Economic downturn, leverage and corporate performance

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Abstract

This study tests the hypothesis that highly leveraged firms face a greater decrease in their operating performance than less leveraged companies during economic downturn in their industry. One would expect firms with higher debt obligations to have greater difficulty creating value. In principal stakeholders are risk averse and highly leveraged firms are risky investments. The timeframe upon which this study focuses is 2005-2012(first part); within this timeframe the years 2008-2010 are marked as distressed years. The method used to analyze the problem statement at hand is a linear regression model. The results show that an increased leverage ratio has a negative influence on a firm's operating performance. I also find that in times of financial distress this result is even more negative. It is important to note that the results proved to be insignificant.

1. Introduction

There has been done a lot of research on capital structure decisions. One of the most well known theorems about this matter is the Modigliani Miller (1958) proposition. It states that it does not matter for the firm value how much leverage a firm has. This theorem is based on a perfect market in a perfect world. Since we don't live in such a world we are exposed to risk and uncertainties which we have to take into account.

Following this proposition, several theoretical models have suggested different debt-related costs or benefits. Bankruptcy costs are one of the most associated costs with debt financings. Asgharian (2003) did some literature research on the theoretical studies that focus on indirect bankruptcy costs. He reports that, according to these studies, leverage may be costly because it affects the expectations of a firm's stakeholders (customers, employees and suppliers) about the ability of the firm to remain in business. This could result in a decrease in sales and a possible increase in production costs per product. He also reports that several theoretical studies argue that high leverage may actually have some benefits, for instance it can improve managerial incentives and force them to invest optimally. In this thesis I will investigate whether firms with low leverage compared to heavily leveraged firms perform better during a period of economic downturn. In other words, does the data provide enough evidence to state that these firms are more resilient to financial distress?

2. Literature review

Leverage is the trade-off between debt and equity. When a firm is solely financed with equity all investments are made with this equity. This means that there are no other beneficiaries except for the shareholders who receive all the profits. But this also means that the shareholders are the only ones bearing the risk. In principle shareholders do not like to share their money with the government. They have a great incentive to create maximum firm value but pay minimum taxes because taxes are a waste of investment. A handy tool for this matter is debt financing. Debt can create firm value; it enables management to invest more, and since interest is deductable before taxes less value is lost due to interest. In essence this creates value for the firm where equity

could not have. Given that in an all equity firm the shareholders bear all the risk, in a leveraged firm debt-holders are senior to shareholders. Therefore debt holders bear part of a firm's risk.

So which factors have an influence on leverage, Frank and Goyal (2003) found the following: According to Harris and Raviv (1991) the current theoretical studies generally agree that an increase in leverage is caused by fixed assets, firm size, growth opportunities and non-debt tax shields. Decrease in leverage generally occurs with advertising expenditures, volatility, R&D expenditures, uniqueness of the product they are selling and probability of default. By summarizing this, I conclude that long term tangible assets and prosperous future macroeconomic conditions lead to an increase in leverage. This is due to the fact that firms tend to take more risk under these conditions. These decisions are counterbalanced by financing intangible assets mostly with equity and because of short term uncertainties. Harris and Raviv (1991) mention volatility as one of the reasons for decrease in leverage however, volatility itself can have high positive yields and low negative yields the latter makes volatility a possible factor for an increase in leverage. In my opinion volatility should be replaced by the value at risk theory or in the case of non financial institutions or smaller enterprises by the cash flow at risk theory (or similar theories). These theories have proven to be a more reliable factor on measuring risk and uncertainties and only look at statistical negative effects.

In this study one of the independent variables with respect to the dependent variable operating performance is leverage. Leverage has multiple ways to influence operating performance. Leverage can increase operating performance by ways of an increase in sales and a reduction in taxes. Investments in for instance research and development may result in a decrease in operating performance on the short term. In the long term these investments should pay-off by means of an increase in operating performance. One of the reasons issuing debt creates firm value is because of the deductible interest before taxes. Although interest decreases a firm's operating performance it also creates a tax shield which again increases a firm's operating performance. I am aware of the fact that in my analysis there is a risk for reverse causality, this means that not only leverage has an effect on a firm's operating performance but it also works vice versa. In the next section I will discuss this in more detail.

To measure a firm's operating performance the operating return on sales (ROS) will be used as an indicator in this study. According to Barber and Lyon (1996) this is a rather strong measure

for operating performance. The ROS is calculated by dividing operating income by total annual sales, also known as net turnover. This method is also known as scaling the operating income. In the next section the control variables for the regression analysis will be introduced.

