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The determinants of working capital: empirical analysis of Dutch firms

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Colophon

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Summary This research gives evidence for the significance of the determinants for working capital requirement in the Netherlands for the period 2001 – 2010 via empirical research and depth interviews.

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Preface

Abstract

This Bachelor thesis investigates the determinants of working capital requirement and also the impact of the last financial crisis on these determinants. The study consist 8 of variables and a sample of 222 firms. The time frame is from 2001 till 2010 with a period for the financial crisis from 2007 till 2010. The conclusion of this study is that there is enough evidence for the following statements of Hill, Kelly, Highfield (2010):

(I) Sales growth, uncertainty of sales, costly external financing, and financial distress encourage firms to pursue more aggressive working capital strategies.

(II) Firms with greater internal financing capacity and superior capital market access employ more conservative working capital policies.

Acknowledgement

After writing this Bachelor thesis I am looking back to a period where I learnt many academic skills and business aspects. It was a period with many challenges but I found several solutions to these challenges. Furthermore, I would like to thank the people who give inspiring support and guidance. Firstly, I would like to thank my supervisor Dr. S. Gryglewicz for his academic support. Secondly, I would like to thank the two CEO's and the financial manager for their answer during the depth-interviews. These discussions were very useful and valuable for my research. Through these depth-interviews I could make a link from business view to empirical research. Finally I would like to thank my family and friends for their mental support. Now it is time for the next phase of my student life: my Master's degree.

Gert-Jan Breukink

Rotterdam, August 2014

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Introduction

Introduction

'Our models should be helpful to future research since they are the first to investigate the factors influencing the determinants of the net investment in operating working capital' (Hill, Kelly, Highfield 2010). This model gives me inspiration to use it for Dutch listed companies and also for research of the last financial crisis on working capital requirement. I have attempted to use the same research design as Hill, Kelly, Highfield (2010). Furthermore, I will add the variable financial crisis to the model to check the differences between a crisis period versus non-crisis period.

Problem definition

Main question

What is the impact of the last financial crisis on the determinants of working capital requirement?

Sub questions

- What are the differences in working capital requirement determinants? [Literature review]
- What are the determinants for working capital requirement in the Netherlands? [Empirical analysis]
- What are the differences in working capital requirement determinants between non-crisis period and crisis period in the Netherlands? [Empirical analysis]
- What is the opinion of financial managers on the determinants of working capital requirement and the impact of the financial crisis? [Depth-interviews]

Academic and financial relevance

During my student life I had the opportunity to speak many financial managers. These people were very interested in the flexibility of working capital therefore this topic is very relevant for business decisions. Next to the flexibility I am interested what business aspects drive working capital strategy. I hope to find these drivers through an empirical analysis. I would like to discuss the determinants of working capital requirement and the impact of the last financial crisis with financial managers parallel to my empirical research. Their view could help me to get a more complete understanding of the determinants and the last financial crisis. After completing these steps, this Bachelor thesis should give a better view of working capital strategies and their underlying thoughts from business perspective.

Structure

This research will consist of four sections. In the first section, I will do an academic literature review and I hope to find more information about the different working capital determinants. In the second section, I will make up my hypothesis on the basis of section I. In the third section, I will do an empirical analysis with data from Dutch listed companies. This analysis will be in the same modelling format as in the paper of M.D. Hill, W. Kelly, and M.J. Highfield. But I will also investigate the changes through adding the variable crisis versus non-crisis into the model and analyse the difference between the two periods. In the last section I will express the views of Financial Managers by having different depth-interviews. At the end I will finalize this research with a comprehensive conclusion and summary.

Literature review

Working Capital

Working capital is an important element of a company. The difference between the current assets and current liabilities is called the working capital or also defined as net working capital. This two elements of working capital can be found on the balance sheet. Current assets are the sum of cash, cash equivalents, short-term investments, inventories and work-in-progress. Current liabilities is the sum of trade payables and short-term debt and accrued liabilities (Berk, and DeMarzo 2011)

Results Studies Working Capital Requirement

In this research there is an analysis on the requirement of working capital through determinants of operating conditions (Sales Growth, Sales Volatility and Gross Profit Margin) and financing conditions (Operating Cash Flow, Market to Book ratio, Size, Market Share, Financial Distress). Moreover, I evaluate the differences caused by the last financial crisis.

Many studies have been done on working capital strategies. Table 1 shows the relations of different determinants on working capital. These determinants will be used in my empirical research and depth-interviews.

Table 1

Determinant	Effect on WCR	Study
<i>Sales Growth</i>	Firms with a lower sales growth rate use more trade credit than firms with a better sales growth. These firms use financial credit as they achieve their planned levels of sales.	Molina and Preve (2009)
	Petersen and Rajan (1997) found in their study a direct relation between payables and growth.	Petersen and Rajan (1997)
<i>Sales Volatility</i>	The study of Emery (1987) shows a relation that not all firms will have advantageous to a higher level of inventory in response to a higher level of sales volatility. Emery concludes that seasonality in the demand for the intermediate good causes the marginal revenue for sales in the peak period to exceed the marginal revenue for sales in the off-peak period. This differences represents the seller's indirect cost of accommodating variable demand.	Emery (1987)
	Their results indicate that there is investment reducing of accounts receivable when a firm has a shortage of cash. While excess cash does not affect trade credit policy in their sample.	Deloof and Jegers (1996)
	This papers shows a wide variation of credit terms across industry, but a little variation of credit terms within industries. So, there is not a significant a relation between fluctuations in the market demand to adjusting trade-credit.	Ng, Smith, and Smith (1999)
<i>Operating Cash Flows</i>	Love, Preve, and Sarria Allende (2007) found by doing an empirical research the following: Firms with high pre-crisis cash flow generation provide more financing to their customers both during and after crises.	Love, Preve, and Sarria Allende (2007)
<i>Market to Book ratio</i>	Firms which are difficult to value will pay a premium for external financing. The expectations are that firms with a high level of informational asymmetries pay higher rates for their credit.	Myers and Majluf (1984)
<i>Size</i>	There consist a relation between the receivables and the size of a firm. Petersen and Rajan (2009) found that firms with less access to financial credit use more trade credit.	Petersen and Rajan (1999)
	Deloof and Jegers (1999) tested the following hypothesis: Small firms will extend more trade credit than large firms. The result of the analysis was that there is not a significant relation between size and trade credit.	Deloof and Jegers (1999)
<i>Market Share</i>	Larger and more dominant firms use more financial credit instead of trade credit, smaller and less dominant firms increase their use of trade credit. This is a finding of the study of Molina and Preve (2009)	Molina and Preve (2009)
<i>Financial Distress</i>	There exist a strong evidence that distressed firms use more trade credit from suppliers than healthy according to Molina and Preve (2009). This statement is consistent with Petersen and Rajan (1997)	Molina and Preve (2009)
<i>Financial Crisis</i>	The conclusion of the study of Love, Preve, and Sarria Allende is that trade credit patterns shows a significant increase of trade credit at the peak of the financial crisis, followed by a subsequent collapse of this source of financing right after the crisis event. These results are found in a research with firms in emerging economies.	Love, Preve, and Sarria Allende (2007)

