Fixed investments:
The role of the credit crisis and working capital in the Netherlands

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Management summary

This study analyzes the impact of the credit crisis on fixed investment of 93 firms in the Netherlands. The emphasis lies on the role of working capital as mitigating or worsening factor during the credit crisis. Several striking results were found. First, contrary to U.S. research on fixed investments, Dutch companies did not reduce their level of fixed investments significantly during the credit crisis. Second, it demonstrates that working capital, specifically cash and receivables, plays a mitigating role in the effect of the credit crisis on fixed investments; in support of the precautionary motive (i.e. Fazzari & Petersen, 1993), high cash and receivables companies reduced investments significantly less than companies with low cash and receivables reserves. Short term debt does not play a role in mitigating or strengthening the effect of the credit crisis on fixed investments when accompanied by high levels of working capital.

Case studies reveal that all companies examined focused on reducing working capital during the crisis to increase free cash flow. The way in which cash is made available and how it is used depends on the effect of the credit crisis and the focus/goals of companies over this period. This research section led to the following propositions: Preserving stable levels of fixed investment is less of a priority for Dutch companies with growth ambitions based on external acquisitions than for those focused on internal growth. Furthermore, companies with high levels of interest bearing debt are hit harder by the credit crisis. Debt reductions, in order to prevent covenant breaches and refinancing during the credit crisis, are focused on at the expense of all other activities requiring finance i.e. fixed investments and working capital for operations. The effect of measures taken to reduce working capital is impacted by the company's position in the supply chain, the buyer/supplier power and the company's working capital investment strategy prior to the crisis.

Dutch management summary

Deze studie onderzoekt het effect van de kredietcrisis op vaste investeringen van 93 bedrijven binnen Nederland. The nadruk ligt op de rol van werkkapitaal als versterkend of verzwakkende factor op het effect van de kredietcrisis op investeringen. Hieruit volgen enkele opvallende resultaten.

Ten eerste blijkt, in tegenstelling tot onderzoek uit de Verenigde Staten, dat deze Nederlandse bedrijven hun vaste investeringen niet significant naar beneden hebben bijgesteld tijdens de kredietcrisis. Ten tweede laat het onderzoek zien dat werkkapitaal, specifiek het kasgeld en de debiteurenpost, de relatie tussen de kredietcrisis en vaste investeringen heeft verzwakt: bedrijven met hoge kasgelden en debiteurenposten reduceren hun vaste investeringen minder tijdens de crisis dan bedrijven met lage voorraden in werkkapitaal. Dit ondersteunt de 'precautionary motive' dat werkkapitaal gebruikt wordt als buffer in tijden waarin krediet moeilijk verkrijgbaar is. Korte termijn verplichtingen spelen geen significante rol in het versterken of verzwakken van vast investeringen van bedrijven tijdens de crisis, wanneer gepaard gaande met hoog werkkapitaal.

Case studies illustreren dat de onderzochte bedrijven gericht zijn op het reduceren van werkkapitaal in reactie op de kredietcrisis om kasstroom vrij te krijgen uit operaties. Hoe deze kasstromen vrijgemaakt worden en waarvoor ze gebruikt worden hangt af van het effect van de kredietcrisis op bedrijven en hun focus/doelstellingen. Dit leidt tot de volgende proposities:

Het behouden van stabiele vaste investeringen is een minder grote prioriteit voor Nederlandse bedrijven met een groei ambitie gericht op externe acquisities dan voor bedrijven die intern willen groeien. Daarnaast worden bedrijven met hoge rentedragende schuld harder geraakt door de kredietcrisis dan die met lage schulden. Om te voorkomen dat lening convenanten met banken worden verbroken, leidend tot herfinancieringmoeilijkheden, moeten deze bedrijven zich vol richten op schuldverlaging. Dit, ten koste van andere activiteiten die financiële middelen vergen zoals zowel vaste and werkkapitaal investeringen. Tenslotte wordt het effect van maatregelen van bedrijven om werkkapitaal te verlagen beïnvloed door de positie van het bedrijf in de toeleveringsketen, the macht van de leveranciers/kopers en het werkkapitaal investeringsstrategie voor de kredietcrisis.

Preface

With this report, a study period of five years comes to an end for me. I can still remember my introduction to the University: Arriving at the University grounds, surrounded by stalls and tents full showing all the activities the university offers. There was so much to do, various sports, committees, associations etc. I could not imagine time would fly so quickly…..and now five years later, while many new students are arriving for their introduction, I will end my time here. I feel like I learned more in the last few years than ever before and I am prepared to step into 'the real world' and show what I can do.

I would like to thank my family, friends, colleagues, supervisors and all cooperating companies for their unique contributions. My research outcomes would not have been of this standard without their criticism, cooperation and support during this creation process.

Nicolai, thank you for giving me the freedom to explore this subject and Orchard Finance Consultants for their expertise and many contacts, my parents mostly for their linguistic contribution and patience and time for checking my entire thesis more than once. A special thanks however goes to my University supervisor Henk Kroon for his uplifting criticism, his will to listen, his flexibility, and for creating a good working relationship/atmosphere. I would like to acknowledge Prof. Bilderbeek, my second supervisor, for his flexibility and time in such a short notice. Finally, I want to thank Bouke for listening to my enthusiastic stories, but for him mostly boring, and my complaints and frustrations over the last six months.

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1. Introduction

Dell'Ariccia et al. (2007) investigated the banking crises throughout the world between 1981 and 1997. Their results demonstrated that the problems in the banking have independent negative effects on the real economy. Over the long term healthy corporations can go bankrupt due to short term liquidity problems (Hull, 2007, p.469). Media publications state that during the credit crisis, banks in the Netherlands were reluctant to extend credit to each other as well as to non-financial companies in the concern that Dutch companies may have been affected by tight external finance (de Nederlandsche Bank, 2009; de Volkskrant, 2009; Z24, 2010)

Prior research finds that when external finance is tight, or available only at high costs, this may affect company investments (e.g., Fazzari, Hubbard, and Petersen, 1988; Hoshi, Kashyap, and Scharfstein, 1991; Fazzari & Petersen, 1993; Duchin, Ozbas, & Sensoy, 2009). Reduced fixed investments may have adverse long term effects on the company's performance. Blomstrom et al. (1996) provide evidence that increases in economic growth follow after increases in rates of capital investment. Chrinko (1993) even links insufficient business investment, due to periods of 'capital shortages' to a host of economic ills such as reduced long-run growth and high unemployment. Recent research by Jiang et al. (2006) confirms that capital expenditure is positively related to future corporate earnings (controlling for current corporate earnings). The investment effect on future earnings persists for up to five years, suggesting that firms foregoing profitable investment opportunities (due to financing difficulties) continually forfeit profits.

Consequently, the question is what companies can do to ensure sufficient funding of fixed investments? The precautionary motive suggests that holding liquidity may be useful as a buffer for times of negative cash flows to smooth long term investments (Fazzari & Petersen, 1993; Campello, Graham & Harvey, 2009). Recent research by Duchin et al. (2010) finds that financial liquidity has a value-enhancing impact on an investment during a time of crisis. Firms examined in their sample with large working capital reserves pre-crisis outperformed firms with low working capital reserves after the crisis while the difference in performance before the crisis was not notable.

Many papers focus on corporate cash holdings as a precautionary form of liquidity to firms (Almeido, Campello & Weisbach, 2004; van Aanholt, 2009). However, other forms of liquidity may be available. For instance Campello, Giambona, Harvey & Graham (2009) consider bank lines of credit as an additional form of liquidity during a financial crisis. The importance of non-cash working capital as a source of liquidity to fund fixed investment has also been

frequently investigated (Fazzari & Petersen, 1988, 1993; Duchin et al., 2010). Following the reasoning above, this study examines the central questions:

1. *What is the effect of the credit crisis on fixed investments and what role does working capital play in strengthening or mitigating this effect?*
2. *What are the conditions under which certain liquidity approaches impact fixed investments?*

The study encompasses annual data on Dutch companies between 2005 and 2009 as well as case study interview documentation on three companies in the industrial sector. This research enriches the available literature on this subject by examining the role of individual internal financial resources (cash, inventory, receivables and short term debt) on fixed investment as opposed to their summed effect as working capital. Another contribution of this research is the sample of Dutch companies (as opposed to U.S. companies in former research), the examination of various sectors and public and private companies. The final contribution of this study to research is the examination of non-quantifiable factors through case studies.

This research studies factors affecting fixed investment during the crisis. Two problems arise:

- As Almeida, Campello and Weisbenner(2009) argue, because this case of credit shortage originated from problems arising from non-corporate assets, it is unique. Therefore research on credit shortages in this specific context is scarce. Other theory on tight liquidity may not be applicable.
- The existing theory covers mainly financial quantifiable factors while less quantifiable, but therefore not less relevant factors, are overshadowed (Fazzari & Petersen, 1993; Almeido et al., 2004; Campello, Graham & Harvey, 2009; Duchin et al., 2010).

To solve these problems this research consists of two components. The first section is theory testing. Hypotheses based on former theory are derived and tested through quantitative methods, which deals with the financial factors affecting fixed investment. The second section is quantitative in nature and theory building. It gives the ability to examine non-quantitative factors through case studies. The theoretical framework and research methodology are divided along these lines; The first paragraph of each chapter deals with the quantitative research and the second with the quantitative factors. The results of each section are presented separately in respectively chapter 4 and 5 followed by a conclusion and discussion of the combined results in respectively chapter 6 and 7.

2. Theoretical framework

In the past few years reducing working capital has become an increasingly important issue to corporations. Price Waterhouse Coopers (2009) states in its 2009 European working capital study that" liquidity and cash have become scarce resources, difficult and, for some, impossible to obtain in today's economic climate. As a result, improving working capital management is back on top of the agenda of finance executives."

Working capital management is the administration of a firms current assets and the financing needed to support current assets (Horne & Wachowicz, 2004). It refers to the financing, investment and process control of current assets. The cash conversion cycle consists of the inventory, receivables and payables conversion period. The time between payment of creditors (suppliers) in procurement and billing/ cash collection from debtors (customers) in sales leads to a financing gap, which companies can fund by internal or external financial resources.

The precautionary motive to working capital suggests that cash and cash equivalents can function as buffer between investment needs and operating cash flows (Ferreira and Vilela, 2004). The transaction cost motive by Keynes (1936) states that transaction costs are related to external financing. These two motives are integrated in the trade-off theory (Ferreira and Vilela, 2004) which assumes that the optimal level of liquidity (working capital level) is a trade off between the cost of external finance and bankruptcy and the opportunity cost of investing the excess/ buffer level of working capital in projects yielding higher returns i.e. fixed investments.

2.1 Quantitative factors related to fixed investment and working capital

In this section hypotheses are developed. Paragraph 2.1.1 to 2.1.3 describe the theoretical underlying and derive the quantitative hypotheses of this research.

2.1.1 Credit crisis and fixed investments

Dell'Ariccia et al. (2007) investigated banking crises throughout the world between 1981 and 1997. Their results demonstrate that banking sector problems have independent negative effects on the real economy. Campello, Graham and Harvey (2009) assert that financially constrained firms plan deeper cuts in capital spending (fixed investments) during the crisis than unconstrained firms. Duchin et al. (2010) found that the 2007/2008 credit crisis, consisting of a negative shock to the supply of external finance to non-financial companies, led to a significant decline in fixed investments in the sample of U.S. companies. Based on these outcomes, hypothesis CC1 is stated:

Hypothesis CC1*: The credit crisis has a negative effect on company fixed investments.*

2.1.2 Working capital effects

Investments in fixed assets can be financed by external capital or operating cash flow (stored in various forms) and there is a trade-off between investments in current- and fixed investments (Brealy, Myers & Allen, 2006).

During a credit crisis acquiring external capital is costly if even possible. In order to sustain a certain level of fixed investments either operating cash flow must be increased (which the firm has little control over) or investments in current assets reduced. A reduction in current investments (without endangering daily operations) can only be achieved if a buffer is held up and above safety levels or if major efficiencies can be achieved to reduce the levels required.
Almeido Campello and Weisbach (2004) find that the change in cash holdings is negatively related to investment expenditure in financially constrained companies. Financially constrained companies are those with little or costly access to external finance. Those with high pre-crisis cash holdings will be able to reduce cash investments (even negative) which will lead to less negative (or even positive) changes in fixed investment. Working capital is not only a use but also a source of liquidity that can be used to smooth a company's investments relative to cash flow shocks if firms face financial constraints (Fazzari and Petersen, 1993). The extent to which working capital can contribute to fixed-investment "smoothing" depend on its initial stock of working capital. Following this reasoning, firms with high initial cash reserves will be more able to smooth investments in fixed assets.
Duchin et al. (2010) who actually studied this most recent financial crisis (with a sample of U.S. public firms) asserted that investments declined significantly for low cash firms after the crisis, somewhat less for medium cash firms and was essentially flat for high cash firms, further enforcing the hypothesis.

Hypothesis WC1*: The negative effect of the credit crisis on fixed investments is larger in companies with low than with high pre-crisis cash levels.*

In the same research by Fazzari and Petersen (1993) referred to above, they split the working capital into inventory and non-inventory components to find that both components contribute to fixed-investment smoothing. Working capital assets consist of a permanent and temporary component. For instance, inventory is rolled over but there is always a minimum level requirement which is permanent to continue operations. Firms that hold only the minimum level

of inventory (pre-crisis) will not be able to reduce inventory investments to smooth fixed investments and will therefore be forced to reduce fixed investment as stated below.

Hypothesis WC2: *The negative effect of the credit crisis on fixed investments is larger in companies with low than with high pre-crisis inventory levels.*

Receivables and its relationship to fixed investment is harder to conceive since its level is not entirely controlled by the company. Credit managers set terms for payments, however the actual levels depend on their supplier-buyer position. If the buyer has power (the firm is highly dependent on this buyer), the firm (supplier) may be forced to sell on credit in order to get the job. The companies in this dataset have a revenue larger than 500 million and therefore can be classified as large for the Netherlands. Porters competitive forces theory (1979) suggests that large companies have greater power in the supply chain, relative to their suppliers and thus these companies should have the power to reduce their receivables, in support of the hypothesis:

Hypothesis WC3: *The negative effect of the credit crisis on fixed investments is larger in companies with low than with high pre-crisis receivables.*

Almeido, Campello and Weisbenner (2009) examine the effect of long term debt maturity during the 2007 financial crisis and find evidence that long-term financial contracting has a sizeable effect on a company's real and financial policies when the firms face a credit supply shock. Firms whose long-term debt was largely maturing right after the third quarter of 2007 reduce investment by 2.5% more than otherwise similar firms whose debt matures well after the crisis (one-third of the pre-crisis level of investment for these firms). Fazzari and Petersen (1993) determined that net short term debt (all debt, short and long, maturing within 1 year) represents a looming reduction in liquidity in times when refinancing is difficult, whereas long-term debt (excluding those maturing) does not. Duchin et al. (2010) take net short term debt into account in their fixed investment model. Investment declined significantly for high short term debt firms, but insignificantly for medium and low short term debt firms during the crisis. Following this reasoning: firms which need to refinance their debt right after the start of the financial crisis will have greater difficulty and higher costs compared to firms with long term financing contracts.