This study is about whether firms with higher leverage perform worse during economic downturn than less leveraged corporations. To measure these effects I will investigate over a time frame of approximately 6 years, from 2006-early 2012. The financial crisis emerged in September 2008 with the bankruptcy of Lehman Brothers, evolving to a worldwide financial downturn. Therefore, in my opinion, this is a good period to conduct my research upon.

This study uses operating return on sales as its dependent variable; economic downturn influences this variable in different ways. Due to a negative median sales growth the assumption is made that a firm's annual sales is affected by this event. Opler and Titman (1994) describe three reasons for a reduction in a firm's sales:

- *Customer-driven:* Customers anticipate at the probability of default, especially when their firm depends on its vendor's products. This can decrease the demand for the firm's product. Especially firms with unique products are expected to be more exposed to this risk of losses in sales.
- *Competitor-driven:* Less leveraged firms use the financial vulnerability of their heavily leveraged competitors as an incentive to start a price war.
- *Manager-driven:* A more theoretical approach is the manager-driven decrease in sales. In theory financial distress could lead to a revision in operating policies and a reduction of capacity in underperforming lines.

Regarding these three arguments Asgharian (2003) wrote the following: "According to Opler and Titman (1994), small firms are more vulnerable to financial distress and thus may face customer-driven and competitor-driven losses in sales. Large firms, on the other hand, are more likely to have some underperforming lines and gain more from reducing their activities in a recession period and are therefore more subject to manager-driven decreases in sales."

Distressed industries and especially individual firms are also affected in the way that it is harder for them to acquire debt. According to the pecking-order theory Korajczyk and Levy (2002) external financing is more expensive for riskier securities thus the preferred order is: Finance

with internal funds, then with debt and then with equity. If it becomes harder to acquire debt firms in distressed industries might finance their investments with equity by means of share emissions. As a result their capital structure will change.

In times of financial distress another theory could be of great benefit to a firm. The agency theory in its essence is the problem regarding the difference in goals of principals and agents representing the principals. In this paper the principals are the shareholders and the agents are the CEO's. Agents have the responsibility to create maximum value for their shareholders. In general agents and principals can have different interests and it is not always transparent for principals whether their agent makes decisions which are most beneficial for them. In times of financial distress agents can develop even more different (risk) preferences as their shareholders. Agents could retain earnings instead of investing and therefore not always maximize firm value. These risk averse actions can lead to an increase in stakeholders because of the assumption that investors are risk averse. Those same actions could also result in a loss in market share because less leveraged firms can use this 'defensive position' as an incentive to start a price war.

A third theory which is interesting for this study is the trade-off theory. This theory states the benefits of increased leverage are weighed against the costs of increased leverage. Therefore one can conclude that firms are always looking for an optimal leverage. The interesting thing about this theory is that its focus is entirely on the optimization of a firm's balance sheet. There is no focus whatsoever on macroeconomic conditions or competition. The traditional trade-off theory does not make a distinction in debt. Hackbarth, Hennessy and Leland (2011) recently wrote a paper about the trade-off theory and debt structure. They found that the optimal debt structure for weak firms should solely consist of bank debt, whereas strong firms can mix bank debt with market debt. The latter under the condition that bank debt is senior.

Lang, Ofek and Stulz (1994) stated that: "finance theory suggests that debt service should affect investment differently from operating cash flow. An all-equity firm can always issue safe debt, so that cash flow shortfalls should have a negligible effect on investment. In contrast, a highly levered firm faces Myers' (1978) underinvestment problem and may not be able to raise outside funds at all". This underinvestment problem is also called a firm's debt overhang problem. In general this means that a heavily leveraged firm has to reject positive NPV projects because increasing their debt even more would be too costly.

In the next section the empirical data is introduced. First the hypothesis will be developed, followed by some general information on the samples, second the regression analysis will be developed. In chapter 4 the analysis will be conducted and the results are then analyzed. The last section will summarize and conclude the results from this study and give some recommendations for further research.

3. Empirical data

In this chapter the data collected will be described and a summary of the sample will be provided. The actual analysis will be done in the next chapter.

3.1. Hypothesis development

In the previous chapter some theories and aspects were addressed which have an influence on a firm's capital structure. Of course this list is incomplete, but I tried to point out the most relevant and interesting ones. As explained in the introduction, this study is about the influence of a firm's leverage on its operating performance. In addition to this problem statement, I added the variable of economic downturn. The trade-off theory suggests that firms should always look for an optimal leverage ratio; managers continuously weigh the cost and benefits of increasing/decreasing debt. I assume that the firms in my sample operate under these conditions. But how optimal is this ratio when macroeconomic conditions turn unfavorable?

