and capital market imperfections: A generalization of the linear quadratic inventory model. *Oxford bulletin of economics and statistics, 62*, 223-242.

Guariglia, A. (2008). Internal financial constratins, external financial constraints, and investment choice: Evidedence from a panel of UK firms. *Journal of banking & finance, 32*, 1795-1809.

Guariglia, A., Liu, X., & Song, L. (2011). Internal finance and growth: Microeconometric evidence on Chinese firms. *Journal of decelopment economics, 96*, 79 - 94.

Hadlock, C. (1998). Ownership, liquidity and investment. *The rand journal of economics, 29*(3), 487-508.

Hadlock, C., & Pierce, J. (2010). New evidence on measuring financial constraints: Moving beyond the KZ index. *Review of financial studies, 35*(5), 1909-1940.

Han, S., & Qiu, J. (2006). Corporate precautionary cash holdings. *Journal of corporate finance, 13*(1), 43-57.

Harada, N., & Honjo, Y. (2005). Does the creative business promotion law enhance SMEs' capital investment? Evidence from a panel dataset of unlisted SMEs in Japan. *Japan and the world economy, 17*, 395-406.

Hayashi, F. (1982). Tobin's marginal q and averga q: A neoclassical interpretation. *Econometrica, 50*(1), 213-224.

Hays, W. (1994). *Statistics - fourth edition.* London: Holt-Saunders.

Hennessy, C., & Whited, T. (2007). How costly is external financing? Evidence from a structural estimation. *The journal of finance, 62*(4), 1705-1745.

Hennessy, C., Levy, A., & Whited, T. (2006). Testing Q theory with financing frictions. *Journal of financial economics, 83*, 691-717.

Hillier, D., Ross, S., Westerfield, R., Jaffe, J., & Jordan, B. (2010). *Corporate Finance.* Berkshire UK: McGraw-Hill.

Honda, Y., & Suzuki, K. (2000). Estimation of the investment threshold of large Japanese manufacturers. *The Japanese economi review, 51*, 473-491.

Honjo, Y., & Harada, N. (2006). SME policy, financial structure and firm grwoth: evidence from Japan. *Small business economics, 27*(4), 289-300.

Hoshi, T., Kashyap, A., & Scharfstein, D. (1991). Corporate structure, liquidity, and investment: evidence from Japanese industrial groups. *Quarterly journal of economics, 106*, 33-60.

Hovakimian, A., & Hovakimian, G. (2009). Cash flow sensitivity of investment. *European financial management, 15*, 47-65.

Hovakimian, G. (2009). Determinants of investment cash flow sensitivity. *Financial management, 38*, 161-183.

Hovakimian, G., & Titman, S. (2006). Corporate investment with financial constraints: Sensitivity of investment to fund from voluntary asset sales. *Journal of money, credit and banking, 38*, 357-374.

Hubbard, R. (1998). Capital market imperfections and investment. *Journal of economic literature, 35*, 193 - 225.

Hughes, A. (1994). Finance for SMEs: a UK perspective. *Small business economics, 9*, 151 - 168.

Hyytinen, A., & Väänänen, L. (2006). Where do financial constraints originate from? An empirical analysis of adverse selection and moral hazard in capital markets. *Small business economics, 27*(4), 323-348.

Jensen, M. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review, 76*, 323-329.

Jensen, M., & Meckling, W. (1976). Theory of the firm: Managerial behavoir, agency costs and ownership structure. *Journal of financal economics, 3*, 305 - 360.

Jordan, B., Westerfield, R., & Ross, S. (2011). *Corporate finance essentials.* New York: McGraw-Hill/Irwin.

Kadapakkam, P., Kumar, P., & Riddick, L. (1998). The impact of cash flows and firm size on investment: The international evidence. *Journal of banking & finance, 22*, 293 - 320.