Table 1 shows see the major findings of recent studies. Sales growth is affecting working capital requirement inversely. The explanation of Molinea and Preve (2009) is that firms with a lower sales growth seem to need more trade credit than firms with a higher sales growth. The firms with a higher sales growth finance their working capital via financial credit.

Emery (2009) concludes that the sales volatility is correlated with working capital through the unpredictable demands. In contrast, Ng, Smith, and Smith (1999) find evidences that there is no relation between sales volatility and trade credit. So, there are conflicting results in the academic literature about the correlation of sales volatility and working capital requirement.

Love, Preve, and Sarria Allende (2007) investigated the operating cash flow, financial crisis and trade credit in emerging economies. They found that firms with higher 'pre-crisis' cash flows provide more financing to their customers than firms with lower 'pre-crisis' cash flows in the period before and after the crisis. So, cash flows and crises seems to affect working capital requirement.

Myers and Majluf (1984) did a research in informational asymmetries and the rates of trade credit. The conclusion is that firms, that are difficult to valuate, pay a higher rate of their trade credit than firms with a clear market value. There is an inconsistency in the academic literature about the explanation for the relation of size and working capital requirement.

Deloof and Jegers (1999) did not find any significant results for a correlation between firm size and working capital requirement while Petersen and Rajan (1999) found a relation between receivables and the size of a firm. Petersen and Rajan (2009) found that firms with less access to financial credit use more trade credit.

A higher market share leads to more use of financial credit while less dominant firms increase their use of trade credit. This an conclusion of the study of Molinea and Preve (2009). Another finding of Molinea and Preve (2009) is the strong evidence that distressed firms use more trade credit than healthier firms.

The academic literature gives an interesting view on the determinants of working capital. However some studies have inconsistent conclusions therefore further research on this topic is very relevant.

Financial Crisis

In the academic literature presents also find a lot of information about the last financial crisis. The study of Ivashina and Sharfstein 2009 shows useful statements regarding the financial crisis.

The banking panic in the fall of 2008 threw economies around the world into severe recession. The seeds of this panic were sown in the credit boom that peaked in mid-2007, followed by the meltdown of subprime mortgages and all types of securitized products. This meltdown, in turn, raised concerns about the solvency and liquidity of financial institutions, becoming a full-blown banking panic following the failures of Lehman Brothers and Washington Mutual, and government takeovers of Fannie Mae, Freddie Mac, and AIG (Ivashina, Scharfstein 2009).

The crisis had a big impact on the financial sector as well as the rest of world. Regarding, working capital it became much harder to get loans and other bank products. Banks had to revise their balance sheets due to crisis and government institutions set up new criteria for loans and this led to a decrease of new loans for businesses.

We begin by showing that syndicated lending started to fall in mid-2007, with the fall accelerating during the banking panic that began in September 2008. Lending volume in the fourth quarter of 2008 (2008:Q4) was 47% lower than it was in the prior quarter and 79% lower than at the peak of the credit

boom (2007:Q2). Lending fell across all types of loans: investment grade and non-investment grade; term loans and credit lines; and those used for corporate restructuring as well as those used for general corporate purposes and working capital (Ivashina, Scharfstein 2009).

Of course, the vision on the new loan criteria is understandably. However EBITDA of companies were declining so it became harder to meet the new criteria for loans because the EBITDA is important parameter for banks. This leads to the fact that operations in companies could be in problems because they did not have the ability to acquire enough working capital for their operations. During my research I would like to investigate this statement.

Hypothesis

Introduction

In the previous part there was an overview of the academic articles regarding this topic. In the following part the focus will be on the empirical research. Firstly, I will form sub questions out of the research question from a statistical point of view. Then I will come up with hypothesis that will be tested via empirical research.

Research Questions & sub question

‘What is the impact of the last financial crisis to the change of the drivers of working capital requirement of Dutch listed firms?’

Regarding the empirical research I will test the differences between non-crisis periods versus a crisis period for working capital requirement. Moreover, I will only focus on the Dutch listed companies and I will exclude financial and utility companies in my sample.

From these points of view I came up with these sub questions:

- What are the determinants for working capital requirement in the Netherlands?
- What are the differences between non-crisis period and crisis period in the Netherlands?

Hypothesis

The sub questions above will be tested under the follow hypothesis:

- What are the determinants for working capital requirement in the Netherlands?
- What are the differences in working capital requirement determinants between non-crisis period and crisis period in the Netherlands?

Research design

Introduction

This section explains the research design of this study. The research design is based on the previous study paper Hill, Kelly, Highfield (2010). Therefore there will be summary of that research design and this will be followed by the explanations of the research design that is used in this study.

Research design in the paper Hill, Kelly, Highfield (2010)

The dataset of the paper Hill, Kelly, Highfield was collected from Compustat. They used a time frame from 1991-2006 however in their analysis they only focused on the period 1996-2006. Their criteria to include data of a firm were that they had at least three appearances in the panel during five-year period preceding a given year. The financial and utility companies have been disregarded in the dataset. This led to a sample with a total of 20,710 firm-year observations for 3,343 unique companies from 1996 to 2006.