In times of normal macroeconomic conditions highly leveraged firms (above industry average) face relatively higher bankruptcy costs compared to lower leveraged corporations. But, when macroeconomic conditions turn unfavorable especially highly leveraged firms face an increase in bankruptcy costs and will also have more difficulty acquiring debt. According to Opler and Titman (1994), highly leveraged could face a decrease in sales under these conditions because of the competitor- and customer-driven decrease, as described in the previous chapter.

Based on these findings, the hypothesis which represents the described theory perfectly will be:

Highly leveraged firms face a greater decrease in their operating performance than less leveraged companies during economic downturn in their industry.

3.2. Regression

The dependent variable in this study is the ROS variable, one of the variables it depends on is a firm's leverage. This leverage ratio is the most important variable for this paper. The leverage of a firm is its debt divided by its book value of equity. The book value of equity is represented by the item 'Stockholder's equity – Total' which is equivalent. In the database I used there was no total equity variable available. In addition to total equity, stockholder's equity also contains retained earnings and capital surplus. Debt will be represented by the CompuStat item 'Long-term debt – Total', long-term debt means debt which will be in a firm for a minimum of one year. I assume that leverage will mostly be affected by long-term debt as current liabilities can easily be paid off by current assets.

To avoid bias in the leverage variable, following Asgharian (2003), some similar explanatory variables will be added. By adding the natural logarithm for a firm's size this study will control for the expectation that large firms are less vulnerable to economic downturns. Therefore, as a measure of firm size, the natural logarithm of the total assets at time *t* is used. For total assets I will not use a lag variable because I assume that assets do not have a significant influence on decisions and performances of the next year. Following Asgharian (2003) this study will also add "the ratio of the net investment to the total assets at time *t-1*". As a final control variable "the ratio of the profit before financial costs and incomes (gross profit) to the total assets at time *t-1*" will be added.

For this study the assumption is made that the financial crisis was most severe in 2008 through 2011, therefore a binary control variable will be added. The so called financial distress dummy will be assigned a '1' if the period is 2008, 2009 or 2010 and '0' if otherwise. This financial distress dummy will be used to interact with the lagged leverage ratio.

The second dummy variable is the industry dummy each industry is assigned to a number. When the dummy is created, the base industry will be defined.

By summarizing all of the above provided independent variables and the dependent variable into a formula, the regression used will be:

$$ROS = \alpha + \beta_1 Leverage_{t-1} + \beta_2 Log\ of\ assets + \beta_3 \frac{Investment}{Assets}_{t-1} + \beta_4 \frac{Profits}{Assets}_{t-1} + \beta_5 Distressed\ lagged\ leverage + \beta_6 Industry\ dummy1 + \beta_7 Industry\ dummy2 + \beta_8 Industry\ dummy3 + \beta_9 Industry\ dummy4 + \beta_{10} Industry\ dummy5$$

3.3. Data collection

I will use data for firms in North America from the CompuStat database during the period 2005 to February 2012. Firms will be divided into industries by means of a 4-digit SIC code. Following Opler and Titman (1994) I will exclude a few industries from my analysis:

- *Firms in the financial sector:* Due to the significantly different accounting treatment of revenues and profits with respect to other sectors (Banks, investment companies, insurance companies, etc.).
- *Small industries:* An industry has to have at least three firms to be able to provide a reasonable benchmark.
- *Unavailable data:* Firms which did not have the required data.

I will not investigate whether firms are listed in multiple industries. The SIC codes provided by CompuStat are the leading variable to which industry a firm is assigned.

The variable used to determine a firm's performance is the operating return on sales. This is calculated by dividing the operating income after depreciation by the number of sales, annually. This variable enables this study to benchmark with other firm's competing in a specific industry. This provides information about the performance relative to other firms in a given industry.

In this study all values will be based on book value because market value is influenced by expected performances and could bias the results. Therefore the leverage ratio used in this study is calculated by dividing total debt by the book value of equity. Following Asgharian (2003) I will decrease the possibility of reverse causality by measuring leverage as per a 1-period lag.

Asgharian (2003) found that especially industries in metal, machinery and vehicle are vulnerable for macroeconomic conditions. This is similar to respectively the construction and mining industry and the manufacturing industry. Therefore I would expect these industries to show clear negative results in this study. It is interesting that consultancy and real estate, similar to the service industry in this study, also show significant results of distress in his study. He gives no specific reasons for this.