Kaplan, S., & Zingales, L. (1997). Do investment-cash flow sensitivities provideuseful measures of financing constraints? *Quarterly journal of economics*, 707-712.

Kaplan, S., & Zingales, L. (2000). Investment-cash flow sensitivities are not valid measures of financing constraints. *Quarterly journal of economics, 115*(2), 707 - 712.

Keynes, J. (1936). *The general theory of employment, interest and money.* London: McMillan.

Keynes, J. (2006). *General theory of employment, interest and money.* Atlantic books.

Khramov, V. (2012). Asymmetric effects of the financial crisis: Collateral-based investment-cash flow sensitivity analysis. *IMF working paper*.

Kim, C., Mauer, D., & Sherman, A. (1998). The determinants of corporate liquidity: theory and evidence. *Journal of financial and quantitative analysis, 33*, 335-359.

Konings, J., Rizov, M., & Vandenbussche, H. (2003). Investment and financial constraints in transition economies: micro evidence from Poland, the Czech Republic, Bulgaria and Romania. *Economics letters, 78*, 253 - 258.

Koop, G. (2005). *Analysis of economic data.* England: John Wiley & Sons Ltd.

Kutner, M., Nachtsheim, C., & Neter, J. (2004). *Applied lienar regression models* (4 ed.). Mc-Graw-Hill Irwin.

Lamont, O., Polk, C., & Saa-Requejo, J. (2001). Financial constraints and stock returns. *The review of financial studies, 14*(2), 529-554.

Lewellen, J., & Lewellen, K. (2009). Investment and cash flow: New evidence.

Lin, Y. (2007). The cash flow sensitivy of cash: Evidence from Taiwan. *Applied financial economics, 17*(12), 1013-1024.

Lins, K., Servaes, H., & Tufano, P. (2010). What drives corporate liquidity? An international survey of cash holdings and lines of credit. *Journal of financial economics, 98*, 160-176.

Lopez-Gracia, J., & Aybar-Arias, C. (2000). An emperical approach to the financing behavirou of small and medium-sized companies. *Small business economics, 14*, 55 - 63.

Lyandres, E. (2007). Costly external financing, investment timing, and investment-cash flow sensitivity. *Journal of corporate finance, 13*, 959-980.

Malmendier, U., & Tate, G. (2005). CEO overconfidence and corporate investment. *The journal of finance, 60*(6), 2661-2700.

Mason, C., & Perreault, W. (1991). Collinearity, power, and interpretation of multiple regression analysis. *Journal of marketing research, 28*(3), 268-280.

Megginson, W., Smart, S., & Gitman, L. (2006). *Corporate finance - second edition.* South-Western: Thomson.

Miller, M., & Orr, D. (1966). A model of the demand for money by firms. *Quarterly journal of economics*, 413-435.

Minton, B., & Schrand, C. (1999). The impact of cash flow volatility on discretionary investment and the costs of debt and equity financing. *Journal of financial economics, 54*, 423-460.

Modigliani, F., & Miller, M. (1958). The cost of capital, corporation finance, and the theory of investment. *American economic review, 48*, 261-297.

Moyen, N. (2004). Investment-cash flow sensitivites: Constrained versus unconstrained firms. *Journal of finance, 59*, 2061 - 2092.

Murphy, K. (1985). Corporate performance and managerial remuneration: an empirical analysis. *Journal of accounting and economics, 7*, 11-42.

Musso, P., & Schiavo, S. (2008). The impact of financial constraints on firm survival and growth. *Journal of evolutionary economics, 18*(2), 135-149.

Myers, S. (1984). Capital structure puzzle. *Journal of finance, 39*, 575 - 592.

Myers, S., & Majluf, N. (1984). Corporate financing and investment decisions when firms have information the investors do not have. *Working paper*, Sloan school of management, universidad catolica de Chile.

Nickell, S., & Nicolitsas, D. (1999). How does financial pressure affect firms? *European economic review, 43*, 1435 - 1456.