Hill, Kelly and Highfield used the following variables:

Dependent variable:

- Working Capital Requirement (WCR): ratio of receivables plus inventory minus payables to sales at the end of each year

- $$WCR = \frac{\text{Receivables} + \text{Inventory} - \text{payables}}{\text{Sales}}$$

Explanatory variable:

- Sales Growth: change in sales over the previous year

- $$\text{Sales_Growth} = \frac{\text{Sales}_t - \text{Sales}_{t-1}}{\text{Sales}_t}$$

- Gross Profit Margin (GPM): ratio of sales minus cost of goods sold to sales

- $$GPM = \frac{\text{Sales} - \text{Cost of Goods sold}}{\text{Sales}}$$

- Sales Volatility (Sales_Vol): standard deviation of sales

$$\circ \text{ Sales_Vol} = \sqrt{\frac{\sum(Ri-\bar{R})}{N}}$$

- Operating Cash Flow (OCF): Operating income before depreciation minus taxes as a percentage of net assets

$$\circ \text{ OCF} = \frac{\text{EBITDA}}{\text{Net assets}}$$

- Market to book Ratio (M/B): ratio of market value of equity plus total liabilities minus payables to net assets

$$\circ \text{ M/B} = \frac{\text{Market Value Equity} + \text{Total Liabilities} - \text{Payables}}{\text{Net assets}}$$

- Size (Size): is sales times (log sales)

$$\circ \text{ Size} = \text{Sales} * (\ln \text{Sales})$$

- Market share (MktShare): is sales divided by the aggregate sales in the firm's industry.

$$\circ \text{ Market Share} = \frac{\text{Sales}}{\text{Aggregate sales in firm's industry}}$$

- Financial Distress (Distress): is applicable in case a firm meets Molina and Preve's (2009) definition of financial distress. The definition is as follows:

- Having an coverage ratio calculated as operating income before depreciation divided by interest expense less than one for two consecutive year or less than 0.8 in any given year
- A firm is considered overleveraged if its leverage ratio is in the top two deciles of its industry's leverage ratio in a given year.
- If a firm meets both conditions in a given year, then distress t-1, an indicator variable, equals one and zero otherwise

The result of the research of Hill, Kelly, Highfield in their model is an evidence of strong relationships between net operation working capital and financing capabilities. Working capital requirement has a got a correlation with operating cash flows and size and a inversely relation with financial distress. Their conclusion is that firms with weaker internal financing, low capital market access and high cost of external financing will have an aggressive working capital requirement strategy.

Research design in this study

In this research, I want to empirically investigate the working capital requirement in the Netherlands. The format of the model that has been used is basically the same as the format in the research of Hill, Kelly, Highfield. Differences in the format are the region where the companies are based. So, in this research the focus is on the Netherlands while in the other research the focus was on the USA. The sample consists all Dutch listed companies without the financials and utility companies. Moreover, in this study there will be an extra variable. This variable is a dummy variable of the last financial crisis. This dummy variable got a value 0 from 2001 – 2006 and from 2007 till 2010 this variable has got a value of 1.

The variables of the empirical study are¹:

Dependent Variable:

- WCR

Explanatory Variable:

- Growth
- GPM
- Sales_Vol
- OCF
- Size
- Market share²
- Financial Distress

¹ More information about the variables can be found at page 10

² Market share is defined via the Fama & French 12 industries classification

Extra explanatory variable

- Financial Crisis

Data Collection

The sample is based on Dutch listed companies on the period from 2001 till 2010. These companies are the largest companies from Netherlands and the information is easily accessible. Furthermore, I have excluded the financial and utility companies to get the same format as the study of Hill, Kelly and Highfield. The total sample consist 222 companies and 609 observations. The distribution of the industries of the companies can be found in the table 2 below.

Table 2

The industry and number of firms of the sample

Industry	Number of firms
1 NoDur Consumer NonDurables -- Food, Tobacco, Textiles, Apparel, Leather, Toys;	23
2 Durbl Consumer Durables -- Cars, TVs, Furniture, Household Appliances;	10
3 Manuf Manufacturing -- Machinery, Trucks, Planes, Off Furn, Paper, Com Printing;	35
4 Enrgy Oil, Gas, and Coal Extraction and Products;	10
5 Chems Chemicals and Allied Products;	12
6 BusEq Business Equipment -- Computers, Software, and Electronic Equipment;	56
7 Telcm Telephone and Television Transmission;	9
8 Utils Utilities;	0
9 Shops Wholesale, Retail, and Some Services (Laundries, Repair Shops);	18
10 Hlth Healthcare, Medical Equipment, and Drugs;	1
11 Money Finance;	0
12 Other Other -- Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment;	48
Total	222

Data was gathered by using two data systems. First of all, I have used Bloomberg for finding Dutch listed companies with corresponding ISIN-codes. The second step was using Compustat for finding the information regarding the variables for empirical analysis. The Compustat codes are given in the table 3 below.

Table 3

Compustat mneomic and codes

Variable	Codes
Accounts Payable	AP, A70
Total assets	AT, A6
Cash and Short-term investment	CHE, A1
Cost of Goods Sold	COGS, A41
Debt-convertible total	DCVT, A79
Invetory	INVT, A3
Total Liabilities	LT, A181
Operating income before depreciation	OIBDP, A13
Preferred Stock	PSTK, A130
Receivables	RECT, A2
Sales	Sale, A12
Deferred taxes-income account	TXDI, A50
Income Taxe-Total	TXT, A16
Interest Expense	XINT, A15

The last step was importing the data into Eviews. I have created a panel data workfile wherefore I could start the empirical research and that will be discussed in next chapter.

Empirical findings

Introduction

After formulating the hypothesis of the research and collecting the data, I started with the empirical analysis in Eviews. This chapter consists of the following parts; formula, descriptive statistics, regression analysis, pearson correlation coefficients and the interpretation of empirical findings

Formula

WCR 1:

In Eviews there will be an analysis of working capital requirement without the dummy variable financial crisis. The formula will be as follows:

- $WCR\ 1 = c(1) + c(2) * Sales\ Growth(-1) + c(3) * Sales\ Vol + c(4) * Size(-1) + c(5) * OCF(-1) + c(6) * GPM(-1) + c(6) * Market\ Share(-1) + c(7) * Distress(-1)$

WCR 2:

In Eviews there will be second analysis of working capital requirement with the dummy variable financial crisis. The formula will be as follows:

- $WCR\ 2 = c(1) + c(2) * Sales\ Growth(-1) + c(3) * Sales\ Vol + c(4) * Size(-1) + c(5) * OCF(-1) + c(6) * GPM(-1) + c(6) * Market\ Share(-1) + c(7) * Distress(-1) + c(8) * financial_crisis_dum + c(9) * Sales\ Growth(-1) * dum + c(10) * Sales\ Vol(-1) * financial_crisis_dum + c(11) * Size(-1) * financial_crisis_dum + c(12) * OCF(-1) * financial_crisis_dum + c(13) * GPM(-1) * financial_crisis_dum + c(14) * Market\ Share(-1) * financial_crisis_dum + c(15) * Distress(-1) * financial_crisis_dum$

Descriptive statistics

In this part the descriptive statistics will be discussed.