3.4. Data sample

The initially collected data consisted of 127,171 observations; before the data can be analyzed obsolete observations have to be excluded from the dataset. I start with total debt and stockholders' equity to create a *t-1* leverage variable[1]. The next step is to create a *t-1* variable for the ratio of net investment to total assets and profits to total assets. For the regression formula the log of assets is created as well as the financial distress dummy (2008, 2009 and 2010) and an industry dummy. All the observations from industries that are in the list of excluded companies are dropped. This results in a total of 45,767 observations left. Next all of the observations which have a zero or no observations can be deleted from the other variables in the dataset, this leaves me with a final sample of 6,809 observations.

[1] About 100 observations had leverage ratios above 10, with a highest ratio of 3,526. Before the decision was made to delete all observations with a leverage ratio above 10, the 'Winsor-method' was applied. This method proved to have insufficient effect on the ratios to solve this issue. An additional 96 observations were deleted this way.

Table I

Distribution of firms per year and per industry

The sample consists of 5.692 unique publicly traded firms in North-America in the period of 2006-2011. The agriculture, forestry, and fishing industry could not provide enough relevant data on firms to do an analysis on the years 2006-2007. Overall the collected data in this table proves to be sufficient for an empirical analysis.

		2006	2007	2008	2009	2010	2011
Dummy	Industry types	Number of firms					
0	Agriculture, forestry, and fishing	0	1	3	36	31	6
1	Mining and Construction	37	65	79	651	650	137
2	Manufacturing	14	22	47	2,323	2,220	704
3	Transportation and Public Utilities	7	8	11	702	695	166
4	Wholesale and Retail Trade	3	7	10	514	492	133
5	Services	3	9	16	961	922	286
	Total Firms	64	112	166	5,187	5,010	1,432

There is no specific reason why there is so much variation in available data. Most of this has to do with a lack of data and was deleted in the process. Years in which an industry does not meet the requirements of at least 3 firms in its sample are dropped from the database. Based on the table above agriculture, forestry, and fishing is dropped from my sample. This industry does not provide enough information for this study to be relevant. This will also result in dropping an industry dummy.

4. Analysis

This section describes the empirical method to analyze the model presented in the previous chapter. The first part presents some median figures regarding three independent variables. The second part will present the results from the regressions.

4.1 The model and its variables

$$ROS = \alpha + \beta_1 Leverage_{t-1} + \beta_2 Log\ of\ assets + \beta_3 \frac{Investment}{Assets}_{t-1} + \beta_4 \frac{Profits}{Assets}_{t-1}$$
$$+ \beta_5 Distressed\ lagged\ leverage + \beta_6 Industry\ dummy1$$
$$+ \beta_7 Industry\ dummy2 + \beta_8 Industry\ dummy3 + \beta_9 Industry\ dummy4$$

The independent variables are:

- Lagged Leverage: The variable is computed as debt over book value of equity with a lag of period to control for reverse causality. According to the literature review it is expected that this variable shows a negative coefficient.
- Log of assets: This variable controls for the size of a firm, this is based on the assumption that larger firms will generally have a higher absolute return on sales. By taking the log of sales the return on sales is turned into relative size.
- Investment over assets: Following Asgharian (2003) this variable was included. Investments during financial distress could result in a short term negative performance, on the long run these investments should pay off.
- Profits over assets: Following Opler and Titman (1994) this variable was included. Profits are expected to decline during financial distress.
- Distressed lagged leverage: This variable is the most important independent variable in this thesis. The independent variable is an interaction term between a distress dummy, which controls for years within which the financial crisis was most severe, starting with 2008 and ending on 2011. The second term is the above mentioned lagged leverage. Similar to the lagged leverage, it is expected that this variable shows a negative effect on a firm's performance.
- Industry dummy: This dummy is added to make a distinction between industries, as some industries are naturally less leveraged as others.

Table II presents industry medians regarding lagged leverage, change in investments over assets and the change in profits over assets. This table shows that especially wholesale and retail trade is on average a highly leveraged industry. The services industry is on average rather low leveraged. It is interesting to see that from 2006 to 2007 on average the leverage of all firms increased and in 2008 it made a 36% drop. This could be the result of the bankruptcy of highly leveraged firms or highly leveraged firms paid their debt. The investments ratio tells us that in 2008 there was actually a negative ratio, which means that instead of an increase in investments firms tended to decreases in investments. I would imagine that these were safety precautions to retain earnings. Especially firms in the mining and construction industry kept their investments at a minimum. 2009 Showed with respect to the investments ratio a significant improvement, I assume that this was due to the optimistic mood on the markets at that time. In 2010 the markets felt that the financial crisis was far from over and this is also visible in the figures shown in Table II. The profits have been dramatic considering the figures regarding the profit ratio, again especially for the mining and construction industry. Surprisingly profits have decreased dramatically for the services industry as well. Asgharian reported similar results but did not write a comment on these findings. This is surprising because these firms typically are not highly leveraged.