Hypothesis WC4: *Companies with high net short term debt outstanding pre-crisis reduce fixed investments significantly more than firms with low net short term debt.*

2.1.3 Indirect working capital effects

Following the reasoning described above on the precautionary motive of working capital, companies with high short-term debt prior to the crisis may not reduce fixed investments if they at the same time have high working capital reserves, since these reserves can be used as buffer. In other words working capital may have a mitigating effect on the relationship between short term debt and fixed investment. Since all working capital components are hypothesized to have the same impact on the effect of the credit crisis on fixed investments (WC1 to 3) their indirect effects will be the same.

Hypothesis I1: *Pre-crisis cash levels mitigate the effect of pre-crisis short term debt levels on post-crisis fixed investments.*
Hypothesis I2: *Pre-crisis inventory levels mitigate the effect of pre-crisis short term debt levels on post-crisis fixed investments.*
Hypothesis I3: *Pre-crisis receivable levels mitigate the effect of pre-crisis short term debt levels on post-crisis fixed investments.*

2.1.4 Hypotheses and research question

Table 2.1 summarizes the hypotheses of this research. These are divided into three parts: 'Credit crisis and fixed investments', 'Working capital effects' and 'Indirect working capital effects' which were discussed in the section above. Together they answer the research question:

What is the effect of the credit crisis on fixed investments and
what role does working capital play in strengthening or mitigating this effect?

Table 2.1: Hypotheses of research derived to answer research question

Credit crisis and fixed investment
Hypothesis CC1: The credit crisis has a negative effect on company fixed investment

Working capital effects
Hypothesis WC1: The negative effect of the credit crisis on fixed investments is larger in companies with low than with high pre-crisis cash levels.
Hypothesis WC2: The negative effect of the credit crisis on fixed investments is larger in companies with low than with high pre-crisis inventory levels.
Hypothesis WC3: The negative effect of the credit crisis on fixed investments is larger in companies with low than with high pre-crisis receivables levels.
Hypothesis WC4: The negative effect of the credit crisis on fixed investments is larger in companies with high than with low pre-crisis short term debt levels.

Indirect Working capital effects
Hypothesis I1: Pre-crisis cash levels mitigate the effect of pre-crisis short term debt levels on post-crisis fixed investments.
Hypothesis I2: Pre-crisis inventory levels mitigate the effect of pre-crisis short term debt levels on post-crisis fixed investments.
Hypothesis I3: Pre-crisis receivables levels mitigate the effect of pre-crisis short term debt levels on post-crisis fixed investments.

2.2 Qualitative factors related to fixed investment and working capital

This paragraph highlights company specific factors that may play a role in a companies decisions on working capital and fixed investment to answer the research question:

What are the conditions under which certain liquidity approaches impact fixed investments?

It is divided in three aspects: strategy, internal and external workings of the company displayed in figure 2.1. Paragraph 2.2.1 contains theory on the intended strategy of the company in terms of investment, financing and the perceived effect of the credit crisis on the company. Paragraph 2.2.2 describes factors related to the internal workings of the company i.e. to the management of working capital while paragraph 2.2.3 relates to the interactions of the company with external parties such as financiers, suppliers and customers.

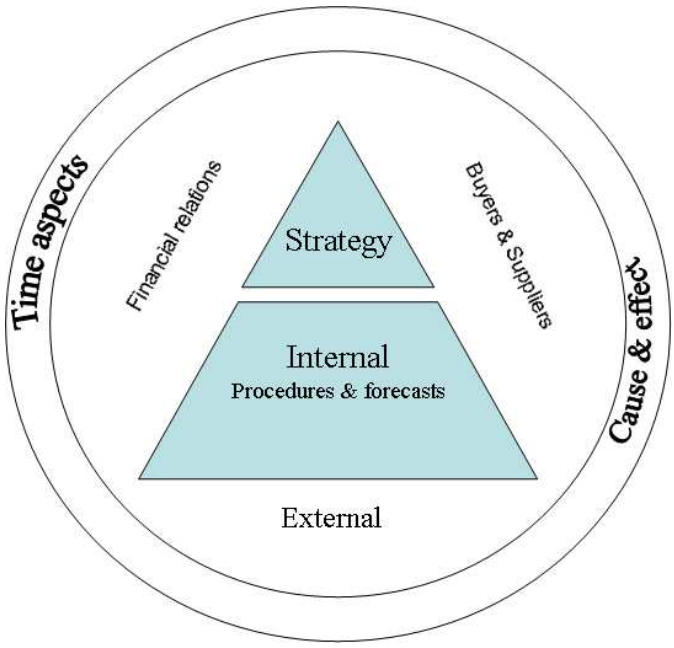


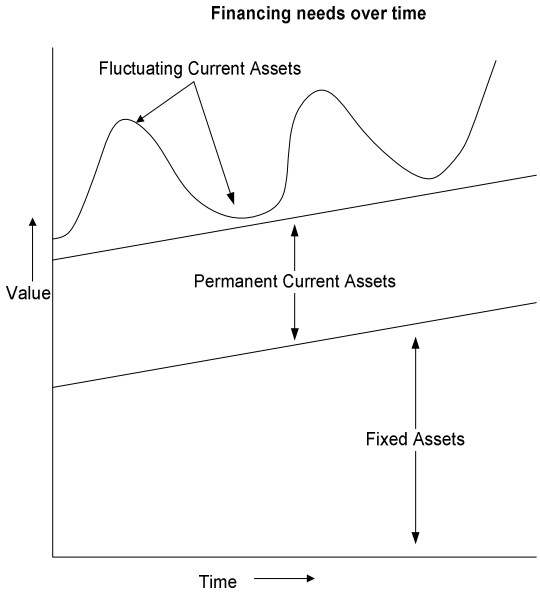
Figure 2.1: Strategy, internal management and external relations

Working capital assets consists of a permanent and temporary component. For instance, inventory is rolled over but there is always a minimum required level which is permanent to continue operations. Temporary current assets may be required due to 'fluctuating' influences. These occur due to seasonal changes in sales demand or as Fazzari and Petersen (1993, p. 340) give empirical

evidence for, working capital levels may vary pro-cyclically if firms smooth fixed investment relative to variations in profits proving a buffer motive.

2.2.1 Strategy

The question is whether working capital is used consciously or reactively by management. Alternative working capital investment strategies for firms are the conservative, aggressive and moderate approach (figure 2.2). The optimal level of working capital investment is a trade-off between the risks and returns associated. In a conservative approach, firms hold additional working capital (cash, receivables and inventory) beyond expected needs as a buffer which are associated to high holding cost and lost investment opportunities in higher return projects. Conversely, it reduced the risk of illiquidity and missed sales opportunities.



An aggressive approach to working capital investment adopts low levels of working capital which reduces the holding cost and increases the return on assets at the expense of increased risk of missed sales and liquidity problems (i.e. inability to settle short term obligations and reduced supply reliability).

Figure 2.2: Investment and financing strategies

With a conservative financing approach, all fixed and permanent current assets as well as a portion of (i.e. average) fluctuating current assets are funded with long-term debt instruments and equity. The aggressive approach finances only its fixed assets and part of its permanent current assets with long term instruments. The remainder of the permanent and fluctuating current assets are financed with short term instruments. Weinraub and Visscher (1998) examined the relationship between asset investment and financing policy and found a negative relationship; Industries pursuing relatively aggressive (conservative) asset policies followed relatively conservative (aggressive) financing policies.

2.2.2 Internal workings

Sales and costs and therefore profits do not necessarily coincide with their associated cash inflows and outflows. Cash receipts often lag cash payments. So even though profits are reported, the company may experience a short-term cash shortfall. For this reason it is essential to create forecasts. Sales-, inventory- and cash flow forecasts determine what working capital levels are required. The accuracy of forecasts depends on the availability and reliability of information. How often is management information produced? How often is it necessary? Clear procedures and systems ensure clear rules of conduct for employees involved in working capital processes. Cash management can be divided in receivables management, management of inventories and accounts payable (Brealy, Myers & Allen, 2006). The most important issue in receivables management is to know customers. Credit checks should be done on potential customers, average collection periods should be monitored and when necessary acted on (ageing schedule) and clear credit limits should be established and continually reviewed. The credit process consists of the terms of sales, the credit decision, and the collection policy. This policy relates to procedure of record keeping, billing, reminding and in some cases turning to collection agencies. This can be done in-house or outsourced to a factor who bears the collection risk at a fixed cost. Inventory management processes to take into account are reviews of security procedures, in sourcing versus outsourcing, monitoring and control of inventory age. The management of accounts payable is the management of suppliers. Ensure alternative sources of supply, negotiate discounts, credit terms and reduce dependence on a single supplier. The amount of inventories held depends on the Customer Order Decoupling Point (CODP). Firms that produce-to-order will require lower inventory levels than those that make-to-stock (Brealy, Myers & Allen, 2006).

2.2.3 External workings

Porter's (1979) competitive forces model deals with supplier and buyer bargaining power: the ability of customers or suppliers to pressure a company. The power of suppliers is high when there are few substitutes to the company, supplier competition is low, the value of purchases is low to the supplier and high to the buyer. A high degree of supplier power may leads suppliers to require quick payments, negotiate long delivery times and only deliver standard packaging and products. This could reduce accounts payable and increase precautionary inventory holdings.

Existing developed relationships with certain financers, such as banks, based on trust, understanding and experience may give companies an advantage during a credit crisis. Banks may be more willing to extend loans due to this relationship.

3. Research methodology and data

This research consists of two research methods. The first is quantitative and uses financial data of 93 companies to statistically test the hypotheses stated above and is theory testing. In the second part, case studies are conducted. Companies are selected and representatives interviewed. The case study section is theory building and highlights differences between cases where certain working capital management practices did and did not lead to reductions in fixed assets. It also functions as test of the outcomes of the statistical analysis. It tests whether the views of financial managers in practice coincide with those derived from the financials. Both research methodologies are described in respectively paragraph 3.1 and 3.2. Paragraph 3.3 explains the time frame chosen in this research and gives a overview of the trend in working capital and fixed investments between 2005 and 2009.

3.1 Quantitative method

3.1.1 Data

To test the hypotheses in chapter 2 a statistical model is developed. It consists of the dependent variable fixed investment (*FI*) and includes the independent (pre-crisis) working capital variables: cash reserves (*Cash*), inventory (*Inv.*), accounts receivables (*Rec*.) and short term debt (*SD*). Since the focus is on the effect of working capital, the model controls for the variables firm size (*Size*) and cash flow (*CF*), and includes a time dummy (*TD*) (whether it is pre or post crisis) and ownership dummy (PP) (whether the company is public or private). Table 3.1 presents the variable names, abbreviations, definitions, numbers of observations, and means/medians of the available data during 2005 to 2009, in which at least four out of the five years of data must be available per company. For the sample, the mean fixed investment is, for instance, 5.62% of book total assets, while the median is 4.56%.

The measure of fixed investment (*FI*) is calculated according to that of Duchin et.al (2010). Purely tangible fixed investments i.e. plant, production and equipment (PPE) (before depreciation) is used scales to book value of total assets. The working capital type variables consist of cash (*Cash*), inventory (*Inv.*), receivables (*Rec.*) and short term debt (*SD*). Cash is calculated as book cash & cash equivalents to book value of total assets, inventory as book inventory (Raw materials, work in progress(WIP) and finished goods(FG)) to book value of total assets, receivables as book receivables (tax and trade) to book total assets and short term debt as all current liabilities to book total assets.

Table 3.1: Descriptive statistics of variables between 2005 and 2009 and their measurement units

Name (abbreviation)	**Description** (* before depreciation)	**Statistics** (% of total assets, except Size)		
		Mean	**Median**	**Obs.***
Cash	Cash & equivalents/ total assets	8.22	5.13	93
Inv.	Inventory (Raw materials, WIP and FG)/ total assets	16.90	13.15	93
Rec.	Receivables (tax and trade)/ total assets	29.41	26.29	93
SD	Current liabilities/ total assets	51.94	40.23	93
CF	(EBIT+depreciation+amortization)/ total assets	11.418	10.71	93
Size	Total assets (Log)	13.83	13.56	93
FI	PPE/ total assets	5.62	4.56	93

*Obs=observations

The time dummy *TD* determines whether the variable measured is pre- (2005 to 2007) or post-crisis (2008 and 2009) valued respectively by 0 or 1 while the ownership dummy *PP* splits the sample companies into private (with value 0) and public (value 1).

Data for working capital and the controlling variables are collected from AMADEUS database (for a detailed overview see appendix B table 1) and data on the variable fixed investment from the companies' individual annual reports. The research examines various periods over a sample covering the years 2005-2009. The selection of this time-period is based on a relatively balanced pre- (2005-2007) and post-crisis period (2008-2009), where the credit crisis intervention occurred end 2007/ beginning 2008. Within this time period, the first criterion for company selection is information availability. Those for which a reasonable amount of data is available: annual data between 2005 and 2009 with only few items of missing data. The second selection step covers yearly turnover. Only those companies with a yearly turnover of above 500 million euro available (medium to large firms, for Dutch standards) are included since Orchard Finance Consultants (the principal for this research) focuses on this market segment. The third and final criterion is based on the number of companies per sector for which a minimum of ten is required to enter the sample. This resulted in a sample of 93 companies.

The choice of the sectors in the sample depends on the availability of firm data in Amadeus. Sectors with less than 10 firms (balanced/ equal per year) are excluded. Financial, utilities, government and service companies are excluded. The sector categorization is based on the sector primary section letter (A to Q) of the BIK codes stated by the Dutch chamber of commerce

(construction BIK=F, industrial BIK=D and commerce BIK=G). An alternative sector analysis is presented based on the fixed investment intensity and divided into two clusters; Companies with low fixed investment intensity (*FII*) (Lower sample median *FI* values) and the high *FII* companies (Higher sample median *FI* values). Table 3.2 presents the mean and median values of the variables per sector for both sector types (based on BIK code and on *FII*) and the dispersion of public/private and low/high FII companies over the BIK sectors. Construction has the highest mean cash (*Cash*) and receivables (*Rec.*) level of the three sectors. Industrial companies have the lowest average short term debt (*SD*) and the lowest fixed investments (*FI*) while commerce has the highest mean inventory (*Inv.*) and short term debt (*SD*) level. Low (high) fixed investment intensive (*FII*) companies have the highest (lowest) mean cash, inventory, receivables and short term debt level and additionally the lowest (highest) cash flow and mean size.