WCR 1 – Descriptive statistics

Table 4 shows the descriptive statistics of the 609 observations across 222 unique companies over the period 2001-2010. The mean of the dependent variable WCR is approximately 57,6 %. WCR is a ratio to total assets so the WCR of 57.6% means that \$0.58 of each euro in sales is tied-up in net operating working capital.

The median of the Sales Growth is 0.07 with a mean of 0.06. The values for the lagged Sales Volatility are a mean of 2195.38 and a median 215.98. The lagged GPM and lagged OCF values are respectively a mean of 0.36 and 2451.95, the media is 0.35 and 59850.35. The mean of the lagged market share is 0.11 and the median is 0.14. The value of the mean of the lagged Size is 111749.50 and the average is 9039.50. The last variable is distress with a mean of 0.02 and the average of 0.00.

Table 4

Descriptive Statistics

Variable	N	Mean	Standard Deviation	Minimum	Median	Maximum
WCR	609	0.57635468	0.117271555	0.099037139	0.366914628	0.788132386
SALES_GROWTH	609	0.073484068	0.239127273	-0.707354634	0.056692308	2.183062002
SALES_VOL	609	2195.377196	7341.977921	0	215.9787043	94663.80036
Size	609	111749.4959	324798.9866	-0.366269172	9039.495735	2632459.218
OCF	609	2451.947189	8314.18714	-271.856	97.772	59850.348
MARKET_SHARE	609	0.107047215	0.219117685	5.12E-06	0.142395623	0.013058946
GPM	609	0.360191444	0.162754544	0.024805275	0.347136327	0.744560644
DISTRESS	609	0.02134647	0.144655307	0	0	1

Regression analyses

In this part the results of regressions will be discussed firstly the part of the regression WCR 1 and thereafter the part of WCR 2.

WCR 1 – Fixed effects results

The results of the regression of the formula WCR 1 can be found in table 5. The model evaluates the determinants on working capital requirement over a sample of 222 unique firms in the Netherlands over the period 2001-2010.

Table 5

Fixed Effects Results				
Variable	WCR			
	Coefficient	t-Statistic	Prob.	
Sale_Growth	*** 0.047997	0.016778	0.0044	
Sales_Vol	0.000001	0.0000015	0.5726	
GPM	** 9.54E-08	3.99E-08	0.0173	
OCF	*** -0.0000586	0.00000141	0.0000	
MktShare	* 0.058714	0.031258	0.0609	
Size	** 0.068645	0.030684	0.0257	
Distress	-0.042813	0.035413	0.2272	
Observations	609			
R ²	0.069737			

*** Significant at the 0.01 level
** Significant at the 0.05 level
* Significant at the 0.10 level

WCR 1 – Fixed effects results – Lagged Sales Growth

The significant level of lagged Sales Growth on WCR is below 1% with a positive coefficient of 0.05. The positive correlation is not consistent with the study of Hill, Kelly, Highfield (2010) and the study of Molina and Preve's (2009). The statement of Molina and Preve's was that firms tighten their credit policy as they achieve planned levels of sales growth. The finding of study of Hill, Kelly, Highfield (2010) is the theory that firms with lagged positive sales growth reduce their investment in net operating working capital, while negative sales growth has a positive effect on the working capital requirement. In the sample that is used for this research I find the opposite. So, Dutch listed companies invest in their working capital when there is a positive lagged sales growth. Hill, Kelly, Highfield (2010) have made subsamples in their empirical findings. In these subsamples manufacturing and service have got a negative correlation on WCR but retail has got a positive correlation on WCR. The difference in total

sample of Dutch listed firms versus sample of Hill, Kelly and Highfield (2010) could explain the inconsistent findings.

WCR 1 – Fixed effects results – Sales Volatility

The estimated coefficient of Sales Volatility is very small and not significant. My expectation was that the coefficient was negatively correlated on WCR as seen by of study of Hill, Kelly, Highfield (2010). However in my dataset I cannot find this result. It seems quite logical that financial managers have got a more aggressive working capital strategy in periods with high sales volatility. During the depth-interviews there will be more discussion about this determinant.

WCR 1 – Fixed effects results – Lagged Gross Profit Margin

The significant effect of lagged Gross Profit Margin on WCR is positive but extremely low. Hill, Kelly, Highfield (2010) could not find a significant effect of the determinant. So, my consideration is to exclude the determinant in the model.

WCR 1 – Fixed effects results – Lagged Operating Cash Flows

The WCR is very low negative correlated with sales volatility with a high significance level. The impact of lagged operating cash flows is very small negative in my model in contrast with model of Hill, Kelly, Highfield (2010). The result of Hill, Kelly, Highfield (2010) is a coefficient of 0.023 and significant at the 0.01 level. This result suggests that firms with lower operating cash flows have a more aggressive working capital strategy.

WCR 1 – Fixed effects results – Lagged Market Share

In the study of study of Hill, Kelly, Highfield (2010) lagged market share was not significantly related and these results were not expected. The results of regressions show a coefficient 0.06 with a probability value of 0.06. This result can be explained through the better market power of firms with a higher market share. In other words, firms with a higher market share have more negotiation power for working capital requirement. This leads to easily adoption of working capital strategy by firms with a higher market share.

WCR 1 – Fixed effects results – Lagged Firm Size

My expectation of lagged firm size is that larger firms have more power for capital market access. The empirical model confirms this expectation because the determinant is significant and has a coefficient of 0.07. This means that size has got impact on WCR.