Table II

Industry medians of three independent variables

This table shows industry median values of three independent variables of interest. An interesting aspect about the findings is that especially 2008 shows a decrease in values and in some cases 2009 shows an even further decrease.

Leverage: This is the average leverage per industry for a given year.

Δ Investment/Assets: The average change in the ratio, this shows whether there is an increase or decrease in investments compared to the year before.

Δ Profit/Assets: The average change in the ratio, this whether there is an increase or decrease in profits compared to the year before.

	Lagged Leverage					Lagged Δ Investment/Assets				
Industry types	2006	2007	2008	2009	2010	2007	2008	2009	2010	2011
Mining and Construction	0.60	0.95	0.71	0.41	0.54	-0.72	-0.02	-0.04	0.28	0.51
Manufacturing	0.34	0.96	0.74	0.39	0.40	1.52	-0.66	1.87	0.25	0.17
Transportation and Public Utilities	1.06	1.84	0.69	1.02	1.09	-1.00	0.00	0.46	0.02	-0.03
Wholesale and Retail Trade	2.50	0.99	1.00	0.60	0.67	0.00	0.00	-0.10	0.37	-0.04
Services	0.04	1.14	0.65	0.50	0.42	1.24	-0.44	5.69	0.21	0.15
Total result	0.91	1.18	0.76	0.58	0.62	0.21	-0.23	1.58	0.23	0.15

Table II-continued

	Lagged Δ Profit/Assets				
Industry types	2007	2008	2009	2010	2011
Mining and Construction	-0.87	-0.98	-0.99	-0.89	-0.88
Manufacturing	0.36	-0.10	0.09	0.03	0.06
Transportation and Public Utilities	0.14	-0.05	0.10	0.03	0.00
Wholesale and Retail Trade	-0.44	0.47	0.09	0.00	-0.05
Services	-0.31	-0.22	-0.01	-0.04	0.12
Total result	-0.22	-0.17	-0.14	-0.17	-0.15

4.2 Empirical analysis

In this section the results from the panel regression analysis will be presented and analyzed.

A. Effects of leverage on return on sales

First I present a correlation matrix to develop expectations regarding the results.

Table IV

Correlation Matrix

This table shows the correlation between the regression variables.

	Dependent Variable	Lagged Leverage	Log Total Assets	Lagged Investment over Assets Ratio	Lagged Gross Profit over Assets Ratio
Return on Sales	**1.000**	0.023	0.069	-0.036	0.079
Lagged Leverage	0.023	**1.000**	0.258	-0.066	-0.065
Log Total Assets	0.069	0.258	**1.000**	0.029	-0.046
Lagged Investment over Assets Ratio	-0.036	-0.066	0.029	**1.000**	0.003
Lagged Gross Profit over Assets Ratio	0.079	-0.065	-0.046	0.003	**1.000**

The results in this matrix suggest that leverage is positively correlated with the dependent variable, return on sales. This is also the case for the logarithm of total assets and the lagged gross profit to total assets ratio, which both have a higher positive correlation compared with the lagged leverage variable. The lagged investment over assets ratio is the only negatively correlated variable. The correlation of the independent variables with the lagged leverage ratio is highly positive for the log of total assets and negative for the other two variables. It is difficult to determine how this is going to affect the results of the regression. I expect that the log of total assets will improve the significance level of the lagged leverage ratio and the other independent variables will decrease its significance level.

The approach of running the regression and analyzing the results will be by means of developing the model. I will start with one β, the lagged leverage ratio, and gradually add the other independent variables, except for the distressed lagged leverage and the industry dummies these will be added at the end.

Regressing the lagged leverage ratio on the return on sales gives a beta of 1.367; this value is significant at the 0.108 level. This coefficient tells us that a higher leverage ratio has a positive effect on the return on sales, which is unexpected. The next variable to be added is the logarithm of assets; this variable has a negative effect on the significance level of the leverage coefficient. This differs from my expectations based on the correlation matrix. The log of assets coefficient itself is highly significant. See Table V for the results.

Table V

Regression on developing model I

This table shows the results of the regression on the return on sales with the two independent variables; lagged leverage ratio and the natural logarithm of assets. It also shows that the log of assets has a negative result on the significance of the leverage coefficient.