O'Brien, R. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity, 41*, 673-690.

OECD. (2012). *Financing SMEs and entreprenuers 2012: On OECD Scoreboard.* OECD Publishing.

Oliner, S., Rudebusch, G., & Sichel, D. (1995). New and old models of business investment: a comparison of forecasting performance. *Journal of money, credit and banking, 27*(3), 806-826.

Oliveira, B., & Fortunato, A. (2006). Firm growth and liquidity constraints: a dynamic analysis. *Small business economics, 27*(2), 139-156.

Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of financial economics, 52*, 3-46.

Ozkan, A., & Ozkan, N. (2004). Corporate cash holdings: an ermpiricial investigation of UK companies. *Journal of banking & finance, 28*, 2103-2134.

Pál, R., & Ferrando, A. (2009). Financing constraints and firms' cash policy in the Euro area. *The European journal of finance*.

Petersen, M., & Rajan, R. (1994). The benefits of lending relationships: Evidence from small business data. *Journal of finance, 49*(1), 3-37.

Pinkowitz, L., & Williamson, R. (2001). Bank power and cash holdings: evidence from Japan. *Review of financial studies, 14*, 1059-1082.

Quader, S. (2013). Corporate efficiency, financial constraints and the role of internal finance: a study of capital market imperfection.

Rauh, J. (2006). Investment an financing constrains: Evidence from the funding of corporate pension plans. *Journal of finance, 61*(1), 33 - 71.

Richardson, S. (2006). Over-investment of free cash flow. *Review of accounting studies, 11*, 159-189.

Riddick, L., & Whited, T. (2009). The corporate propensity to save. *Journal of finance, 64*, 1729-1766.

Saunders, M., Lewis, P., Thornhill, A., Booij, M., & Verckens, J. (2011). *Methoden en technieken van onderzoek.* Amsterdam: Pearson education Benelux.

Savignac, F. (2009). Impact of financial constraints on innovation: What can be learned from a direct measure? *Economics of innovation and new technology, 17*(6), 553-569.

Scellato, G. (2007). Patents, firm size and financial constraints: an empirical analysis for a panel of Itialian manufacturing firms. *Cambridge journal of economics, 31*(1).

Schiantarelli, F. (1995). Financial constraints and investment: Methodological issues and international evidence. *Oxford review of economic policy, 12*, 70 - 89.

Schroeder, L., Sjoquist, D., & Stephan, P. (1992). *Unsterstanding regression analyse.* Beverly Hills, CA: Sage publications.

Sendorvitz, M. (2009). How are SMEs defined in current research? *University of South Denmark*.

Shin, H., & Park, Y. (1999). Financing constraints and internal capital markets: evidence from Korean 'chaebols'. *Journal of corporate finance, 5*, 169-191.

Silva, F., & Carreira, C. (2010). Measuring firms' financial constraints: Evidence for Portugal through different approaches. *GEMF Working Paper, No. 15/2010*.

Silva, F., & Carreira, C. (2012). Measuring firms' financial constraints: A rough guide. *GEMF-Group for Monetary and Financial Studies, 14*, 1-33.

Stiglitz, J., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *American economic review, 71*, 393-410.

Stulz, R. (1990). Managerial discretion and optimal financing policies. *Journal of financial economics, 26*, 3-27.

Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of money, credit and banking, 1*, 15-29.

Van Ees, H., & Garretsen, H. (1994). Liquidity and business investment: evidence from Dutch panel data. *Journal of macroeconomics, 16*, 613-627.

Verbeek, M. (2004). *A guide to modern econometrics.* England: John Wiley & Sons Ltd.

Verhoeven, N. (2007). *Wat is Onderzoek? Praktijkboek methoden en technieken voor het hoger onderwijs.* Amsterdam: Boom Onderwijs.

Vermeulen, P. (2002). Business fixed investment: evidence of a financial accelerator in Europa. *Oxford bulletin of economics and statistitcs, 64*(3), 213-231.