WCR 1 – Fixed effects results – Lagged Financial Distress

In the model of the study of Hill, Kelly, Highfield (2010) WCR is negatively related to financial distress. The coefficient of financial distress in my model is also negative but the coefficient is not significant. Molinea and Preve (2009) confirmed that financially distressed firms have significant reduced levels of trade credit relative to their non-distressed counterparts. The economic explanation for the result of Molina and Preve (2009) is that distressed firms have limited access to capital market and therefore these firms cannot easily change their working capital strategy.

WCR 2 – Fixed effects results

Table 6 is presenting the result of the second WCR formula. The second WCR formula is investigating the impact of the last financial crisis on the determinants of working capital requirement. In this regression there is an extra dummy variable with the value 1 for period 2007 – 2010 and the value 0 for the period 2001-2006.

Table 6

Fixed Effects Results

Variable	WCR			
	Coefficient	t-Statistic	Prob.	
Sales_Growth	*** 0.3807	13.7325	0.0000	
Sales_Vol	0.0343	1.4767	0.1409	
GPM	0.0000	0.5303	0.5963	
OCF	0.0000	1.4574	0.1461	
MktShare	* (0.0000)	(1.9381)	0.0536	
Size	(0.0134)	(0.1950)	0.8455	
Distress	0.0718	1.3485	0.1786	
Growth * Financial Crisis	(0.0352)	(1.0364)	0.3009	
Sales_Vol * Financial Crisis	0.0356	1.4267	0.1548	
GPM * Financial Crisis	(0.0000)	(0.0115)	0.9909	
OCF * Financial Crisis	(0.0000)	(0.9189)	0.3589	
MktShare * Financial Crisis	(0.0000)	(0.3512)	0.7257	
Size * Financial Crisis	0.0946	1.0582	0.2909	
Distress * Financial Crisis	(0.0876)	(1.1741)	0.2414	
Oberservations	609			
R ²	0.101462227			

*** Significant at the 0.01 level
 ** Significant at the 0.05 level
 * Significant at the 0.10 level

Adding the dummy variable financial crisis to the model has a big impact on the probability levels of determinants. My expectation was that there would be a significant difference between working capital requirement before the last financial crisis and during the financial crisis. This difference cannot be significant measured in this model. I still belief that there should be a difference in working capital strategies between a crisis period versus a non-crisis period. Unfortunately, this model cannot be used to give this explanation. Further research should be done to give a better understanding to the impact of the financial crisis on working capital requirement. However I will discuss the impact of the financial crisis during my depth-interview and I hope to find more explanation about the impact of the last financial crisis on working capital requirement

Pearson Correlation coefficients

In this part the results of Pearson Correlations Coefficients will be discussed.

Pearson Correlation coefficients

Table 7 provides us the values of the Pearson Correlation Coefficients. The values are not highly correlated therefore there is not a collinearity problem. However not all values are similar to the values in study of Hill, Kelly, Highfield; 2010. The explanation of these differences will be further discussed in next part, the interpretation of empirical findings.

Table 7

Pearson Correlation Coefficients

Variable	WCR	SALES_GROWTH	SALES_VOL	GPM	OCF	MARKET SHARE	SIZE	DISTRESS
WCR								
SALES_GROWTH	-0.034316712							
SALES_VOL	0.098978897	-0.011485573						
GPM	-0.04814004	-0.04804591	0.175316331					
OCF	-0.038435778	0.045739366	0.189553531	0.62758614				
MARKET_SHARE	-0.0064194	-0.076091663	0.032596768	0.052240723	0.005734774			
SIZE	-0.040156059	-0.025824516	0.046998406	0.604901245	0.681794433	0.01121049		
DISTRESS	-0.041255664	0.042400341	0.116927823	0.701914555	0.907058585	0.002987617	0.838360808	

Summary of empirical findings

The results of the regression WCR 1 are shown in table 5. The determinants sales growth, market share and size have a positive and significant effect on WCR. GPM have also positive effect and significant but the effect is very small. The effect of OCF on working capital requirement is also small but the effect is negative. The impact of financial distress and sales volatility is not significant in the model.

Table 6 shows the results of WCR 2. The effect of sales growth and market share is significant and the other variables are not significant. Therefore I cannot give an explanation of the impact of the financial crisis on working capital requirement and its determinants.

The empirical findings of my research are not exactly similar to study of Hill, Kelly, Highfield 2010. The determinants sales growth, operating cash flow, market share and size are significant in my research. In the results of Hill, Kelly, Highfield 2010 the determinants sales volatility and financial distress are also significant. Moreover the sign of the effects of sales growth and market share are also not exactly the same. The difference in sample size and unique companies and periods can explain these

inconsistencies. So, in the academic literature there are also different explanations for working capital requirement. The determinants will be discussed during the depth interviews in the following parts. After completing these depth-interviews I hope there will be a better understanding of explanation of working capital via the determinants.

Depth-Interviews

Introduction

This chapter deals with the results of my depth-interviews. First of all, I will show the questions which were asked during the interviews. Then I will give an overview of the results of the interviews. The last part of this chapter is a short summary of the results that are given in previous part.

Design depth-interview

The interviews have been held with different managers with a responsibility in working capital. One of the interviews was with a financial manager with a specialization in working capital and the other two interviews were with the CEO of the company. The duration of the interviews was about 45 minutes. I started with a introduction of the topic where I shortly explained the goal of my research, the different determinants and the two important statements of working capital requirement found by Hill, Kelly, Highfield. These statements are:

(I) Sales growth, uncertainty of sales, costly external financing, and financial distress encourage firms to pursue more aggressive working capital strategies.

(II) Firms with greater internal financing capacity and superior capital market access employ more conservative working capital policies.

After this short introduction there was a discussion with the follow questions

- What is the working capital management strategy?
 - How often do you change the strategy?
 - Aggressive versus conservative strategy
- Discussion about the determinants of working capital requirement
 - Sales_Growth
 - Did you see changes in the working capital strategy when your firm was in high versus low growth period?
 - Sales_Vol
 - Did you see changes in the working capital strategy when your firm had a high versus low Sales Volatility?
 - GPM

- Did you see differences in working capital strategies in periods with higher versus lower Gross Processing Margins ratio's?
- OCF:
 - Did you see differences in working capital strategies in periods with higher versus lower Operating Cash Flows?
- M/B
 - What is the effect of M/B ratio (over- / undervalued firms) on working capital strategies?
- Size:
 - Did the size of your firm affect the working capital strategy?
- Market Share
 - Did the market share of your firm affect the working capital strategy?
- Distress
 - What is your vision about the working capital strategy of financial distressed firms?
- Financial Crisis
 - What is the impact of the last Financial crisis on working capital strategies?
- Future
 - What are you expectations regarding working capital strategies for the future?