Variable	Coefficient	P-value
Lagged Leverage	0.373	0.670
Log of Assets	1.960	0.000
Constant	-15.739	0.000
R^2	0.000	-
No. of observations	6,809	-

In the next table the effect of adding a third independent variable, net investments to total assets ratio, is analyzed. The result of this variable supports my expectations based on the correlation matrix; the variable has a negative coefficient and decreases the significance level of the leverage coefficient. The coefficient is now significant at the 0.791 level.

Table VI

Regression on developing model II

This table shows the results of the regression on the return on sales with three independent variables. It shows that the lagged investment over assets ratio increases the insignificance of the leverage coefficient even more.

Variable	Coefficient	P-value
Lagged Leverage	0.241	0.791
Log of Assets	2.050	0.000
Lagged Investment to assets ratio	-18.390	0.005
Constant	-15.649	0.000
R^2	0.000	-
No. of observations	6,409	-

In the next table the lagged gross profit to total assets ratio is added to the model. This addition unexpectedly improved the significance level of the leverage coefficient and has a positive effect on the ROS. The variable itself is highly significant.

Table VII

Regression on developing model III

This table shows the results of the regression on the return on sales with all four independent variables, except for the distressed lagged leverage and the industry dummy variables. It shows that the lagged gross profit to asset ratio has a positive coefficient. This variable also has a positive effect on the leverage coefficient's significance level.

Variable	Coefficient	P-value
Lagged Leverage	0.477	0.599
Log of Assets	2.137	0.000
Lagged Investment to assets ratio	-18.053	0.006
Lagged Gross Profit to assets ratio	14.195	0.000
Constant	-20.524	0.000
R^2	0.000	-
No. of observations	6,409	-

The next table presents the final results from the regression. The distressed lagged leverage variable and the industry dummy variables are included as well. The distressed lagged leverage variable is highly insignificant; this means that I cannot conclude anything regarding the result with respect to the effect of leverage on a firm's profitability in periods of economic distress. It is also not possible to conclude anything about industry effects. The complete model also shows that the lagged leverage ratio is highly insignificant. This means that there cannot be drawn a conclusion regarding the effect of leverage on a firm's performance in general. The distressed lagged leverage coefficient shows a negative coefficient, this is interesting since the lagged leverage coefficient is positive. This could mean that on average a firm's profitability increases with a higher leverage ratio, but this would not apply to times of economic distress. Since the results are insignificant this cannot be concluded accordingly. Also the R^2 has been very low throughout the model building process, which means that the results are to a large extent not determined by the model.

Table VIII

Regression results

This table shows the results of the complete regression model with the return on sales as its dependent variable.

Variable	Coefficient	P-value
Lagged Leverage	0.824	0.776
Log of Assets	2.115	0.000
Lagged Investment to assets ratio	-18.849	0.004
Lagged Gross Profit to assets ratio	12.949	0.000
Distressed Lagged Leverage	-0.525	0.855
Industry Dummy	Yes	No
Constant	-16.054	0.000
R^2	0.000	-
No. of observations	6,409	-

B. Effects of leverage on return on assets

The conventional accounting ratio's to measure a firm's profitability are return on sales, which is the one I used for this model, return on assets and return on equity (Dewenter and Malatesta (2001)). Since my results are insignificant for the profitability measurer return on sales, I tend to improve the model by replacing the ROS by the return on assets (ROA). As most of the independent variables are scaled by assets[2], I expect a higher correlation between the independent variables and the new dependent variable ROA. The ROA variable is calculated in a similar way as the ROS, but instead of dividing it by sales, the return is divided by assets. The, at beginning, mentioned measurers for profitability are the three most commonly used measures. Since the paper is unexpectedly extended by the ROA and for the purpose of the completeness of this thesis, the return on equity analysis will be added as well. The development of the model is presented for both the ROS and the ROA, similar results are expected from the ROE. Therefore I only present the final results of the panel regression with return on equity (ROE) as its dependent variable. The change from ROS to ROA results in the following correlation matrix.

[2] Multi-collinearity is not a problem in any analysis, also not when scaling with total assets.

Table IX

Correlation Matrix

This table shows the correlation between the regression variables.