Table 3.2: Descriptive statistics per sector between 2005 and 2009 (as % of total assets)

Sector	**Cash**	**Inv.**	**Rec.**	**SD**	**CF**	**Size**	**FI**	**Obs.**	**Public**	**Low FII**
Construction	12.70	15.63	36.64	52.96	10.09	13.63	5.86	11	5 (6)	6 (5)
	[13.16]	[12.22]	[35.23]	[54.06]	[12.14]	[13.63]	[4.38]			
Industrial	8.24	16.79	24.30	36.90	11.73	14.36	4.78	41	9 (32)	23 (18)
	[5.13]	[16.14]	[25.57]	[35.35]	[11.34]	[14.15]	[4.60]			
Commerce	7.01	17.34	32.58	66.70	11.39	13.35	6.41	41	18 (23)	18 (23)
	[3.22]	[12.33]	[23.97]	[47.02]	[10.10]	[12.94]	[4.32]			
Low *FII*	10.05	18.55	32.84	62.30	9.46	13.76	2.67	47		
	[6.76]	[14.52]	[27.54]	[42.69]	[8.51]	[13.74]	[2.59]			
High *FII*	6.36	15.22	25.90	41.34	13.40	13.90	8.64	46		
	[3.49]	[12.60]	[23.71]	[39.18]	[12.67]	[13.40]	[6.13]			
Private	7.91	16.70	34.78	49.70	12.31	13.49	6.02	61		
	[4.84]	[13.11]	[31.13]	[46.36]	[11.74]	[13.04]	[4.40]			
Public	9.71	17.57	21.42	35.41	12.09	14.56	5.58	32		
	[4.10	[17.58]	[22.56]	[32.83]	[12.24]	[14.30]	[4.44]			

*Median values in parenthesis [ ] and private/ high FII in brackets ( )

The descriptive results show that the variable data is positively skewed. Parametric tests require the data distribution of the variables to correspond to the parameters of the normal distribution for valid results. Non-normality can be due outliers or the nature of the variables. There is a debate among scholars on the elimination of outliers from data to achieve normality (Orr, Sackett, and

DuBois, 1991; Osborne, 2002). An alternative is to transform the distribution. In this research eliminating outliers (detected in box plots) did not achieve normality. A square root transformation proved effective (shown by a Kolmogorov-Smirnov test).

3.1.2. Analyses

First, the descriptive statistics are computed. To test the change in fixed investments and working capital variables, *t*-tests are performed in SPSS. Additional analyses based on Pearson correlations and hierarchical multiple regression are conducted to get an idea of the sample relationships. Finally, the hypotheses are tested through a regression analysis of interaction effects. First, the main variables are entered in Step 1 of the regressions. In the regression analyses we controlled for the variables: *cash flow (CF)* and *Size*. We next entered the control effects in Step 2 and examined the significance of these independent variables on fixed investments.

In order to test the **Hypothesis CC1**, the effect of the credit crisis on fixed investments, a paired sample T-tests compare the mean fixed investment values pre- and post-crisis. Then independent sample T-tests are done to assess whether pre- and post-crisis fixed investments varied among working capital levels (cash, inventory, receivables and short term debt). Finally, an OLS regression shows the effect of the credit crisis, through the time dummy, controlling for company size and cash flow on fixed investments.

The second and third group of hypotheses, related to **Hypothesis WC 1 to WC3** and **Hypothesis I1 to I3**, analyse the role of the pre-crisis working capital on the effect of the credit-crisis on fixed investments. The interaction effects of the working capital components (cash, inventory, receivables and short term debt) and the credit crisis (time dummy) on fixed investments are tested through a regression analysis (as well as an analysis of variances (ANOVA)). To determine the direction of the interaction figures are created. Based on the beta-coefficient and corresponding p-value and the graph, the hypotheses can be evaluated. Further regression-tests assess whether these results hold controlling for firm size (total asset size) and cash flow. For those working capital variables for which a significant interaction effect is found additional tests are conducted to assess whether these working capital reserves were decreased significantly. Finally, additional robustness tests are conducted to address timing issues related to the credit crisis.

3.2 Qualitative method

3.2.1 Data

Company selection is based on company BIK codes, where only industrial sector companies are selected (=41 cases). In order to reduce differences between cases the ten cases with the highest fixed investment intensity (fixed investment/ total assets) are selected. These ten cases are then categorized based on a working capital (WC) and a fixed investment (delta FI) ranking. The company with the lowest (out of the ten cases) WC level is assigned the lowest rank (1) and that with the highest WC level the highest rank (10). The delta FI is based on the difference (reduction or increased) in fixed investment between 2008 and 2007, where the company with the lowest delta FI (even negative) is assigned the lowest rank (1) and that with the highest delta FI (positive) is assigned the highest rank (10).

This categorization is stated graphically in figure 3.1. Four out of ten companies increased fixed investments; one of these had above median working capital levels, one was the median and two were below. Of the companies which reduced fixed investments working capital levels were half above and half below the median.

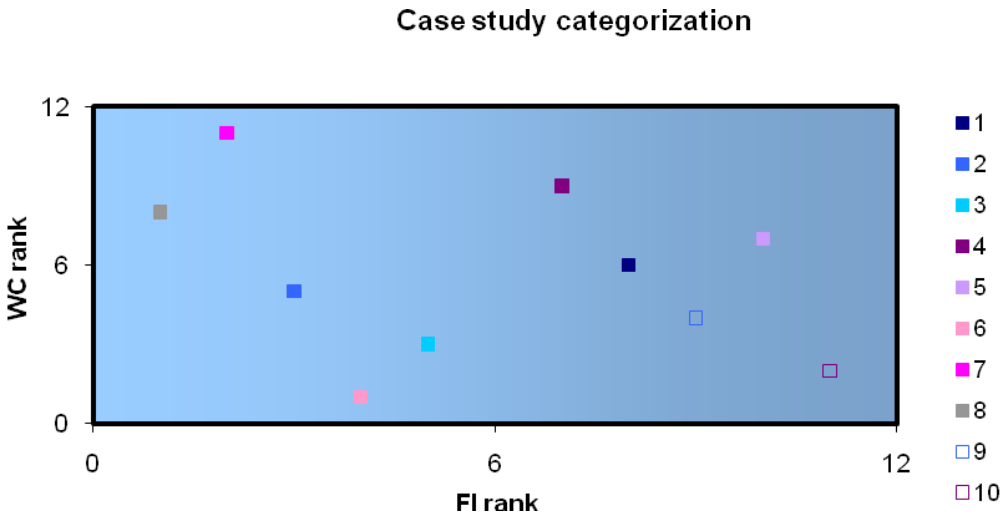


Figure 3.1: Case study categorization of ten industrial companies based on WC and FI rank

Interviews are conducted to collect additional data not readily available from annual reports or financials in the AMADEUS database (interview setup in appendix C). The interview questions are derived from the theory described in chapter 2.2 on qualitative factors affecting working capital and fixed investments.

3.2.2 Analyses

Since the trigger or intervention (the credit crisis) is behind us a retrospective approach is used. According to de Vaus (2001) when adopting a more inductive, theory building approach a sequential design is more appropriate than a parallel approach. There are two levels or case unit analyses making these embedded case studies. The levels are (1) company level financial documentation analysis and (2) the strategic management (CFO/ Group Treasurer) level. The research consists of multiple cases.

The research model in figure 3.2 describes the steps of conducting the research.

First, the theory developed throughout this research, which functions as basis for this research, is described in the theoretical framework. This theory consists of financial and additional non-financial information related to deeper liquidity processes and strategies. Second, cases are selected based on the financials and an approach to data collection is made. In the selection of cases it is important to choose information rich cases, in which the expected phenomenon is clearly present (Swanborn, 1996). The industry should consists of a number of cases that support and others that contradict the statement or phenomenon that "large liquidity reserves prior to the crisis mitigate the negative effect of the crisis on company investment and performance"

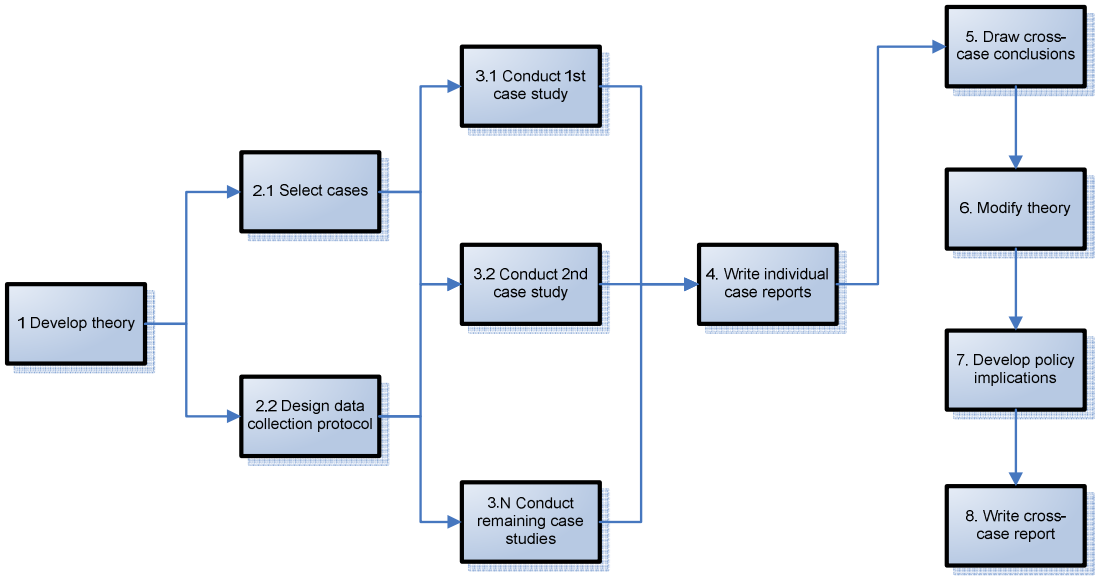


Figure 3.2: Research method for case study (as adapted from Yin, 2003)

At this point the case studies can be performed sequentially and reports drawn up. Once all case studies have been conducted, the cases must be analyzed structurally to create quality conclusions.

To assess whether the interviews are complete, a test interview is held prior to the start of the case studies. Based on the answers to this test interview, the interview is adapted/ questions

added until the two research questions above can be answered. Table 3.3 gives a schematic overview of the link between the interview questions (1 to 35), the theory described in the theoretical framework (strategic, internal or external) and which research question is answered (1. conditions of WC impact on FI or 2. maintenance of fixed investment level).

Table 3.3: Link between interview question, theory and research questions of case study

Interview questions	Theory	Answer research question
1-2	-	-
3-7	Strategy	Maintenance fixed investment level
8	Strategy	Conditions of WC impact on FI & Maintenance fixed investment level
9-10	External	Maintenance fixed investment level
11	Internal	Conditions of WC impact on FI
12-16	Internal/ external => Procurement process	Conditions of WC impact on FI
17-20	Internal/ External =>Sales process	Conditions of WC impact on FI
21-25	Internal/ external =>Inventory process	Conditions of WC impact on FI
26-30	Internal/ external => billing process	Conditions of WC impact on FI
31-35	Internal/ external => collection process	Conditions of WC impact on FI

The interview questions are not always asked in the specific order by which they were structured. In response to answers questions are brought forward or skipped at the discretion of the interviewer. Following the research model, cross case conclusions are drawn through a structured analysis. The analysis of the interviews is loosely based on the Grounded Theory approach of Strauss & Corbin (1998). This approach gives theoretical insight through a systematic data collection and stepwise analysis.

On each of the levels (company and strategic) the similarities and differences between the cases are examined based on the concepts (strategy, internal & external) and propositions developed that fit these cases (theory building). Then a second analysis is conducted to test the developed propositions. The same case is now compared to another case using the same framework as the first analysis. Based on this analysis the propositions are revised to fit all three cases.

To determine whether the statements made by respondents are placed in the correct categories, a second categorization is done by an independent party, separate from the researcher. Once the second analyzer has categorized all statements, these outcomes are compared to the initial researcher's outcomes. Where discrepancies were found, the researcher and second analyzer discussed the reasoning for the placement and adjusted them accordingly.

3.3 Time scope and trends

The exact moment of impact of the credit crisis is difficult to isolate. The credit crisis was expected to occur later in the Netherlands than in the United States. This research assumes the credit crisis occurred between 2007 and 2008. Also, it is almost impossible to determine how far the effects of the credit crisis reach. There are generally speaking two effects on company fixed investments due to the crisis. These are the supply and demand side effects. The supply side relates to those effects on company investments due to a shortage of credit from banks. The demand side on the other hand relates to a decreased demand for products from customers. In the section below the timing and effects are examined through the trends in the Netherlands.

The one-, three-, six- and twelve month EURIBOR rates all dropped from September 2008 (see appendix A figure 1) around the time of the fall of Lehmann Brothers. This point could be selected as credit crisis trigger in the Netherlands. The Dutch gross domestic product growth (Appendix A figure 2), reflecting the economic growth of a country by the amount of goods and services produced, decreased in the Netherlands from the third quarter of 2008 onwards and became 5% negative in 2009. This economic shrinkage indicates recession (occurrence of two of more successive quarters of decline in GDP). Company investments decreases started in the second quarter of 2008 while consumer spending only slowed down from the first quarter of 2009 (appendix A figure 3). This suggests that during 2008 the supply side effects played a role, while in 2009 the demand effects kicked in.

Figure 3.3 reveals the trend in the data (internal resources and funding); Receivables and short term debt decrease slightly between 2005 and 2009 with the larges decrease between 2007 and 2009. The average cash position has steadily but slowly increased, becoming practically flat after 2007. Inventories showed a small increase as of 2008 but was relatively flat during the rest of the period. Finally, fixed investments showed a miniscule decrease after 2008.