Participating companies

Results Company A

Working Capital Strategy

Company A has got a recently a big change in their working capital strategy. The CEO mentioned that the elements in the statements of the academic literature have got a serious impact on working capital requirement. However there is missing one element namely the differences in the payment conditions. In our business these payment condition are really important. During our production process we are buying different elements (e.g. steel, motors, electronics) to build a vessel. Normally the client was paying on progress payment. This means that the client is paying upfront a fixed amount of around 10% of contract value, in the next phase the client is paying again a fixed amount at different milestones (e.g. placing engine) and then the client has to pay for the test run with the vessel and the last part is paid upon the completion of the vessel. The CEO has seen changes in payment conditions because clients do not pay on progress base anymore. The payment conditions are 10% up-front and 90% by completion now. This change has got a big impact on working capital requirement. This difference you

can see all over the world for example in the car industry. You can buy a car now and pay one year later. This new payment condition results in a capital need.

When Company A recognized these other payment conditions, they had to adapt drastically the working capital strategy. The CEO said: ‘Formerly, we had a consortium of five banks and there we had our credits lines. Now, we have also some credit lines at different banks but also new products, which are especially used in Germany and called “schuldschein”³. This new strategy results in a credit line with a longer maturity. Another point of the new strategy is the new way to finance the new wharfs. Originally they were financed through equity capital but now they are financed with debt so the leverage for the new wharfs is higher. Through this new method of financing an extra 100 mln became available for working capital in our firm.

Finally, the CEO mentioned that the cost of funding was very low the last years. The euribor is 0.3 % at the moment. The problem with negotiations with the banks was the availability of the funds. The negotiations with the banks were pretty tough however the new strategy is nearly fully implemented.

Sales Growth

Yes this determinant has an impact on working capital requirement. The big issues were the changing payment conditions, and the growth in the sales of the last years. Both situations lead to a higher working capital requirement.

Sales Volatility

A big fear of the CEO was a high sales volatility in an unexpected situation like 9/11. However the CEO told that they did not have any business problems after this situation. The CEO can imagine that a buyer’s strike can have an enormous impact on working capital during a situation like 9/11. Company A has got a production process of 6 months where we cannot stop the process. ‘Its like a train that can’t stop’. Moreover we have to pay the salaries and other suppliers so this can have a big impact on working capital requirement.

³ Schuldschein: is a equivalent of a private placement. It is a unlisted bilateral loan and the benefits are the same as US private placement (competitive pricing, longer tenures, accessible to smaller borrowers, diversification of lender base and no formal rating requirement)

Gross Processing Margins (GPM)

No, GPM has not a real effect on working capital requirement. The margins are pretty the same in the last years. Also the profit is really constant. The lowest earnings were 60 mln EBIT en the highest 110 mln EBIT in the last years. So, after taxes the differences between these are about 30 a 40 mln.

Operating Cash Flows

No, it's like the same story as GPM.

When we have discussion with financing partners (e.g. banks) the determinant that we like to show is the sales growth. Off course we need to clarify this sales growth with underlying EBITDA. But I can say we mainly focus on the sales growth in this kind of conversations.

Market to Book ratio

Company A is a family business therefore we do not measure this determinant. It is not relevant to us.

Size

The CEO of Company did not see a relevant link of size to working capital requirement.

Market Share

Company A is worldwide company that focuses on the niches in the market. Company A does not use the determinant market share to develop their working capital strategy. However it is an interesting variable and maybe we are going to use this variable in the future.

Company would like to have the biggest market share in their business. When we are market leader we can determine the market in terms of prices, standards and other aspects. However when you are market leader and there are problems in the market, you will have the biggest problems at first. Despite of that fact, we would like to be market leader to invest more in our R&D with as result a lower cost price and more profit.

Within this strategy for market share the CEO does not see any direct relations with working capital.

Distress

Company A was not distressed as defined via Molinea and Preve (2009).

Financial Crisis

The difference in payment conditions is linked to the financial crisis. Furthermore the financial crisis did not have a big impact on our sales. There was a small decrease in sales but not measureable in our profits. This can be explained by our strong diversification in our products and in geographic markets. We saw a big impact of the financial crisis on West-Europe and the USA and our target markets are outside these countries.

So, I can say that we have a conservative working capital strategy. This strategy is also normal in our business because we build vessels with a delivery period of 4 a 5 years. An aggressive working capital strategy does not have a big impact in this kind of projects.

Future

After the change in payment conditions Company A is closely involved in changes of working capital requirement. The CEO said: ‘We are awakened. Before the changes in payment conditions we had around 100 mln in cash and you do not check your working capital every moment. However when the situation was changing in very fast period, you will be focused on working capital requirement. We have decided to assess the working capital requirement more often and to evaluate the structural solutions.’

Results Company B

Working Capital Strategy

Company B is a manufacturing firm that produces bags with a size of 25 liter especially for industrial processing. The bags are used for the potting soil for professional gardening but also individual customers. Moreover the bags are also used for packaging of milk powder. A challenge of these milk powder bags is the new hygiene criteria for the future. Company B is originally started with making paper bags and they are now also producing polyethylene bags.

‘Our business is quite straight forward’ said the CEO of company B. We make customer-specific bags and therefore we always know the buyer of the produced bags beforehand. Therefore we do not have

products in stocks. The downside is that we are not flexible when a customer decides to not take delivery of the ordered bags for any reason.

Company B has had a tough period for the last years. Twelve years ago, there was a verdict of the European Competition Authorities because of cartel in this industry. The European Competition Authorities gave Company B an unjustified penalty. Moreover the operating results were declining. At the end Company B ran into problems and the banks made restrictions for their credit lines. When Company B was having a higher sales volume they were not able to buy enough resources to produce it because of the restrictions of the banks. The CEO of company B said: 'It was a situation of surviving and therefore we could not make a strategy for the far future.' The customers of company B were not aware of these problems so from that side there were problems.