	Return on Assets	Lagged Leverage	Log Total Assets	Lagged Investment over Assets Ratio	Lagged Gross Profit over Assets Ratio
Return on Assets	**1.000**	0.022	0.191	0.003	0.135
Lagged Leverage	0.022	**1.000**	0.282	-0.066	-0.065
Log Total Assets	0.191	0.282	**1.000**	0.029	-0.046
Lagged Investment over Assets Ratio	0.003	-0.066	0.029	**1.000**	0.003
Lagged Gross Profit over Assets Ratio	0.135	-0.065	-0.046	0.003	**1.000**

The matrix in Table IX shows a positive correlation between the dependent variable and the leverage ratio. It should be noted that the correlation is only 0.001 less compared with the correlation between the return on sales and the leverage ratio in Table IV. The logarithm of total assets shows a high positive correlation with the return on assets variable. This is as expected because both variables have the asset element in its calculation. As opposed to the correlation matrix in Table IV, the investment over asset ratio is positively correlated with the return on assets. But the correlation is rather low. Naturally the return on assets is positively correlated with the gross profit on assets ratio. As a result of these findings I expect that the independent variables, except for the lagged investment to asset ratio, have a positive effect on the significance of the model. The lagged investment over asset ratio has a very low correlation with the dependent variable and is negatively correlated with the model's main independent variable; lagged leverage ratio. Therefore it could lead to an insignificant coefficient.

By calculating the first panel regression I find that the lagged leverage ratio is significant at the 0.058 level with a coefficient of -0.0126. This result is surprising because, in the correlation matrix the lagged leverage ratio showed a positive correlation with the independent variable.

From this result can be concluded that an increase in leverage has a negative effect on the ROA. This is a rather surprising result because the model based on the ROS had a positive lagged leverage coefficient. But it is in line with my previous hypothesis.

Similar to the first approach with the ROS, I will now gradually build the model. I will start by adding the logarithm of total assets to the model.

Table X

Regression on developing model I

This table shows the results of the regression on the return on assets with the two independent variables; lagged leverage ratio and the natural logarithm of assets. It also shows that the log of assets has a positive result on the significance of the leverage coefficient. By adding this variable it even increases the absolute value of this coefficient.

Variable	Coefficient	P-value
Lagged Leverage	-0.033	0.000
Log of Assets	0.073	0.000
Constant	-0.432	0.000
R^2	0.077	-
No. of observations	6,809	-

The model already has a significantly higher R^2 as the former model which regressed on the return on sales. By adding the variable lagged net investments over assets to the model, it gives the following result, see Table XI on the next page.

Table XI

Regression on developing model II

This table shows the results of the regression on the return on assets with three independent variables. By adding the lagged net investment over asset ratio it slightly decreases the absolute value of the lagged leverage coefficient. It has no other significant implications on the model.

Variable	Coefficient	P-value
Lagged Leverage	-0.032	0.000
Log of Assets	0.073	0.000
Lagged Investment to assets ratio	0.029	0.547
Constant	-0.431	0.000
R^2	0.078	-
No. of observations	6,409	-

The added variable is highly insignificant and has no effect on the model as it is. I expect that this variable can be deleted from the final model to increase the R^2.

The final variable to be added before the complete model can be presented is the lagged gross profit over assets ratio. See Table XII on the next page for the results.

Table XII

Regression on developing model III

This table shows the results of the regression on the return on assets with all four independent variables, except for the distressed lagged leverage and the industry dummy variables. It shows that the lagged gross profit to asset ratio has a highly significant negative coefficient. This variable also has a positive effect on the lagged leverage's significance level. By adding this variable it significantly increases the coefficient of the logarithm of assets beta.

Variable	Coefficient	P-value
Lagged Leverage	-0.033	0.000
Log of Assets	0.727	0.000
Lagged Investment to assets ratio	0.028	0.557
Lagged Gross Profit to assets ratio	-0.099	0.000
Constant	-0.401	0.000
R^2	0.168	-
No. of observations	6,409	-

Table III also shows that by adding the lagged gross profit over total assets ratio, the model's R^2 increases to almost 17%. The complete model is shown on the next page in Table XIII.

Table XIII

Regression results

This table shows the result of the complete regression model with the return on assets as its dependent variable. The leading variable, distressed lagged leverage ratio, is significant at the 0.265 level (which is a rather low level of significance) and the coefficient shows a negative effect on the return on assets. The lagged investment over assets ratio is highly insignificant and therefore useless for the model. This model also does not show significant results.

Variable	Coefficient	P-value
Lagged Leverage	-0.020	0.160
Log of Assets	0.075	0.000
Lagged Investment to assets ratio	0.017	0.725
Lagged Gross Profit to assets ratio	-0.126	0.000
Distressed Lagged Leverage	-0.014	0.265
Industry Dummy	Yes	No
Constant	-0.315	0.000
R^2	0.183	-
No. of observations	6,409	-

The result of this model supports the hypothesis that highly leveraged firms perform worse than less leveraged companies during global economic distress, if it wasn't for the relatively high significance levels. By removing the investment over assets ratio from the model it does not improve the model's reliability.

C. Effects of leverage on return on equity

Since the previous model also does not show significant results I present the final, complete, model with the return on equity as its dependent variable.