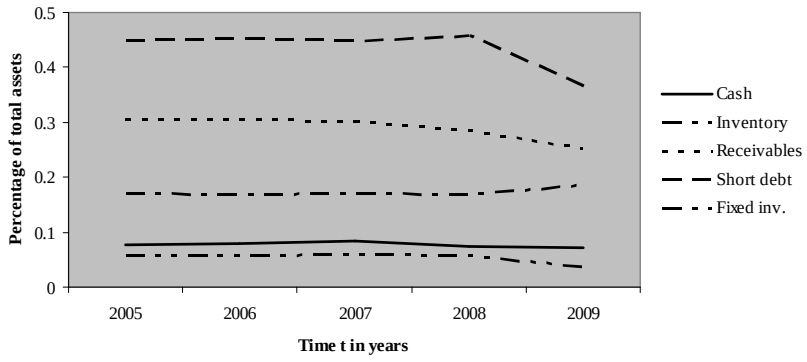


Figure 3.3: Overall trend in working capital variables and fixed investment between 2005 and 2009

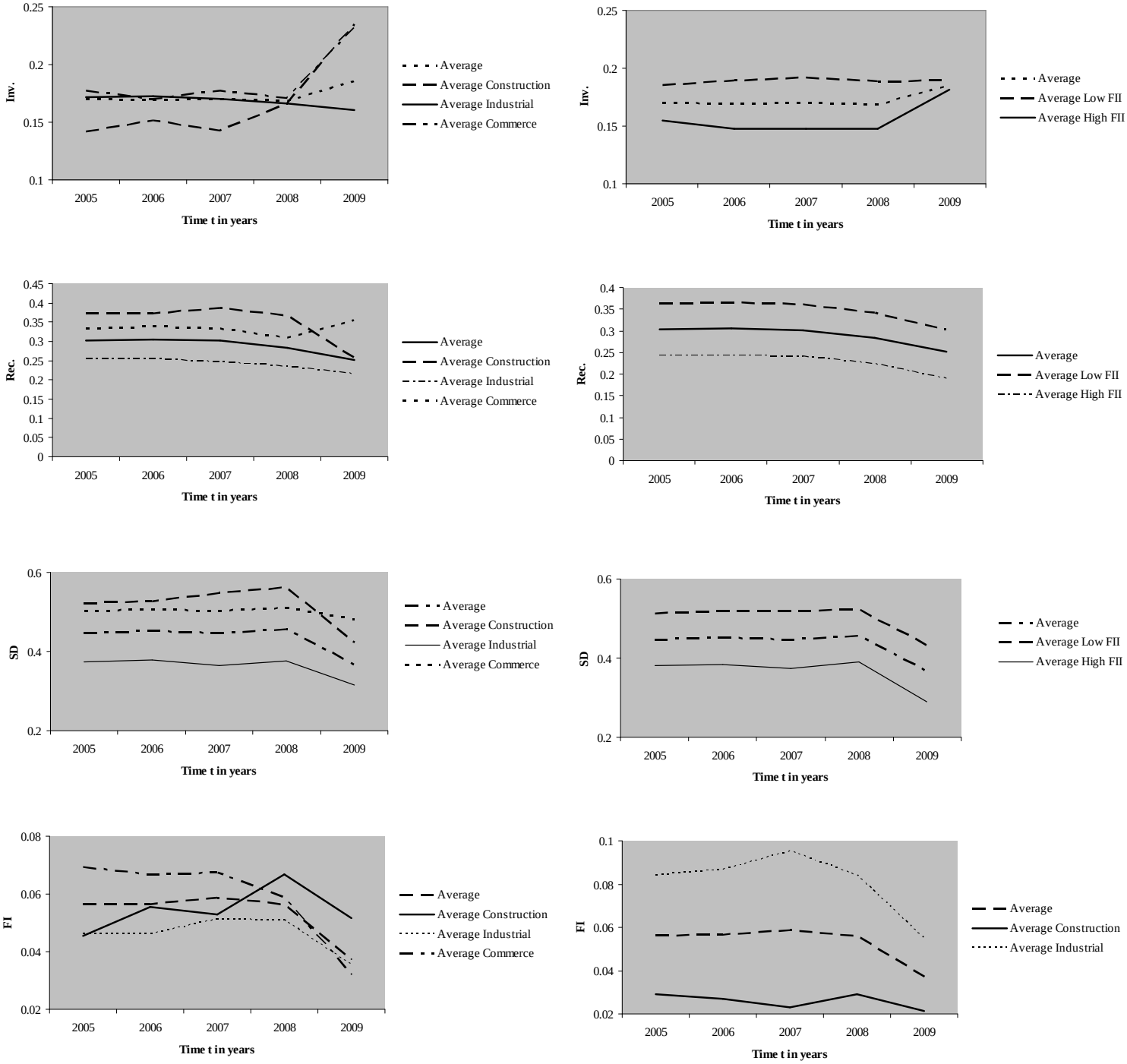


Figure 3.4: Trend in working capital and fixed investment levels between 2005 and 2009

Figure 3.4 depicts the trend in working capital components for the two sector types. The graphs on the left side are split based on the sectors construction, industrial and commerce while those on the right side are split based on fixed investment intensity (FII).

Zooming in on the cash trends in the various sectors, Construction, industrial and commerce, shows large differences. Construction has the highest cash levels over the whole period, while the other sectors swing above and below the average. The cash position in the construction sector is volatile over time with a peak in 2007. Overall the level remained stable though. The industrial sector displayed a rise in cash levels from 2005 to 2007 and a decrease between 2007 and 2009. In commerce, cash increased between 2006 and 2007 and decreased in the other periods. The trend over the whole period was however essentially flat.

There are large differences between sectors in terms of inventory levels. Construction had by far the lowest inventory levels of the three sectors in the year 2005 but its levels have increased rapidly since. In 2008 they even shot past the average level. Industrial and commerce companies haven't changed inventory levels much since 2005. The inventory levels of industrial even decreased in 2009 while those in the commerce sector exploded. The construction sector had the highest level of receivables in 2005. In the period 2008-2009 it reduced its receivables levels drastically, giving them an average receivables level in 2009. Industrial companies had the lowest level of receivables over the entire period and showed only a slight decreasing trend. What is interesting about the trend in short term debt, is that all sectors show a similar parallel pattern, with a shift downward after 2008. The commerce sector seems to be the least affected by tight credit; It shows an insignificant reduction in short term debt. Investments in fixed assets of all sectors are relatively volatile, but for all sectors there seems to be a downward trend caused by a large reduction between 2008 to 2009.

The trends in working capital based on fixed investment intensity (high and low) are much more similar to each other. Companies with high fixed investments have lower levels of cash than those that do lower yearly fixed investments. Both types of companies increase inventory levels over the period, reduce receivables, although high fixed investment companies more than low ones and decrease short term debt. Interestingly, high fixed investment companies reduced fixed investments drastically after 2007 while the fixed investments of low fixed investment companies remained stable.

This research assumes, from the above information, that the credit crisis supply side effect of tight external finance occurred in the Netherlands between 2007 and 2008 and thus this study focuses on this pre- to post-crisis period. An additional robustness check is conducted for the period 2008-2009, which includes more effects of the demand side since the working capital trend graphs suggest that the largest differences lay in this period.

4. Quantitative results

This chapter presents the results of this research. Paragraph 4.1 to 4.3 sum the results of the hypothesis tests, based on the methodology described in paragraph 3.1. Then additional tests are conducted and it ends with a discussion of the results.

4.1 Credit crisis and fixed investments

This next section addresses the effect of the credit crisis on fixed investments. A paired sample T-test on the mean differences in fixed investment between the pre-/post-crisis period revealed that, for neither the overall sample nor any of the sectors, fixed investments decrease significantly due to the credit crisis (table 4.1). This is confirmed by the hierarchical multiple regression in table 8.

Table 4.1: Paired means of fixed investments pre- to post-crisis 2007-2008

	Mean difference	**N**	**P-value (T-statistic)**
Overall model	.002	93	.893 (0.135)
Construction	-.022	11	.552 (-.606)
Industrial	.002	42	.851 (.189)
Commerce	.008	42	.800 (.255)
Low FII	-.009	47	.493 (-.688)
High FII	.013	46	.489 (.701)

Step 1 of table 4.2 tests whether there is a difference in the dependent variables fixed investment (FI) between pre-crisis 2007 and post-crisis 2008 (through time dummy TD).

Table 4.2: Hierarchical multiple regression analysis for dependent variable FI

Variable	**TD**	**PP**	**CF**	**Size**	**Adjusted R2**
	P-value (Beta)	P-value (Beta)	P-value (Beta)	P-value (Beta)	
Step 1	.893 (-.010)				-.005
Step 2	.749 (.023)	.878 (-.012)	.000** (.303)	.255 (.088)	.070

Controlling for cash flow, size and the ownership dummy variable PP (private or public) in step 2, there is still no statistically significant effect of the credit crisis on fixed investments. Table 1 in appendix B presents the results per sector. Based on these results, there is not sufficient evidence to support **Hypothesis CC1** that the credit crisis had a negative effect on company fixed investments.

4.2 Working capital effects

This section further analyses the role of the pre-crisis working capital on the impact of the credit-crisis on fixed investments. First, to get a general view on the relationships between variables, a correlation matrix is created. It demonstrates that main as well as interaction effects exist between the working capital variables and fixed investments. All correlation coefficients in relation to fixed investment are negative except for cash flow. For instance, the significant negative relationship between cash and fixed investments shows that pre-crisis high cash companies invested less in fixed investments. This negative relationship between Cash and FI weakens when interacted with the time dummy which suggests that pre-crisis high cash companies at the same time reduced fixed investments less than low cash companies during the credit crisis. The working capital- time dummy interaction effects are further examined through regression analyses in the next section. Interesting other outcomes are the highly negative correlation coefficient for the relationship between cash and inventory and the highly positive coefficient for short term debt in relation to inventory and receivables.

Table 4.3: Correlation matrix

Variable	Cash	Cash*TD	Inv	Inv*TD	Rec	Rec*TD	SD	SD*TD	CF	Size	FI
Cash	1	.858**	-.215**	-.161*	.003	.002	.057	.032	-.20**	.224**	-.191**
Cash*TD		1	-.185*	.108	.002	.315**	.049	.377**	-.23**	.203**	-.163*
Inv			1	.748**	.130	.084	.233**	.130	.031	-.272**	-.203**
Inv*TD				1	.098	.519**	.174*	.605**	-.066	-.191**	-.166*
Rec					1	.646**	.777**	.432**	.061	-.425**	-.339**
Rec*TD						1	.502**	.903**	-.024	-.296**	-.212**
SD							1	.556**	-.040	-.425**	-.339**
SD*TD								1	-.098	-.222**	-.190**
CF									1	-.134	.289**
Size										1	.045
FI											1

Pearson correlation coefficients *Significant at p=.05 level **Significant at p=.01level

Both steps of the multiple regression in table 4.4 show that the interaction effect of cash-, inventory- and receivables-TD is significant on fixed investments at $p < 0.05$, where step 1 enters the working capital effects (the working capital components and short term debt) into the regression and in step 2, controlling for cash flow (CF), company size (Size) and ownership structure (PP) are entered.

Table 4.4: Multiple regression analysis of interaction effects with dependent variables FI

Variable	**TD**	**PP**	**TD*Cash**	**TD*Inv**	**TD*Rec**	**TD*SD**	**CF**	**Size**	**R2**
Overall	P-value								
model	(Beta)								
Step 1	.000**		.000**	.005**	.044**	.425			.169
	(.666)		(-.275)	(-.257)	(-.321)	(-.151)			
Step 2	.000**	.561	.004**	.005**	.002**	.842	.001**	.192	.218
	(0.666)	(-.042)	(-.230)	(-.253)	(-.515)	(-.037)	(.242)	(-.107)	
Construction	.229	.098	.725	.684	.275	.677	.022*	.168	.705
	(-.396)	(1.404)	(-.159)	(.411)	(4.766)	(-.875)	(.759)	(-.723)	
Industrial	.997	.030*	.379	.127	.031*	.158	.141	.891	.135
	(-.001)	(-.248)	(-.115)	(-.253)	(.646)	(-.379)	(.176)	(.016)	
Commerce	.000**	.322	.002**	.007**	.004*	.640	.112	.265	.388
	(.670)	(.103)	(-.332)	(-.339)	(-.723)	(.142)	(.156)	(-.130)	
Low FII	.000**	.454	.002**	.442	.747	.016*	.120	.912	.198
	(.744)	(.087)	(-.374)	(-.104)	(.083)	(-.652)	(-163)	(-.013)	
High FII	.015*	.867	.357	.024*	.005**	.556	.020*	.018	.143
	(.524)	(.018)	(-.108)	(-.317)	(-.690)	(.170)	(.254)	(-.300)	

Figure 4.1 makes the direction of the interaction clear through graphical representations of the interaction effect *Cash-TD* (the graphical representation of the other effects are depicted in figures 1 to 3 in appendix B).

In the overall model, the credit crisis had a significantly more negative effect on companies with low cash, receivables and short term debt reserves pre-crisis than those with high cash, receivables and short term debt reserves. The significant interaction effect between the credit crisis dummy and inventory has the opposite sign; The credit crisis had a significantly more negative effect on companies with high inventory reserves pre-crisis than those with low inventory reserves.

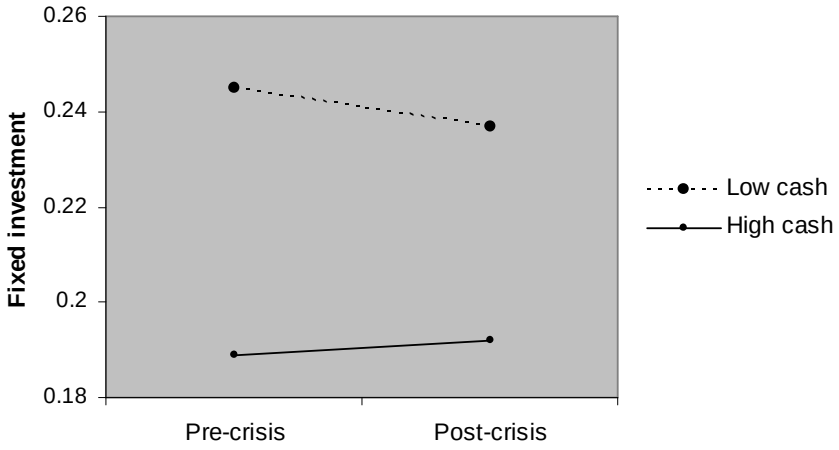


Figure 4.1: Interaction-effect of credit crisis and cash levels pre-crisis on fixed investments

The second part of table 4.4 presents the sector results of the step 2 multiple regression analysis. It reveals that in the construction sector none of the interactions have a statistically significant effect on fixed investment. In the industrial sector the interaction receivables-TD had a statistically significant effect while for commerce, as in the overall sample model, cash-, inventory- and receivables-TD effects affect fixed investments significantly. This means that companies in the industrial sector with high levels of receivables reduce investments significantly less than those with low receivables. Cash, inventory and short term debt do not affect the effect of the credit crisis on fixed investments. In commerce cash, inventory, receivables and short term debt impact the effect of the credit crisis on fixed investments. Companies with high levels of these working capital components were able to maintain fixed investments more than companies with low levels.

Based on the overall results, there is evidence to support **Hypothesis WC1** which states that high cash companies reduced fixed investments less than low cash companies. For commerce this hypothesis is rejected since here high cash companies reduce investments during the credit crisis more than those with low cash reserves. **Hypothesis WC2** is rejected based on the overall results, since companies with low (and not high, as hypothesized) inventory pre-crisis reduced fixed investments less than those with high (and not low) inventory. On the other hand, companies in commerce with high inventory and receivables reduces fixed investments less than those with low inventory and receivables, which is in support of hypotheses WC2 and WC3. Companies with high receivables reduce investments less than companies with low receivables, supporting **Hypothesis WC3**. High short term debt companies reduce fixed investments less than

those with low short term debt, which is in contrast with the results expected in **Hypothesis WC4**. High short term debt companies before the crisis were able to maintain fixed investment despite the risk associated with rolling-over their short term debt.

In a single regression analysis, short term debt mitigates the effect of the credit crisis on fixed investments. The interesting finding, as already suggested by the theory, of the multiple regression analysis is therefore that that the level of short term debt does not influence the effect of the crisis on fixed investments significantly in the presence of the other working capital components. This phenomenon is further explored in paragraph 4.3.

To conclude this section on working capital effects on pre- to post-crisis investments: high cash and receivables companies reduced fixed investments less than low cash/ receivables companies during the crisis. This however does not necessarily mean that companies with high cash and/or receivables actually used these reserves as buffer to fund fixed investments. High cash/ receivables could also be a characteristic of companies that are dependent on/ need to sustain fixed investments.