Finally company B out-argued the unjust punishment and was compensated by the European Competition Authorities. The total amount of the penalty was refunded so it became possible to make an investment in a new machine. The financing of the machine was also done for 50% by the firm.

Another aspects in the working capital are the debtors and creditors. Company B has seen changes in payment conditions in the last years for especially the debtors. The debtors have got a big impact on the firm because of their market power. These firms set the payment conditions and these firms postpone the payments last years. However the company B intensively tried to cash the debtors as early as possible. When company B buys their raw materials they can get a discount when they pay earlier (e.g. minus 3% for 14 days earlier). The other main creditors are utilities suppliers, insurances and taxes. These are fixed payment terms without any flexibility.

The last point that the CEO mentioned was the postponing of salary payments. First the employees received their salaries on the 20th of the month, now they received it on the last day of the month. This creates more working capital.

Sales Growth

Company sees a direct relation between working capital and growth. A higher or lower sales volume will increase or decrease or working capital requirement immediately. For example, when we would like to finance an extra order we need extra working capital. This process is working vice versa so we decrease our working capital in a period with a low sales volume.

Sales Volatility

Typical for this business is also the seasonal trend. We produce 30% more when the weather is good in the spring. Then customers are buying more potting soil and the sales volume rises. So, the CEO of Company B sees a relation between sales volatility and working capital requirement.

Gross Processing Margins (GPM)

Yes, gross processing margins are correlated with working capital requirement. When we produce plastic bags we buy the raw product polyethylene. This is an oil product and also very volatile. Company B did a study of the predictability of polyethylene price with the oil price, dollar exchange rate and some other determinants. Nevertheless there was not a significant correlation so they cannot use this information for a buying decision. Moreover there are not derivatives in this product so you cannot protect yourself to price changes. Nowadays Company B is talking to customers and tries to make a payment condition where the customers pay the price of the raw materials at the time of producing the order. Through this construction there is no price risk anymore and they can reduce their working capital need.

Operating Cash Flows

This determinant is not really important. We only adjust our working capital requirement in a period of very low EBITDA. The CEO said; 'We have a little room in our working capital strategy so we have response fast in a situations of low EBITA.'

Market to Book ratio

Company B does not check the M/B ratio because there are financed as: 'Commanditaire Vennootschap'.

Size

Yes this determinant is correlated with working capital requirement. A bigger firm has easier access to working capital nevertheless we did not have any problems financing the firm the last year. The banks are looking seriously to company B and they are willing to finance the company at the moment.

Market Share

The market share of company B is small however this is an advantage in the market. There are a few big players in the market but they are not flexible. Company B can be very flexible and we decide much faster than the bigger players in the market. Moreover we can provide very good technical support. In the market of industrial bags you also see that customers do not like single sourcing so customers buy bags from different suppliers. Regarding working capital requirement the CEO did not recognize any specifics.

Distress

Company had a distressed moment during the crisis. Firstly they got an unjustified penalty of the European Competition Authorities, moreover the sales dropped. This was a period with a lot of challenges and also in the working capital policies as discussed earlier.

Financial Crisis

The financial crisis is directly linked to the distressed moment.

Future

The strategy for working capital requirement is hardly to predict. The CEO is making a plan for 2016 – 2017 where he focuses on a higher EBITDA. The working capital requirement will be higher when the EBITDA rises. Moreover we are more often tracking our working capital in the raw materials. We do not want to speculate in the raw materials so we are looking for different solutions. The plan is not finished yet so the strategy is not defined concretely.

Results Company C

Working Capital Strategy

Company C is a group of various business units operating in the energy industry. There is a business strategy for company C, but this strategy is at enterprise level. Working capital strategy is set at business unit level, due to the difference in operations between the business units. Company C chooses to balance cash generation from existing assets, with cash investment for future assets/assets under construction.

Due to the long lead times of project delivery (up to 10 – 20 years), and the desire for a robust balance sheet and resulting credit rating, the preferred financing method is via internal cash generated from ongoing operations. Moreover the cash flows from existing assets are also used for the payment of dividends and operating costs.

The opinion of the Finance Manager of company C is that they need a conservative working capital strategy because their shareholders (mostly institutional investors) attach great value to steady returns. By demonstrating ability for predictable and stable performance for the longer term, Company C intends to drive a ‘future-proof’ strategy.

Company C tries to make contracts with suppliers with standard terms of conditions. Company C is big enough to get favorable terms when negotiating with suppliers. Where applicable, the business units use the enterprise level framework agreements for contracting. Thereby they make use of the negotiating power of the entire company, not just the individual business unit (economies of scale). The payables under these contracts will be done automatically on the last day of the agreed payment terms via the ERP system. Company C tries to receive the cash of creditors as soon as possible, however these partners have also developed their cash management and pay at the latest moment.

Sales Growth

Due to the nature of oil & gas extraction, increasing sales through production is not straightforward, as asset design production limits set the upper boundary. Generally energy companies will always try to optimize production to get healthy cash returns and pay back the asset as soon as possible. Increasing sales through price is also not straightforward, as the price of oil & gas is set by the market, not individual companies. Fortunately demand for energy generally outstrips supply, so production can usually be sold externally or internally for upgrading.

Sales Volatility

The determinant Sales Volatility is the same story as the determinant Sales Growth in the opinion of the Finance Manager.

Gross Processing Margins (GPM)

When we are looking to the determinant GPM in the oil industry you see a cap of the margins because of the oil prices. We are not able to change this oil price per barrel. However, we can affect the product

slate through the refinery and petrochemical plants. We can check which products have favorable margins at the moment and then focus more on these products. There is also a big drive to continually reduce operating costs.

The link of GPM to working capital is hard to explain because GPM is driving through the P&L. We plan our profit and associated risks, working capital requirements flow from this plan.

Operating Cash Flows

‘We are in a luxurious position because we are generally a cash rich company’ said the Financial Manager. New projects can then be funded through internal financing. The company evaluates a project opportunity for value. When value is established, a legal entity is usually setup in the country of the investment project for tax reasons (if not already available). The treasury of company C handles the funding of the legal entity. We can apply this strategy because we have many assets with steady cash flows. Therefore we can internally finance our working capital requirements and other investments.

Market to Book ratio

Market to Book ratio is not a relevant determinant for Company C because not all the entities are listed.