Table IXX

Regression results

This table shows the result of the complete regression model with the return on equity as its dependent variable. The leading variable, distressed lagged leverage ratio, is significant at the 0.356 level (which is a rather low level of significance) and the coefficient shows a negative effect on the return on assets. The lagged investment over assets ratio is highly insignificant and therefore useless for the model. This model also does not show significant results.

Variable	Coefficient	P-value
Lagged Leverage	-0.314	0.101
Log of Assets	0.541	0.002
Lagged Investment to assets ratio	0.276	0.703
Lagged Gross Profit to assets ratio	-3.045	0.000
Distressed Lagged Leverage	-0.155	0.356
Industry Dummy	Yes	No
Constant	-1.886	0.000
R^2	0.0568	-
No. of observations	6,409	-

All the common profitability measures have been used to test the data. Unfortunately the results are not significant therefore all my expectations are not statistically supported. Based on the matching results in the last two tables I could carefully draw a conclusion from those findings. Although the results are not statistically significant both models show similar results namely, a negative coefficient on the leverage variables. Based on the lagged leverage significance level of 10%, I can conclude with 90% certainty that the a firm's profitability decreases with increased leverage. But this is just a general effect, this does not conclude anything regarding the effect of distressed years.

The results correspond with my expectations, and are also economically significant (not statistically). An explanation for the negative effect of high leverage on the return on assets/equity could be related to the trade-off theory. As firms weigh the benefits of leverage versus the costs of leverage they could be surprised by the drastic change in the global economy.

Firms with relatively high levels of debt could face increased costs of debt and might not have the resource to change their optimal leverage ratio along with the change in the economy. The results do not give any information whether firms are aware of these positions. If they are it is very likely that these firms choose to maintain this position and invest for instance in sales and R&D, instead of retaining their earnings to set their optimal leverage ratio. It is not within the range of this paper to investigate this.

The result of the models could also support the pecking order theory, especially in times of financial distress firms prefer to finance their assets with retained earnings or equity instead of debt. Financing with retained earnings would be in line with the pecking order theory.

Similar to Opler and Titman (1994) I focused on the effect of leverage on a firm's performance in periods of economic distress. But this only goes for surviving firms, it may be that leverage is/becomes too costly for a firm that it has to go out of business. This means that their performance has not been recorded for my sample. By neglecting this, the results possibly understate the impact of financial distress costs.

Summary and conclusion

In this paper I do not find statistically significant evidence that there is a negative relationship between highly leveraged firms and their operating performance in periods of economic downturn. However, based on the similar results with the ROA and the ROE as dependent variables I could carefully formulate some conclusions.

In the process of writing this paper I found that bankruptcy costs are one of the most associated costs with debt financing. Therefore leverage can be costly, even more costly then beneficial. But even though leverage has its side effect it is very important for creating firm value. One of the introductory questions I presented was: "Does the data provide enough evidence to state that these firms are more resilient to financial distress?". Based on the results I found, I can only partially answer this question. Since the results from the return on assets and equity are similar I could, although statistically insignificant, very carefully state the following. Firms with high debt financing perform worse than firms with relatively low debt financing. With that respect, yes. Of course this requires further research to verify. The limitation regarding this question is that I have no data regarding bankruptcy. For further research it could be interesting to investigate whether

firms with high leverage with respect to firms with low leverage ratio's file for bankruptcy more often.

In generalized terms could be stated that long term tangible assets and prosperous future macroeconomic conditions lead to an increase in leverage. On the other hand, intangible assets are usually financed with equity or retained earnings. Also short term uncertainties lead to a decrease in leverage. By comparing these arguments with the results in Table II, I conclude that the upcoming period (2008) of severe financial distress was completely unexpected.

In the process of writing the literature review I found that the return on sales as dependent variable would possibly offer the best results. As I came to the point of analyzing the results I found that the return on assets and equity proved to be better variables with respect to my sample. By replacing the initial dependent variable respectively with the return on assets and the return on equity, I found that they both showed that higher leverage ratios have a negative influence on a firm's return on assets and return on equity. Although they both show the same sign and correspond to my expectations, the negative coefficients in both models are not supported by proper levels of statistical significance.

In assume that the (distressed) lagged leverage ratio is highly insignificant because of a lack of data in some industries. In the data selection process I already took this into account by deleting industries with less than 4 firms.

The investment to asset ratio proved to be insignificant in this model. In further research the model can be improved by replacing this variable. Also by taking a greater period of time this could result in a better sample. The final suggestion I have for further research is to properly analyze years of financial distress, whereas in this paper these years where assumed based on recent events.

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