This phenomenon is examined through additional tests; The goal is to assess whether the cash and receivables reserves of these high cash companies shrunk during the crisis and whether it shrunk more than those of low reserve companies. If so this could imply that cash and receivables were actually used to fund investments. Sample T-tests reveal that receivables levels decreased significantly during the credit crisis but cash was not (table 4 appendix B). OLS regressions show a significant relationship for cash (table 5 of appendix B). In short this means that although there is no statistically significant decline in cash reserves pre- to post-crisis, there is a significant difference in the cash reserves pre- to post-crisis between high and low cash companies. Figure 4 of appendix B presents this relationship graphically: Companies with low cash reserves pre-crisis increased cash reserves over the period while high cash companies (which reduced fixed investments significantly less than those with low cash) did reduce cash levels.

This, combined with the statistical evidence that high cash companies reduced fixed investment less than low cash companies due to the credit crisis suggests that high cash companies used cash to fund fixed investments while low cash companies decreased investments in fixed assets to build up cash reserves. Companies with high and low receivables levels both reduced their levels of receivables due to the credit crisis evenly. High receivables companies may have used the freed cash flow to finance fixed investments while low receivables companies used these freed funds for other ends.

4.3 Indirect working capital effects

Paragraph 4.2 already stated that short term debt in isolation played a significant role in mitigating the effect of the credit crisis on fixed investments but that the multiple regression revealed that this interaction effect no longer existed in the presence of the other working capital variables. Here, this result is further explored through an examination of the role of the other working capital elements on the interaction between short term debt and the credit crisis. Table 4.5 presents the results of the variance analysis. It confirms the significant interaction effect between short term debt and the credit crisis (row 1). All interaction effects are significant as well (row 2 to 4) suggesting that the interaction effect between short term debt and the credit crisis is significantly affected by the level of cash, inventory and receivables pre-crisis. Figure 5 to 7 of appendix B depict the three interaction effect. The statement that 'high short term debt companies pre-crisis reduce fixed investments less due to the crisis than those with low short term debt' is stronger for low (high inventory) cash or receivables companies than for those with high (low inventory) cash or receivables pre-crisis.

Table 4.5: Analysis of variance for dependent variable fixed investments

Independent variable	F	P
Interaction SD-TD	6.903	0.009**
Cash*Interaction	10.479	0.001**
Inv*Interaction	15.125	0.000**
Rec*Interaction	16.828	0.000**

The results confirm **Hypothesis I1** and **I3** that cash and receivables mitigate the impact of short term debt on the effect of the crisis on fixed investments. **Hypothesis I2** is rejected since the significant interaction effect is in the opposite direction: inventory strengthens (instead of mitigates) the impact of short term debt on the effect of the crisis on fixed investments (see figure 6 of appendix B).

4.4 Additional tests

The tests above assume that the credit crisis occurred in the Netherlands between 2007 and 2008. It is however difficult to isolate this event to a time period. Two additional tests in the next section address this issue. First, the pre- to post-crisis period is shifted to 2008-2009 as described in the trend section of the research methodology. The second part, tests a non-crisis period to determine what the differences are between results acquired during 'normal' times and the crisis.

The first additional robustness check is conducted for the period 2008-2009, which includes more effects of the demand side. The results in table 4.6 reveal that over this pre- to post-crisis period working capital has no significant effect on fixed investments. Cash flow is the only significant determinant of fixed investment levels. Table 6 of appendix B shows that in 2005/2006 fixed investments are determined by receivables and cash flow and not by other working capital levels.

Table 4.6: Multiple regression analysis for pre- to post-crisis period 2008-2009

Variable	**TD**	**PP**	**TD*Cash**	**TD*Inv**	**TD*Rec**	**TD*SD**	**CF**	**Size**	**R2**
Overall	P-value								
model	(Beta)								
Step 1	.994	.742	.666	.135	.260	.422			.029
	(.002)	(-.050)	(.074)	(-.273)	(-.401)	(.338)			
Step 2	.377	.823	.696	.382	.598	.350	.024*		.074
	(-.258)	(.034)	(0.073)	(-.166)	(-.190)	(.380)	(.321)		

4.5 Discussion of results

Table 4.7 depicts the results of the hypotheses tests. A striking outcome from hypothesis CC1 is the fact that the sectors examined did not reduce fixed investments in the context of the credit crisis. This is in contrast to the U.S. sample examined by Duchin et al (2010) which demonstrated that in the U.S. fixed investments decreased significantly due to the credit crisis. A possible explanation could relate to differences in the financial support system of companies in the U.S. and the Netherlands, the power position these relatively large companies have in relation to banks or the strategic importance of fixed investments in the Netherlands compared to the United States.

Hypothesis WC2 is rejected; companies with low (and not high, as hypothesized) inventory pre-crisis reduced fixed investments less than those with high (and not low) inventory. An explanation for this result may lie in the significant negative correlation between cash and inventory. There is a financial trade-off between these working capital components; Low inventory companies have high cash reserves and vice versa. Inventory cannot unconditionally function as buffer in the same way as cash. Inventory may perish, become old and lose value, suggesting possible sector differences. From this viewpoint, high inventory is seen as inefficient, not as precautionary. Another interpretation could lie in the timing of inventory reductions. The bullwhip effect (Lee et al., 1997), caused by incongruent information across the supply chain, caused inventories to first increase (since demand has already started to shrink) and only later decrease, once this 'information' reached the suppliers.

Table 4.7: Hypothesis test outcomes

Credit crisis and fixed investment	*Rejected*
Hypothesis CC1: The credit crisis has a negative effect on company fixed investment	
Working capital effects	
Hypothesis WC1: The negative effect of the credit crisis on fixed investments is larger in companies with low than with high pre-crisis cash levels.	*Not rejected*
Hypothesis WC2: The negative effect of the credit crisis on fixed investments is larger in companies with low than with high pre-crisis inventory levels.	*Partially Rejected*
Hypothesis WC3: The negative effect of the credit crisis on fixed investments is larger in companies with low than with high pre-crisis levels of receivables.	*Not rejected*
Hypothesis WC4: The negative effect of the credit crisis on fixed investments is larger in companies with high than with low short term pre-crisis debt levels.	*Rejected*
Indirect Working capital effects	
Hypothesis I1: Pre-crisis cash levels mitigate the effects of short term pre-crisis debt levels on post-crisis fixed investment.	*Not rejected*
Hypothesis I2:Pre-crisis inventory levels mitigate the effects of short term pre-crisis debt levels on post-crisis fixed investment.	*Rejected*
Hypothesis I3: Pre-crisis receivables levels mitigate the effects of short term pre-crisis debt levels on post-crisis fixed investments.	*Not rejected*

The result of hypothesis WC4 on short term debt is totally inconsistent with the theory. High short term debt companies reduced fixed investments less than those with low short term debt. Although short term debt is defined very broadly in this research as total current liabilities, consisting of loans, accounts payable to creditors and other current liabilities such as taxes, this does not explain this opposite effect. The financing theory of this research proposes that companies with **high** short term loans would incur financing difficulty during the credit crisis and thus would not be able to acquire sufficient finance for fixed investments. Working capital theory suggests that companies with **high** levels of accounts payable prior to the crisis would not be able to stretch their payment terms during the crisis as much as those with low accounts payable and therefore would be forced to reduce fixed investments. More so this outcome could be the result of the characteristics of companies with relatively high levels of short term debt (to balance total).

The matching principle states that short term assets (working capital) should be financed by short term debt (Brealey & Myers, 2002). Companies with high levels of short term debt thus would have higher levels of working capital, reflected in this research by high positive correlation between short term debt and receivables/inventory, which could be used as buffer in times of credit shortages to fund fixed investments.

During the 2008/2009 period cash flow is the only determinant of fixed investment levels. Duchin et al. (2010) suggests that this result can be explained by the demand side effect. If the demand for investment decreased (as results of reduced product demand from consumers) to such an extent that the tightened supply of external finance caused by the crisis was not the binding constraint, then no relationship between working capital levels and fixed investment would be expected. Another explanation could be that companies depleted their reserve working capital to such an extent that it cannot be used as buffer anymore to mitigate decreases in fixed investments. This could be the case for receivables reserves, since these reduced significantly in the period 2007-2008, but not for cash or inventory.

The commerce sector reflects the hypothesized relationships best. The industrial and construction sector show less consensus for the hypothesized theories based on quantitative data. Due to the small number of companies in the construction sector sample (11), from an availability perspective, the industrial sector is chosen to perform additional case studies. Chapter 5 assesses what other factors determine fixed investments and further tests the outcomes of the quantitative results in the Netherlands to answer the questions:

1. *What are the conditions under which certain liquidity approaches impact fixed investments?*
2. *How were companies in the industrial sector able to maintain their investments in fixed assets during the credit crisis?*

5. Qualitative results

This section provides a guiding framework to understand the conditions under which liquidity approaches impact fixed investments. Understanding this will provide companies with guidelines to support working capital management decision making. Additionally, the results of the previous section revealed that fixed investments were not reduced significantly during the credit crisis. The question is how they were able to maintain sufficient funds to do so. This question will be further examined through case studies. This research section is theory building and highlights differences between cases where certain working capital management practices did and did not lead to reductions in fixed assets and identifies commonalities among cases (de Vaus, 2001).

The case study consists of the three cases described below:

- Case A relates to a company with high working capital prior to the crisis and stable investments during the credit crisis. This case follows the theory of this research that a company with high working capital buffers would be able to maintain more stable levels of fixed investments during the credit crisis.
- Case B has above median working capital prior to the crisis and yet reduced fixed investments due to the credit crisis.
- Case C consists of a company with relatively low levels of working capital before the crisis and reduced fixed investments during the credit crisis. This is consistent with the theory that since there were no working capital buffers prior to the crisis this company was not able to maintain stable levels of fixed investments in a climate of tight credit supply.

Each case is described separately, first based on documentation research (annual report/media coverage) which gives directional leads for the interview phase. Then the interviews are described in full and divided in strategy, internal and external components (as described in the case study theory). Finally pair wise comparisons are made. First case A and B are compared and propositions developed, then case A and C and finally case B and C.

5.1 Case A

Documentation research

This privately held Dutch company is a large player in the international marine-engineering industry. It produces ships with a value between twenty and eighty million Euro's. The late cyclical character of the marine-engineering industry is due to the long order times of ships. Orders are placed years in advance and so the order books of ship-builders are full for 2008 to 2010. This means that although incoming orders from the end of 2008 have stagnated, the demand side effects of the crisis on company performance will only become clear at a later stage (Rabobank, 2010).

In company A's annual report the credit crunch is mentioned. However, mainly related to the future market decline impact on the company. It drew a syndicated credit facility mid-way 2007 and again in 2008 with a consortium of banks ensuring credit for some time period but has a substantial amount of cash to its disposal. In line with the findings of the Rabobank (2010), documentation suggests that company A did not incur a decline in earnings during 2008 and 2009. Company A had above average levels of working capital prior to the crisis compared to the industry average and was able to maintained stable levels of fixed investments during the crisis thus supporting the theory of this research. Overall, the largest problem of company A is related to the demand side of the crisis. Is this related to the banking sector and how is the company handling this in terms of investments, working capital and financing?

Interview results

The largest problem company A encountered during the crisis is the inability of its customers to finance large projects, resulting in a weaker order demand and difficulty in closing order negotiations. It had no problems financing its own investments, since these are funded internally through cash. Company A works with a consortium of 4 banks and found that negotiations became tougher during the credit crisis (its interest bearing debt was only 12% of balance sheet total). When the government set up a guarantee (through Atradius, an export credit insurer), company A was the first Dutch company to make use of it. Not to fund its own fixed investments but to pre-finance supplies for customer orders. Company A was able to finance its own fixed investments internally with cash combined with improvements in working capital in the form of cash awareness and receivables control.

In short: the supply side of the credit crisis did not force company A to reduce investments. In 2008, the demand side of the credit crisis threatened to affect the company's future cash flows. The company was able to use financing as unique selling point to maintain customer orders.

5.2 Case B

Documentation research

This company participates in a diverse range of activities in the industrial sector. In the supply chain, ranging from raw materials handling to consumer, this company is a converter of raw materials and sells mainly to product manufacturers. The company states in its 2008 annual report that it, on paper, incurred relatively little damage due to the credit crisis. However, acquisitions in the first months of 2008 led to an increased demand for financing. For this reason, the existing syndicated loan facility, closed in 2007, was extended from 250 million to 400 million euro's early in 2008.

Anticipating the downward development of the world economy, early in 2008, the company steered toward a reserved investment policy and took measures to reduce costs. Also, in the last quarter of 2008, steps were taken to control working capital. The production of certain facilities was temporarily halted and in 2009 its build and fix-it strategy became subjugated to a sound liquidity strategy. In 2009 its financial policy is primarily focused on reducing debt (interest bearing debt over 35% of balance total). Over 2008 working capital increased, of which most attributable to acquisitions, whereas investments decreased. In 2009 the company was able to reduce working capital significantly. It however did not increase fixed investments; even so, they were reduced more over this period. These reduction enabled the company to meet its net debt/ EBITDA covenant despite reduced earnings. This document research does not suggest that working capital buffers were used to stabilize fixed investments. The company had relatively high working capital levels prior to the credit crisis and yet reduced fixed investments more than the industry average. The debt reduction of company B may furthermore indicate some friction with its banks and thus financial difficulties.

Interview results

The main concern of company B due to the credit crisis was the whether it could stay within its loan covenant (net debt/ EBITDA) with the prospect of future earnings decreases during the crisis . Its focus was therefore on reducing its debt position. Experiences of other companies, also publicly listed companies with similar bank relations, gave the CFO a grim view of the banking

sector. He described it as follows: “Those which breached their covenants were hit hard and double. First of all, banks forced those companies to issue new shares on the, already weak, stock market, hitting its existing shareholders. Next, the revenue of the share issue had to be applied to repay the loans as much as possible. Finally, once the loans to banks were partly repaid, the companies were confronted with horrific terms for the remainder of the loans, which they were forced to accept.

Company B used whatever means it could access, to reduce its debt: first fixed investments were reduced and then (partly simultaneously) working capital was accessed. The CFO states that the way investments were chosen to be reduced was that all investment over 250.000 euro’s needs to be tested. Subsidiaries are required to write up an investment proposal including expected earnings. For years already, holding level has seen that a majority of investments do not achieve the expected levels and has showed the subsidiaries this. “”The subsidiaries are always optimistic and do not take calamities into account”. Stricter *testing*, leading to reduced investments, was already incorporated in 2005. The credit crisis just strengthened this policy. The CFO found that the working capital policy did not change much since the crisis, however “the strings of the company were pulled a little bit tighter”. Since subsidiaries are dependent on the holding for credit, this could be used as leverage to ensure efficient use of working capital. *“ Saying No is the best way to save money”*, he says. If subsidiaries only have so much at their disposal they will become more aware of wastefulness. The question whether the company foresees a financing gap in the coming years is answered with an undoubtful NO. Bank relations have not changed dramatically since the crisis and the company is able to acquire alternative forms of finance (private placement) in order not to become too dependent on banks.