Size

Size is an important determinant because with a higher firm size you are able to get economies of scale. Company C is a big firm therefore we can diversify our projects and manage risk. When you are a one-project company you can get in problems with your working capital when the return of the project is declining. Through our diversified portfolio we have a steady income and which allows us to plan for the future.

Market Share

The market share determinant for working capital requirement is generally less applicable in the upstream business, but in the downstream business the determinant market share can affect working capital requirement. The downstream is a B2C & B2B business, like retail or lubricants, and in these businesses market share is important. Market share is a function of sales in terms of the total market. As such, it is hard to say something about the market share and its relation to working capital requirement for the whole company.

Distress

Company C is not a distressed firm.

Financial Crisis

The crisis has made a big impact for many companies around the world. The energy industry is equally affected by the crisis. Especially companies with external financing are affected by the crisis due to the reduction of credit available to the market. The working capital strategy of Company C is mainly focused on internal financing so we could arrange a lot within the company. We saw the effects of the crisis particularly with our customers and suppliers and their ability to pay, and through decline in product demand.

Future

Our strategy needs to be future proof, understandable and acceptable. I do not expect any major changes in the near future because our strategy was recently updated. However, should the oil price show extreme drops, to a level of say 50 dollar per barrel, than we may need to revise our strategy as some new investment projects would become uneconomical.

Summary Results Depth-interviews

The working capital strategy of the three companies can be considered as conservative. The strategy of company A has recently changed and is driven by the determinant which is not included in the research namely changing payment conditions. Company B was in a distressed situation through decline EBITDA and an unjustified punishment and these situations where the driver of working capital strategy the last years. Company C has a strategy for working capital requirement that is based on internal financing.

Company A and B see a direct relation between sales growth and working capital requirement while Company C does not see this relation. The CEO's of Company A and B said that sales growth had a positive correlation on working capital requirement. Sales volatility is also not a determinant for company C instead of company A and company B. Company A is afraid for a high sales volatility during a situation like 9/11. Company B is affected by high sales volatility through seasonal effects. Company A and company C do not see a relation with GPM and working capital requirement. Company B mentioned that the prices of raw materials are important driver for the business and likewise for

working capital requirement. Operating Cash Flows and Market to Book ratio does not seem to be an important driver for working capital requirement according to the three companies. The CEO of company A did not see a correlation between market share or size to working capital requirement while company B and C did see a correlation. They explained that market power and firm size are important determinants because these determinants are the driver for the payment conditions. The financial distressed impact could not be discussed during the interviews with company A and C because they were not in a distressed situation. Company B had a distressed situation. This situation arose as an impact of an unjustified punishment and declining EBITDA. The CEO said: 'It was a situation of surviving and therefore we could not make a strategy for the far future.' Banks have made special criteria for their credit line. Therefore it was hard to receive working capital. Their working capital requirement was hardly influenced during this period.

The last discussion was about the future. The strategy of working capital of company A and company B will be revised through the last financial crisis but in a conservative way. Company C had already have a good working capital strategy and they do not make any big changes because it is already future proof.

Conclusion & summary

This chapter will give a comprehensive conclusion and summary of the findings my research.

The academic literature presents many explanations of determinants for working capital requirement. The determinants that I have been using in my research design were presented in the academic literature part of this thesis. The explanation of the determinant sales growth is inconsistent because Molinea and Preve 2009 found a relation that firms with a lower sales growth seem to need more trade credit than firms with a higher sales growth while Petersen and Rajan (1997) found in their study a direct relation between payables and growth. Moreover there is an inconstancy for the explanation of sales volatility because Emery (2009) found a correlation but Ng, Smith and Smith did not find a relation. Love, Preve, and Sarria Allende (2007) found that firms with higher 'pre-crisis' cash flows provide more financing to their customers than firms with lower 'pre-crisis' cash flows in the period before and after the crisis. The conclusion for the determinant M/B ratio is that firms, that are difficult to value, pay a higher rate for their trade credit than firms with a clear market value regarding the study of Myers and Majluf (1984). More findings of Molinea and Preve (2009) are that higher market share leads to more use of financial credit while less dominant firms increase their use of trade credit and also that there is the strong evidence that distressed firms use more trade credit than healthier firms.

According to the academic literature the financial crisis had a big impact on the banking industry. Therefore new criteria were established so it became harder to acquire loans. This leads to less availability of working capital financing from banks.

The results of the empirical findings are interesting. Most of the determinants are significant and give an explanation of working capital requirement. The effects and significance of the determinants are not exactly the same as in the study Hill, Kelly, Highfield 2010. These differences can be explained by the different data sets. Furthermore there are also different explanations in the academic literature for working capital requirement.

Unfortunately, I cannot give a good clear understanding of the impact of the last financial crisis on working capital requirement. The results of the regression with the financial crisis dummy variable did only show two significant determinants for which I cannot give a good explanation.

The three interviews generated a lot of new information for the explanation of working capital requirement. The CEO of company A was missing the determinant payment conditions in my research.

This is an interesting determinant for working capital requirement but I could not include this determinant anymore in my research. The determinants sales growth and sales volatility was correlated with working capital requirement according Company A and Company C. Company B mentioned that the prices of raw materials are important driver for the business and likewise for working capital requirement. Operating Cash Flows and Market to Book ratio does not seem to be an important driver for working capital requirement as reported by the three companies. Company A and C see a relation between market power and firm size. They explained that market power and firm size are important determinants because these determinants are the drivers for the payment conditions. Company B had a distressed situation whereby it was hard to acquire working capital.

The study Hill, Kelly, Highfield 2010 gives two statements:

(I) Sales growth, uncertainty of sales, costly external financing, and financial distress encourage firms to pursue more aggressive working capital strategies.

(II) Firms with greater internal financing capacity and superior capital market access employ more conservative working capital policies.

After doing this research there is enough evidence that the statements of above are also valid in the Netherlands during 2001-2010. In my dataset I could not find any significant correlation of the financial crisis on working capital requirement however during the interviews there are explanations of financial crisis on working capital requirement. External financing became harder therefore companies with conservative working capital policies have to change their policies during the crisis. The impact of the financial crisis should be further discussed in the academic research because I find relations during the interviews while I cannot find relations in my empirical research. This research gives evidence for the determinants for working capital requirement in the Netherlands for the period 2001 – 2010 via empirical research and depth interviews.

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