Whited, T. (1992). Debt, liquidity constraints, and corporate investment: evidence from panel data. *Journal of finance, 47*(4), 1425-1460.

Whited, T. (1998). Why do investment Euler equaions fail? *Journal of business & economics statistics, 16*(4), 479-488.

Whited, T. (2006). External finance constraints and the intertemporal pattern of intermittent investment. *Journal of financial economics, 81*(3), 467-502.

Whited, T., & Wu, G. (2006). Financial constraints risk. *The review of financial studies, 19*(2), 531-559.

Yoshikawa, H. (1980). On the Q theory of investment. *American economic review, 70*, 739-743.

APPENDICES

Appendix 1: Correlation table (PMCC) controlled for industry

Variables	$\left(\dfrac{I}{K}\right)$	$\left(\dfrac{I}{K}\right)_{t-1}$	$\left(\dfrac{\Delta S}{K}\right)$	$\left(\dfrac{CF_1}{K}\right)$	SA_1	SA_2
$\left(\dfrac{I}{K}\right)$	1					
$\left(\dfrac{I}{K}\right)_{t-1}$	0,672**	1				
$\left(\dfrac{\Delta S}{K}\right)$	-0,166**	-0,213**	1			
$\left(\dfrac{CF}{K}\right)$	0,227**	0,197**	0,025	1		
SA_1	0,005	0,119	-0,034	0,072	1	
SA_2	0,006	0,123**	-0,030	0,078	0,996**	1

** = Correlation is significant at 0,05 level (2-tailed)

Appendix 2: OLS regression results controlled for industry

Division	Dependent variables $\left(\frac{I}{K}\right)$	OLS regression	Observations	R^2
Manufacturing	(Constant)	0,09 (0,277)	97	0,771
	$\left(\frac{I}{K}\right)_{t-1}$	0,880 **(0,000******)**		
	$\left(\frac{\Delta S}{K}\right)$	0,003 (0,596)		
	$\left(\frac{CF}{K}\right)$	-0,023 (0,150)		
Wholesale- & retail trade	(Constant)	0,247 **(0,004******)**	281	0,295
	$\left(\frac{I}{K}\right)_{t-1}$	0466 **(0,000******)**		
	$\left(\frac{\Delta S}{K}\right)$	-0,005 (0,227)		
	$\left(\frac{CF}{K}\right)$	0,066 **(0,000******)**		
Transportation	(Constant)	0,380 (0,069)	81	0,346
	$\left(\frac{I}{K}\right)_{t-1}$	-0,049 (0,747)		
	$\left(\frac{\Delta S}{K}\right)$	0,017 (0,247)		
	$\left(\frac{CF}{K}\right)$	0,294 **(0,000******)**		
Services	(Constant)	-0,003 (0,987)	74	0,846
	$\left(\frac{I}{K}\right)_{t-1}$	1,104 **(0,000******)**		
	$\left(\frac{\Delta S}{K}\right)$	0,012 (0,125)		
	$\left(\frac{CF}{K}\right)$	0,050 **(0,022******)**		

** = Correlation is significant at 0,05 level (2-tailed)

Appendix 3: Multicollinearity check – Variance inflation factor

Dependent variable: $\left(\frac{I}{K}\right)_{t-1}$	VIF
$\left(\frac{\Delta S}{K}\right)$	1,001
$\left(\frac{CF}{K}\right)$	1,001

Dependent variable: $\left(\frac{\Delta S}{K}\right)$	VIF
$\left(\frac{CF}{K}\right)$	1,037
$\left(\frac{I}{K}\right)_{t-1}$	1,037

Dependent variable: $\left(\frac{CF}{K}\right)$	VIF
$\left(\frac{I}{K}\right)_{t-1}$	1,049
$\left(\frac{\Delta S}{K}\right)$	1,049