5.3 Case C

Document research

This company is a large Dutch beer brewer active internationally in the fast moving consumer goods market. Just as the former two companies, it does relatively high fixed investments in plant, production and equipment compared to the industry average.

The company finds that times have proven the credit markets situation could be such that it is difficult to generate capital to finance long-term growth of the Company. The annual report of 2008 states that to mitigate the effects of the crisis company C will focus on reducing debt (up to almost 50% at year end 2008) by strengthening cash conversion (i.e. working capital), cash generation (cash flow) and reducing capital expenditure. So even though company C has

relatively low levels of working capital, it still focuses on reducing its levels to use as financial resource. The savings made from working capital is however not used to fund fixed investments. In contrast, this too is seen as a source of finance and both are used to repay debt.

Interview results

The last few years, this company grew through a number of large acquisitions, financed by debt thus increasing its leverage. The focus of company C during the crisis was on reducing its net debt. It had simultaneously done major fixed investments in the last few years and decided that these could be reduces over the coming years without endangering (future) operational cash flows. Free cash flow resulting from this was used to repay debt. Other cost and working capital reducing initiatives were taken. Its supplier/ buyer bargaining power ensured possibilities to improve credit and payment terms and additionally suppliers were tendered. An additional difficulty arose during the credit crisis. Part of company C's credit facility with a group of ten banks was to be repaid end of 2008. The bank sought to finance this through a bond issue. However, since the capital market was completely frozen this was not an option. The company was able to stretch the term of the bank loan till this bond issue could be issues, end of first quarter 2009, when the market opened a bit.

5.4 Case comparison

In this section the cases are compared based on the effect of the crisis on the companies and their reaction in terms of the three sections of the quantitative theoretical framework: strategy, internal workings and external relations. First case A and B are examined and propositions derived. Second are case A and C, for which the propositions are tested and if necessary rejected or improved. Last but not least, through the comparison of case B and C, final propositions are developed for future research.

Cases A and B

Credit crisis – Company A maintained fixed investment levels while B reduced investments during the credit crisis; both companies had above industry median levels of working capital prior to the credit crisis. The focus of company A during the credit crisis was on maintaining a steady order level over the coming years. The main action taken to achieve this was the pre-finance customer orders through additional bank loans backed by government guarantees. Company B emphasized the reduction of its net debt position during the credit crisis; free cash flow from working capital efficiency efforts as well as fixed investment reductions was used to repay debt.

Case A

Strategy – The representative states that the company follows a conservative strategy toward investments in working capital which would explain the relatively high levels of working capital. Investments related to replacement and expansion of production (fixed) are financed internally with cash. The shipbuilder is "cash rich", even though not all as free cash. Its financing strategy is also viewed as conservative; credit facilities are mainly closed with a maturity of at least a few years. Coincidentally, the company negotiated a credit facility at the end of 2007 (just before the capital market collapse) maturing in 2012, which meant no refinancing was required during the crisis.

Internal – Driven by the credit crisis, the company focused on working capital improvements to free liquidity. Cash awareness programs were initiated in the business. Cash forecasts were always made by subsidiaries, however these were not sufficient. Nowadays, subsidiaries deliver monthly cash flow prognoses which are integrated to give an overview of the companies free cash flows. It started reducing its inventory to anticipate on reduced demand in 2008 and 2009 and with its less strategic suppliers, the company was able to increase the terms of its accounts payable. On the other hand company A stepped over from prepayment by customers to pre-financing for its customers leading to increased receivables. This action was strategic to increase future cash flows.

External – Suppliers are often smaller companies, providing the shipbuilder with a powerful position in negotiations. Some (also smaller) suppliers make strategic parts for the company. These are specialists for which company A has no alternative creating a dependence on these suppliers. The shipbuilder has been work with a consortium of banks (ING, Rabobank en Royal Bank of Scotland en Commerzbank) for years now and all loans are acquired through this construction. The company does recognize that negotiations with banks have become "tiring and difficult" since the crisis. They state that the government guarantee and their solid solvability position, high cash reserves, ensured credit supply from banks to company A during the credit crisis.

Case B

Strategy - The representative of Company B states the company has always been very cautious with supplying credit to its subsidiaries. This is a way to ensure (/pressure) subsidiaries (to) make efficient use of working capital. Working capital and fixed investment financing has always been limited to retain more financial resources for acquisition. This suggests an aggressive investment strategy. The financing strategy of the company on the other hand is conservative. Most debt finance is long term and the representative states that refinancing negotiations are started far in advance (at least 1.5 to 2 years). The headroom of its syndicated loan is far larger than the forecasted financing need.

Internal - The CFO states that the companies working capital policy did not change during the credit crisis, however it was applied more tightly. From 2005 already subsidiaries were required to develop a yearly budget including not only the expected revenues, but also the spread of cash flows over time, what the working capital requirements are and what investments need to be done and how much cash is freed from operations. Credit is deployed centrally, by a modest allocation the holding pressures the holding to reduce waste.

Subsidiaries are required to depreciate half of the value of any inventory that stands still for over a years, which they feel in their results if they are wasteful. Furthermore, the company has a central credit management department which is very strict when it comes to creditors. If customers are late in their payment the CFO states they have solid policies (credit note/factoring).

External - The company B representative explains that in the supply chain, ranging from raw materials handling to consumer, this company is a converter of raw materials and sells mainly to product manufacturers. The raw materials suppliers are often large (chemical) companies and many of their direct customers are large (production) companies. This means that the buyer and supplier power of company B is relatively low. To increase its power, the company uses a pull strategy in which the final customers in the chain (sport clubs, municipalities etc) are made aware of its products; to pull the demand backward through the chain.

The banking relations did not change much since the crisis; the company has a syndicated loan from a consortium of twelve banks. Yet the CFO has a negative view of the banking sector. His strategy is focused on reducing the company's dependence on banks.

Case C

Strategy – Over the last few years, the company's working capital investment strategy was largely aggressive; no buffers in cash or inventory were held to use as internal source of funding. It heavily invested in fixed assets as well as acquisitions. These were debt financed. Company C's financing strategy is moderate, not conservative but also not aggressive. Acquisitions are financed with a combination of short and long term debt, while fixed investments financed as much as possible through cash flow.

Internal – Working capital efficiency initiatives were mainly based on renegotiations with suppliers, receivable factoring programs and slightly due to inventory category TYPE reductions to also reduce actual inventory. Before the crisis, payments to suppliers were paid largely when the bills came in. Without stretching payment terms, the business was made aware of its option to pay later (with most suppliers term of 60 days). All free cash flow is used to reduce debt. However due to the companies already low working capital levels only so much could be done.

External – Especially in the Netherlands this company has a strong position in the supply chain. Its direct customers (supermarkets, cafés, etc.) cannot afford not to stock its products and due to the large scale of its supplies it has a powerful position in negotiations with suppliers, compared to its Dutch competition. On a worldwide scale however, it, on average (varies across countries), has an equal position to its competition. Since each country has only two or three beer brewers, all of them have a relatively large power over suppliers.

The representatives state that the company's banking relations did not deteriorate due to the difficulties during the credit crisis; even thought the company had trouble repaying its short term debt at end 2008.

Conclusion and propositions

Company A held working capital buffers in cash, inventory and receivables (in 2007 respectively 33%, 20% and 24% of balance total) which could be made free through working capital efficiency measures as described above. It furthermore was not on the brink of breaching its loan covenant nor of large amounts of short term debt maturing and so the company was able to maintain its levels of fixed investments during the credit crisis. Company B's growth strategy was not dependent on fixed investments prior to the crisis and thus this was no priority during the credit crisis. Despite the conservative financing strategy of the company, loan covenants relating to debt financing of external acquisitions leading to potential refinancing risk, forced the company to focus on reducing debt. Working capital (in 2007 cash 0.6%, inventory 23% and receivables 21%) and fixed investment reduction initiatives were taken to increase free cash flow toward repaying debt.

In short, case A and B differ in their focus toward fixed investment prior to the credit crisis, their (initial) working capital investment strategy (conservative versus aggressive) but both led a conservative financing strategy resulting in the following propositions:

Proposition 1: *Companies focused on internal growth prior to the credit crisis are less inclined to reduce fixed investments during the crisis than those focused on growth through external acquisitions.*

Proposition 2: *The choice between debt and internal financing of assets may affect fixed investment levels; high debt companies reduced fixed investment during the crisis more than low debt companies*

Proposition 3: *Companies with an aggressive working capital investment strategy will reduce fixed investments during the crisis more than those with a conservative strategy.*

Cases A and C

Company A maintained fixed investment levels and had high WC levels while company C reduced its fixed investments during the credit crisis and had low WC levels (cash 3.3%, inventory 6.0% and receivables 13%). The focus of company A during the credit crisis was on maintaining a steady order level over the coming years. The main action taken to achieve this was the pre-finance customer order supplies through additional bank loans backed by government guarantees. Company C had done a number of major acquisitions ending half way 2008 financed by debt thus increasing its leverage; the focus of company C was during the crisis was on reducing its net debt since it had incurrence loan covenants with banks. It had made major fixed

investments in the last few years and decided that these could be reduces over the coming years without endangering (future) operational cash flows. These were both used to reduce its debt level.

Conclusion and restatement of propositions

The focus on company C was on reducing debt through capital expenditure reduction initiatives. Although the company had conducted an aggressive working capital investment strategy, working capital and cost reduction programs were set up. It's financing strategy was moderate
To conclude this section, case A and C differ in their focus toward fixed investment prior to the credit crisis, their (initial) working capital investment strategy (conservative versus aggressive), and partly in their financing strategy (conservative to moderate).
Proposition 1, 2 and 3 are confirmed by this case comparison. Since company C encountered difficulties repaying its short term bank loan and then reduced fixed investments this may suggest a relationship between short term debt and fixed investments. The representatives however say that the short term loan was finally repaid through a bond issue and not through free cash flow from reduced fixed investments. The propositions therefore are not restated.

Cases B and C

Both companies reduced fixed investments during the credit crisis, however company B more so than C (as percentage of balance total). These companies both lead an aggressive working capital investment strategy prior to the credit crisis. Both companies growth strategies are based on external acquisitions and both heavily debt financed prior to the credit crisis. Company B has a conservative financing strategy (long term finance and timely review of refinancing options) while C is (more than B) financed short. Company B has higher working capital levels (cash 0.6%, inventory 23% and receivables 21%) than company C (cash 3.3%, inventory 6.0% and receivables 13%) prior to the credit crisis but less buyer and supplier power in its supply chain. The way the companies reduced working capital was therefore different in that company A had an internal focus which was executed by moderate credit allocation to subsidiaries which enabled the holding to ensures/control working capital efficiency. Company C however looked directly into the supply chain and focused on supplier/ buyer renegotiations and tendering.

Conclusion and final propositions

Company A focus on external acquisitions for company growth, while company C did extensive internal fixed investments as well as acquisition. Both were largely debt financed because of

acquisitions, although company A had a maintenance covenant, in which a breach would force it to repay its loans and refinance, and C only a incurrence covenant, meaning that when in breach the company is not allowed to make new acquisitions. During the crisis both reduced fixed investments. Hence, proposition 1 and 2 cannot be rejected based on this comparison.
Propositions 3 can be defined more sharply. Low margins in the beer brewing industry forced company C to more strictly follow working capital efficient methods, though Company A and B both have an aggressive working capital investment strategy. The way the companies reduced working capital in reaction to the credit crisis differs (as described above). Company C reduced working capital by 11% mostly due to receivables reductions (547 million of total working capital level 4749). Since the company had a stringent working capital policy prior to the credit crisis most possibilities to reduce working capital were based on the companies strong position in the supply chain: renegotiations and supplier tenders. Company B reduced working capital by 40% (105 million of total working capital level 262) mostly through inventory reductions. The position of company B in the supply chain did not allow large reductions in receivables.

Proposition 1: *Companies focused on internal growth prior to the credit crisis are less inclined to reduce fixed investments during the crisis than those focused on growth through external acquisitions.*
Proposition 2: *The choice between debt and internal financing of assets may affect fixed investment levels; high debt companies reduced fixed investment during the crisis more than low debt companies*
Proposition 3: *Companies with an aggressive working capital investment strategy will reduce fixed investments more than those with a conservative strategy.*
Proposition 4: *The position of a company in the supply chain affects the way in which working capital can be reduced; Companies with a strong buyer/supplier position are able to reduce working capital through accounts receivables and increase accounts payable better than companies with a weaker position in the supply chain.*

5.5 Discussion of results

These results address management issues related to the credit crisis that could not be quantified or explained through financial data. In the interviews representatives of all three companies experienced difficulties as result of the credit crisis and all stated that working capital was used as instrument in response to the credit crisis. The effects of the crisis and the company's responses varied. From the case studies the following propositions were developed:

- The intentional focus formulated as strategy turned out to be a major predictor/ determinant of actual company fixed investments; Maintaining fixed investment levels is more important for a company whose management is focused on internal growth than one based on growth through external acquisitions.
- The financing decision of debt versus internal financing, determines how these companies are affected by the credit crisis. Companies that are highly debt financed (even more so for those with maintenance loan covenants) were forced to reduce debt at the expense of other aspects (i.e. fixed investment and working capital for operations).
- Finally, the position of the company in the supply chain plays a vital role in how working capital is reduced during the credit crisis.

6. Conclusion and recommendations

This research examined the impact of the credit crisis on fixed investments of companies in the Netherlands and specifically the role of working capital as mitigating or worsening factor during the credit crisis. The outcomes of this research should be viewed in its context. The sample consisted of 93 Dutch companies with an annual turnover of at least 500 million euro over the period 2005 to 2009; mainly large Dutch players on the international market.

The Dutch companies in this research sample did not reduce fixed investments significantly due to the financial crisis. Whether fixed investments are reduced in the context of the credit crisis depends on the growth focus of the company, its pre-crisis working capital investment strategy, its financing structure and its position in the supply chain. The results did support the precautionary motive or trade-off view as found by Duchin et al.(2010); Low cash and receivables companies reduced fixed investments more than those with high levels. The case studies furthermore revealed that inventory was also reduced in response to the credit crisis, however the timing varied based on the position of the company in the supply chain.

The conclusions above have diverse implications for companies in various situations:

Companies focuses on growth through fixed investment with a weak position in the supply chain have various options to maintain fixed investments during times of crisis; large companies, such as those in this sample, could ensure bank lines of credit or hold buffers in working capital.

Companies which already have sizeable amounts of debt outstanding should be cautious. Whether a company focused on growth through external acquisitions or fixed investments, loan covenants may restrict its possibilities to respond to a crisis and force it to reduce both fixed investments and working capital creating barriers to future growth.

The position of a company in the supply chain affects companies in a number of ways. First of all, companies with a strong buyer/supplier position are able to renegotiate favorable payment and receivable terms and thus will not require large cash buffers. It partly determines the operating margin a company can achieve and its working capital investment strategy. At the same time, low supply chain power creates a challenge for these companies to increase cash flow from working capital in times of need.

7. Discussion

This research commences with a discussion of the combined quantitative and qualitative results. Second, it illustrates the relevance of this research, from a scientific as well as a practical viewpoint. Third, the limitations of this research are described and finally suggestions for future research are developed.

7.1 Results

This discussion aims to place the qualitative results in the context of the former statistical results. It presents a comparison and explanation of the quantitative and qualitative results.

The quantitative results claim that fixed investments were not reduced in the Netherlands during the credit crisis. The additional case studies create a more nuanced image. It proposes that whether fixed investments were reduced depended on the intended strategy of the company and the capital structure; Companies with an external growth strategy were internally less motivated to continue fixed investments during the crisis and companies with large debt prior to the credit crisis are forced to reduce fixed investments in order to repay debt. Furthermore, government guarantees may have played a role in acquiring funding.

The general model of the quantitative research proclaims that cash and receivables mitigate the effect of the credit crisis on fixed investment. This notion is supported by the fact that all three companies used working capital as instrument to increase cash flow in response to the credit crisis. These initiatives however were not only related to reducing cash and receivables, but also to inventory. This result may not have become apparent in the quantitative section due to the bullwhip effect which is larger at the back of the supply chain, suggesting not companies experienced this simultaneously. Information arrives there last and thus the level (increase/decrease) of inventory is more volatile. The quantitative research examined 2007-2008, where some companies first increased inventory and only a few were already reducing its levels and then 2008-2009, where some had steadied levels and others only just started reducing.

An important addition of the case studies, which the quantitative study did not reveal, is the existence of a financing factor influencing the fixed investment policy during the credit crisis. In contrast to short term debt, fears of a loan covenant breach considerably limited companies during this period. The fear of having to renegotiate long term debt caused companies to drastically reduce debt levels at the expense of fixed investments and working capital.

7.2 Scientific and practical relevance

From a scientific point of view, the 2008 financial crisis creates a novel opportunity to examine

the effect of tight liquidity on corporate outcomes. As Almeida, Campello & Weisbenner (2009) have argued, because this case of credit shortage originated from problems arising from non corporate assets, it is unique. Theory developed for companies based on financial constraints can be tested for a large sample, in the context of a credit crisis, at present instead of backward looking to past crisis' . As for the case study section, the theory building nature of this research is fundamental to scientific development. The propositions derived from the case study analyses function as starting point for further scientific research. These propositions or hypotheses can be tested in order to generalize the outcomes.

This research examined what factors affect the fixed investment policy of companies in the context of tight liquidity. The importance of the outcomes for practice relates to the fact that foregoing profitable investments may have adverse long term effects for companies and the economy (Chrinko, 1993; Jiang et al., 2006). The recommendations in chapter 6 can guide companies toward an optimal working capital management policy for its personal situation.

7.3 Limitations

Each research approach has its limitations. It is important to select the most effective approach specific to the research subject and to minimize the limitations associated to it. This research consists of a quantitative empirical study and qualitative case studies. The difficulties of the empirical part of the research are:

Isolating the exact impact of the credit crisis; The credit crisis cannot be attributed to a specific timeframe and the reach (in terms of time) of its impact even less so. This research therefore tested whether the same outcomes were achieved during a the non-crisis period 2005-2006 and the robustness check of 2009.

The small sample size, overall and specifically for the construction sector, leads to generalization issues for the Dutch business sector.

Case studies are qualitative in nature. This gives the researcher greater information gathering possibilities and optimally creates a more complete model of reality. It therefore has high internal validity (de Vaus, 2001) compared to more quantitative research designs. Still, there are a number of limitations to this case study research, of which some due to the limited timeframe of this master research project and others due to the approach.

Retrospective approaches may lead to inaccuracies and biases in data and for that reason is often criticized. However, as Runyan (1982) states, retrospective reports are just one of the

techniques used in case study designs. In this research, additional material, financial data, was collected to evaluate/ underlie the interviews.

A linked limitation is the fact that only one or two peoples perspective were examined. This was due to time limitations. Assessing multiple perspectives would reduce the limitations of the retrospective approach and add to the validity of the case study approach.

The last criticism of the approach used relates to the sample size.; The research compares only three companies within one sector (industrial). General statements thus cannot be derived.
Still, for many purposes the case study is the single most effective method. A case study is able to systematically acquire information in a complex situation to offer a theory about an entity under specific circumstances. Reflecting on the goal of the research, a case study approach was fitting to reduce the limitations of the quantitative research as much as possible. These approach limitations aside, this research gives qualitative as well as quantitative insight into the effect of the credit crisis on fixed investments thus reduces many limitations of both approaches.

7.4 Future research

As stated in paragraph 7.2 the importance of the outcomes for practice relates to the fact that foregoing profitable investments may have adverse long term effects for companies and the economy. Future research could examine the long term effects of the different approaches, as defined in this research, to this specific credit crisis.
This research presented evidence for sector differences related to inventory, receivables and cash flow, as well as additional factors in the case study, which affect company fixed investments. Further research could extend the overall model by testing the impact of sector-specific variables on fixed investment and the indirect effect of sector-specific variables on firm-specific working capital variables.
In this study there was no statistically significant difference in approach to the credit crisis between companies with different ownership structure (private versus public as dummy variable). Public companies in the sample are listed on different exchanges (AEX, NYSE, etc.) in various countries making them susceptible to credit crisis influences from different countries. Since former research in the U.S. found a different reaction to the crisis (Duchin et al., 2010) it may be useful to make this distinction in the sample of public company registries. Differences between countries could be further examined; although there are numerous publications on financing patterns and the role of institutions (Levine et al., 2001; Maksimovic et al., 2002) the difference between countries (in this case the Netherlands and the US) banking and government reaction to this specific credit crisis in terms of credit stimulation to corporations is less well examined.

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Appendix A Time scope and trend

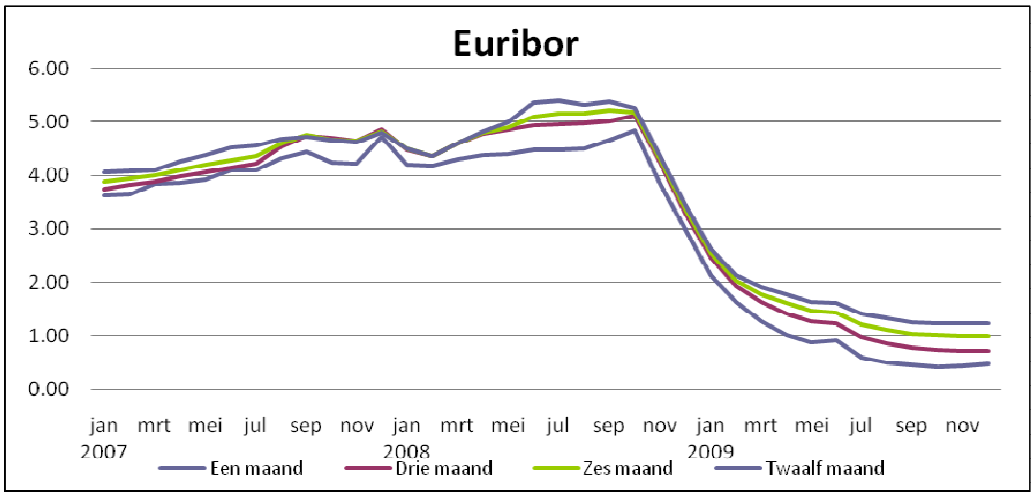

Figure 1: Short term Euribor interest rate changes between ’07 and ’09. Source: b DNB, 2010.

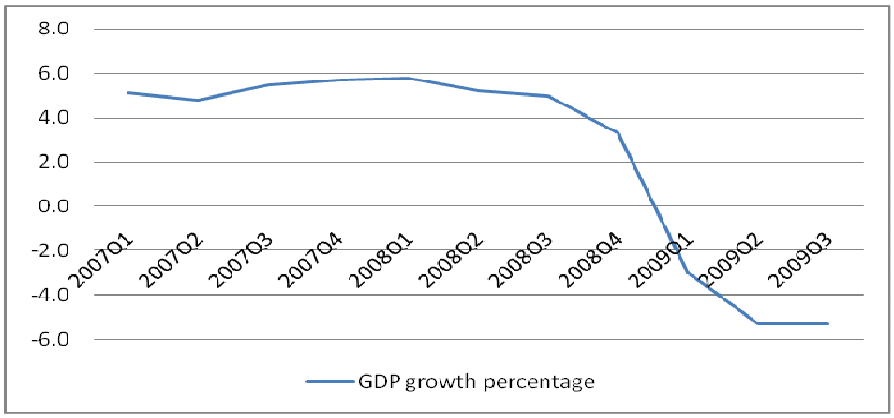

Figure 2: GDP growth percentage between ’07 and ’09 per Quartile. Source: DNB, 2010

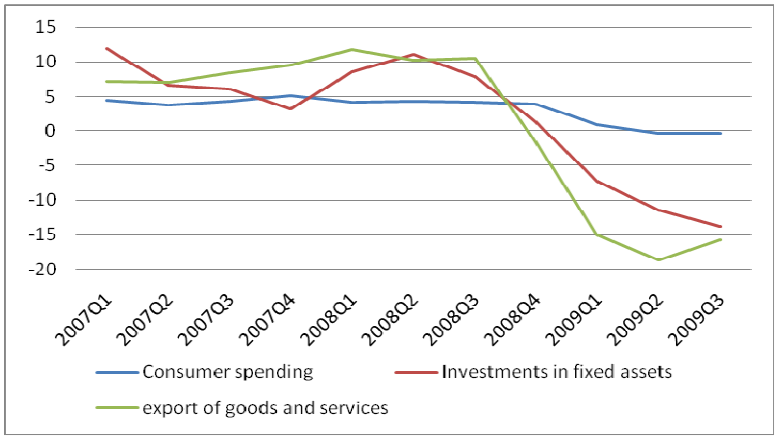

Figure 3: Developments between ’07 and ’09 per Quartile. Source: a DNB, 2010.

Appendix B Quantitative results

Table 1: Calculation of variables from Amadeus data

Name (abbreviation)	**Description** (* before depreciation)	**Transistion from Amadeus**
Cash	Cash & equivalents/ total assets	Row 60/ Row 61
Inv.	Inventory (Raw materials, WIP and FG)/ total assets	Row 57/ Row 61
Rec.	Receivables (tax and trade)/ total assets	(Row 58 + Row 59)/ Row 61
SD	Current liabilities/ total assets	Row 69/ Row 61
CF	(EBIT+depreciation+amortization)/ total assets	(Row 112 + Row 107) / Row 61
Size	Total assets	Row 61
FI	PPE/ total assets	ANNUAL REPORT DATA

Table 2: Sector hierarchical multiple regression analysis for dependent variable FI

	Variable	**TD**	**PP**	**CF**	**Size**	**Adj. R2**
	P-value (beta)	**P-value (beta)**	**P-value (beta)**	**P-value (beta)**	**P-value (beta)**	
Construction	Step 1	.552 (.134)				-.031
	Step 2	.242 (.147)	.836 (.044)	.000**(.903)	.335 (.193)	.723
Industrial	Step 1	.851 (-.021)				-.012
	Step 2	.896 (.014)	.032* (-.239)	.019* (.263)	.779 (-.031)	.103
Commerce	Step 1	.800 (-.028)				-.012
	Step 2	.935 (.009)	.067 (.209)	.031* (.250)	.305 (.118)	.081
Low FII	Step 1	.493 (0.072)				-.006
	Step 2	.563 (.062)	.130 (.185)	.734 (-.341)	.709 (.046)	0.009
High FII	Step 1	.485 (-.074)				-.006
	Step 2	.643 (-.050)	.861 (.019)	.054 (.210)	.434 (-.085)	.016

Table 3: Sector multiple regression analysis with dependent variable FI

	Construction	**Industrial**	**Commerce**	**Low FII**	**High FII**
Variable	P-value (Beta)	P-value (Beta)	P-value (Beta)	P-value (Beta)	P-value (Beta)
PP	.098 (1.404)	.030* (-.248)	.322 (.103)	.454 (.087)	.867 (.018)
TD	.229 (-.3961)	.997 (-.001)	.000** (.670)	.000** (.744)	.015* (.524)
TD*Cash	.725 (-.159)	.379 (-.115)	.002** (-.332)	.002** (-.374)	.357 (-.108)
TD*Inv	.684 (.411)	.127 (-.253)	.007** (-.339)	.442 (-.104)	.024* (-.317)
TD*Rec	.275 (4.766)	.031* (.646)	.004* (-.723)	.747 (.083)	.005** (-.690)
TD*SD	.677 (-.875)	.158 (-.379)	.640 (.142)	.016* (-.652)	.556 (.170)
CF	.022* (.759)	.141 (.176)	.112 (.156)	.120 (-.163)	.020* (.254)
Size	.168 (-.723)	.891 (.016)	.265 (-.130)	.912 (-.013)	.018 (-.300)
Adj. R2	.705	.135	.388	.198	.143

Table 4: Paired means of variables pre- and post-crisis

Variable	**Pre-crisis 2007**	**Post-crisis 2008**	**N=**	**T-statistic [p-value]**	**Sig. difference**
FI	0.2166	0.2145	93	0.893	No
Cash	0.243	.230	93	0.243	No
Inv.	0.385	.382	93	0.516	No
Rec.	0.527	0.507	93	0.000**	Yes
SD	0.652	0.661	93	0.248	No
WC	0.731	0.710	93	0.000**	Yes

Table 5a: Regression analysis with dependent variable Cash 0708

Variable	Beta	P
Cash07	-.441**	0.000

Table 5b: Regression analysis with dependent variable Rec. 0708

Rec07	-.007	0.949

Table 6: Multiple regression analysis for Placebo period 2005-2006		
Variable	Beta	P
TD	0.011	0.864
TD*Cash	-0.03	0.660
TD*Inv	0.013	0.846
TD*Rec	-.387**	0.000
TD*SD	-.021	0.819
CF	0.264**	0.000
Size	-.193*	0.011

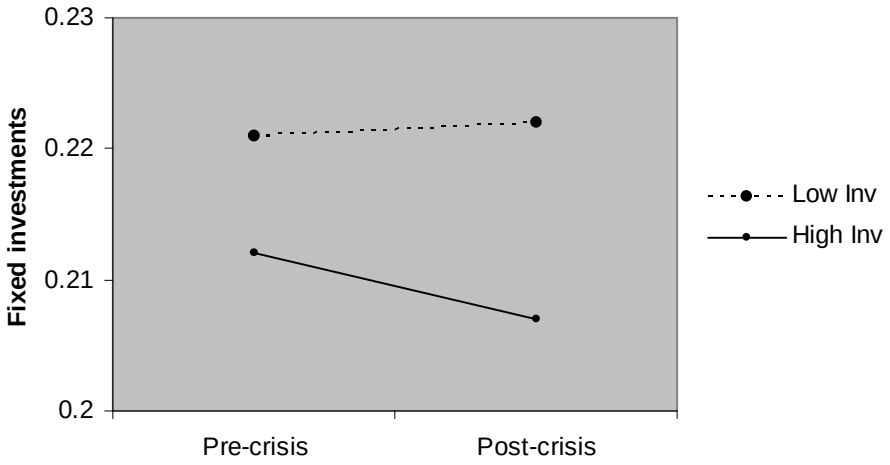

Figure 1: Interaction-effect of credit crisis and inventory levels pre-crisis on fixed investments

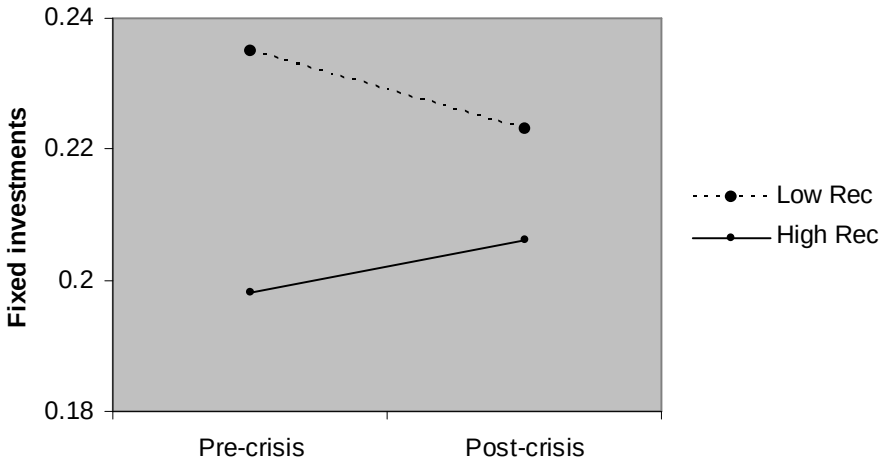

Figure 2: Interaction-effect of credit crisis and receivables levels pre-crisis on fixed investments

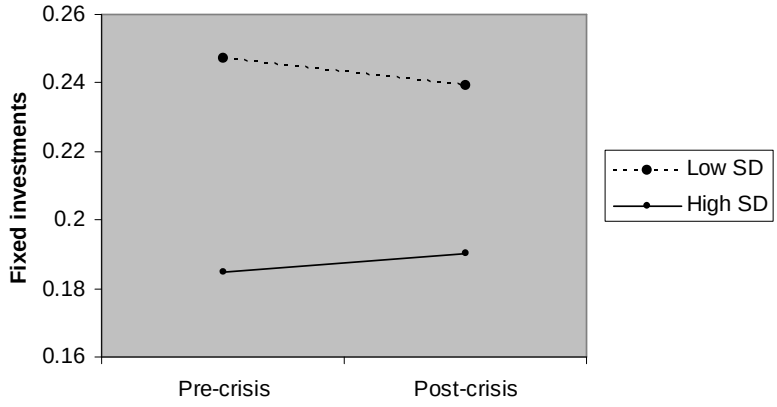

Figure 3: Interaction-effect of credit crisis and short term debt levels pre-crisis on fixed investments

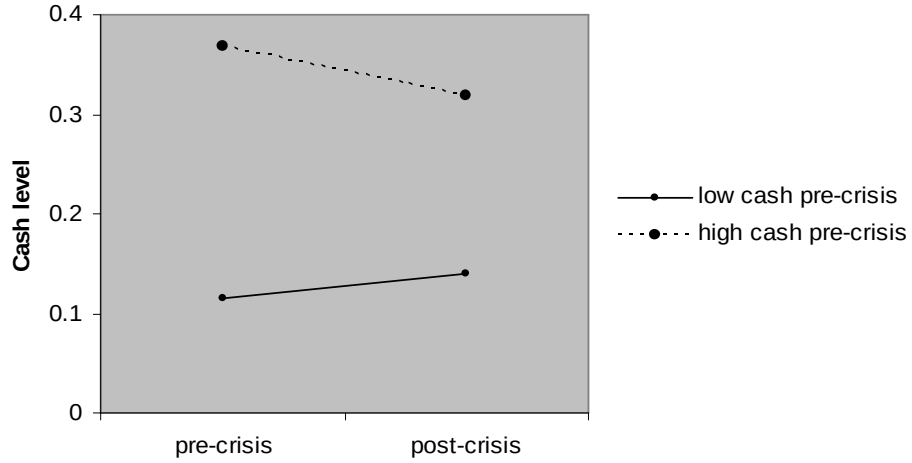

Figure 4: Interaction effect of pre-crisis cash level with TD on dependent variable cash reserves

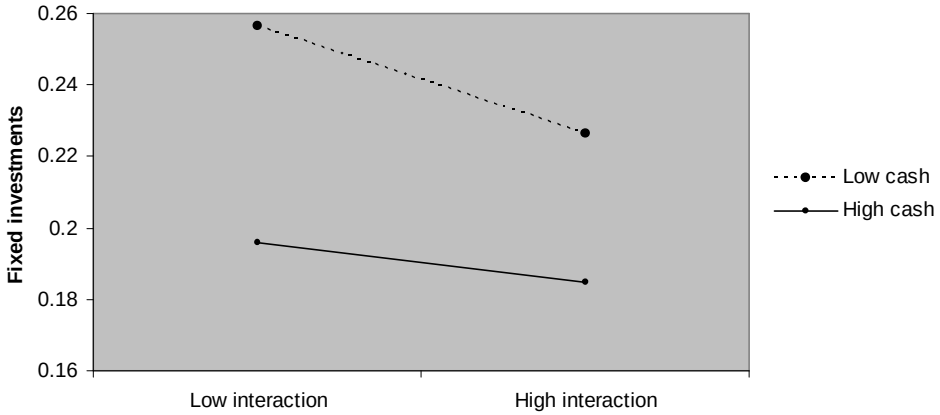

Figure 5: Interaction-effect of cash with short term debt-credit crisis interaction on fixed investments

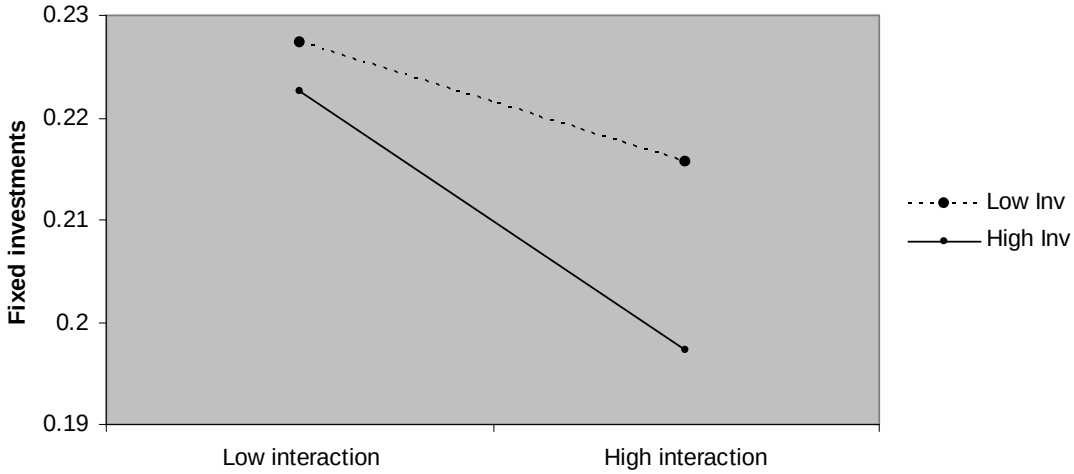

Figure 6: Interaction-effect of inventory with short term debt-credit crisis interaction on fixed investments

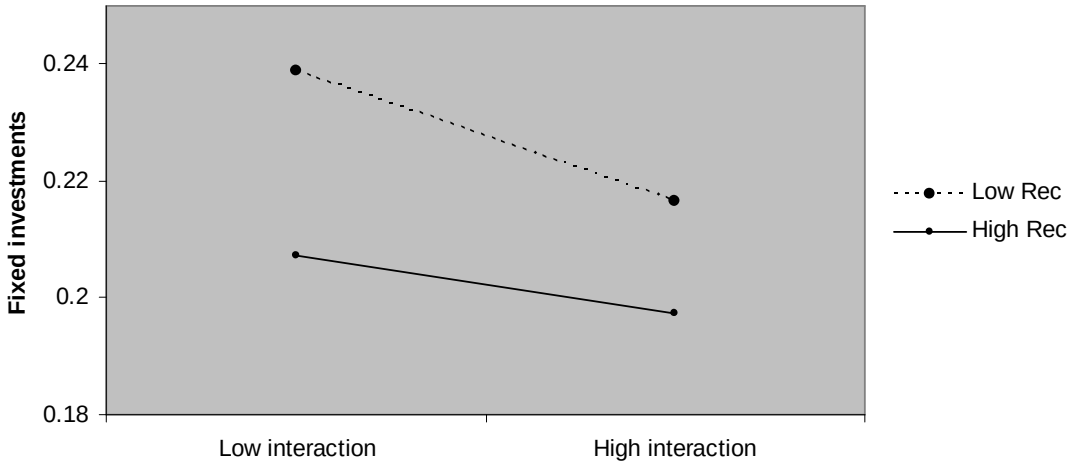

Figure 7: Interaction-effect of receivables with short term debt-credit crisis interaction on fixed

Appendix C Interview setup

Vooraf

1. a. Sinds wanneer bent u werkzaam binnen [Bedrijfsnaam]?
2. b. Bent u op de hoogte van de ontwikkelingen van [Bedrijfsnaam] tussen 2005 en 2009?

Investeren en financieren

3. a. Heeft [Bedrijfsnaam] een conservatief of agressief investeringsbeleid? i.a.w. houdt u buffervoorraden aan in de vorm van cash, voorraden of debiteuren?
   b. Is dit beleid tussen 2005 en 2009 veranderd? (meer of minder buffer?)
4. Zijn de investeringsmogelijkheden van [Bedrijfsnaam] veranderd tussen 2005 en 2009?
5. a. Heeft [Bedrijfsnaam] een conservatief of agressief financieringsbeleid? Meer kort of lang financieren (autonoom of extern opgelegd)?
   b. Is dit beleid tussen 2005 en 2009 veranderd? (meer kort of lang financieren)?
6. Ondervindt [Bedrijfsnaam] onder normale omstandigheden moeilijkheden met financieringen rond krijgen?
7. a. Heeft [Bedrijfsnaam] tijdens de kredietcrisis extra problemen ondervonden met financieren?
   b. Zowel, was dat vooral met kort of lang financieren?
8. Hoe zijn deze problemen opgelost?
   a. Door investeringen uit te stellen/ desinvesteren
   b. Minder dividend uit te keren
   c. Uit cash financieren
   d. Voorraden verlagen/ crediteuren later betalen?
   e. Debiteuren saldo te verlagen?
   f. Niet bankleningen aangaan?

g. Anders……..(belastingen)

9. Maakt u altijd gebruik van dezelfde financiers?

10. Hoe gaan de financieringsonderhandelingen met potentiële financiers?

a. zware onderhandelingen/ ontevreden financiers;

b. vriendelijk/ tevreden partijen.

Processen

11. a. Worden cashflow, voorraad en sales prognoses gemaakt?

b. Hoe vaak ontvangt u voor elk element hierboven management informatie? En is dit in lijn met uw informatiebehoefte?

Forecasted		**Frequentie**					
Cash	**behoefte**	Dagelijks	Wekelijks	Maandelijks	Kwartaal	Jaarlijks	Niet
	Werkelijk-heid	Dagelijks	Wekelijks	Maandelijks	Kwartaal	Jaarlijks	Niet
Voorraden	**behoefte**	Dagelijks	Wekelijks	Maandelijks	Kwartaal	Jaarlijks	Niet
	Werkelijk-heid	Dagelijks	Wekelijks	Maandelijks	Kwartaal	Jaarlijks	Niet
Sales/ verkoop	**behoefte**	Dagelijks	Wekelijks	Maandelijks	Kwartaal	Jaarlijks	Niet
	Werkelijk-heid	Dagelijks	Wekelijks	Maandelijks	Kwartaal	Jaarlijks	Niet

Extra vragen indien er tijd voor is.

Het inkoop process

12. Hoe wordt er omgegaan met leveranciers?
    a. Zware onderhandelingen, grote kortingen, ontevreden leveranciers;
    b. Vriendelijk overleg, kleinere kortingen, tevreden leveranciers.
13. Hoe belangrijk zijn de leveranciers voor de continuiteit/ winstgevendheid van het bedrijf?
14. Wanneer zijn grote leveranciers voor het laatst getendered/ Hoe veel tenders/RFP's worden er jaarlijks geschreven?
15. Wat is de evaluatie frequentie van de huidige leveranciers op markt conformiteit en in hoeverre presteren deze leveranciers in lijn met de initiële afspraken (in termen van kwaliteit, levering, logistiek en after-sales)?
16. Hoeveel leveranciers en dus crediteuren zijn er? Zijn schaalvoordelen mogelijk?

Het verkoop proces

17. Hoe belangrijk is het verkochte product/ dienst voor de continuiteit/ winstgevendheid van de klanten (supplier power voor het verkopende bedrijf dus)?
18. Welke trends/ontwikkelingen/nieuws is beschikbaar over klanten (en hun klanten)?
19. Wat is het remuneratie/ bonus systeem voor de verkoop afdeling (verkoop, gerealiseerde verkoop en gerealiseerde marges)?
20. Hoe voorkomt het bedrijf dat zijn belangrijkste producten commoditeiten worden?

Het voorraad proces

21. Hoeveel dagen/weken/maanden voorraad is vereist als veiligheidsvoorraad en wat is het huidige voorraad niveau?
22. Hoe hoof is het permanente voorraad niveau (vereist voor continue operaties)?
23. Waar is het KlantenOrderOntkoppelPunt? Wat betekent dit voor het voorraad niveau?
24. Hoe wordt de voorraad gefinancierd? Welke rol speelt de klant hierin (voor-/ nabetaling)?
25. Kunnen de kosten van het houden van voorraad worden doorberekend aan de klant?

Het facturatie proces

26. Hoeveel dagen duurt het om de factuur te maken na levering van het product/service?
27. Hoe veel orders (%) worden in een keer goed afgeleverd? Hoeveel credit notas worden maandelijks (als percentage van totale facturen)?
28. Wordt ere en periodieke analyse gemaakt van de oorzaken van credit nota's?
29. Welke factoren vertragen op dit moment het facturatie proces?
30. Weet commercie (verkoop, account managers) de facturatie eisen en de limitaties van het systeem?

Het proces van innen

31. Wat is de DSO en komt dit overeen met de contractuele DSO?
32. Hoe is de DSO te vergelijken met die van concurrenten?
33. Hoe ziet de age-analyse van crediteuren eruit?
34. Is er een vaste procedure voor het innen van geld?
35. Worden KPI gelinked aan 'ageing' en rekening gehouden met DSO in management rapportages?