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The Impact of 2008 Crisis on U.S. Firms' Leverage

Difference in Difference Approach

Investment Grade vs Speculative Grade firms.

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Dissertation written under the supervision of professor

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ABSTRACT

The dissertation evaluates the impact of the 2008 Financial Crisis on the US firms' leverage proportions to Capital and to Total Assets: mainly the *Debt to Capital ratio* [Total Debt / (Total Debt + Market Value of Equity)] and the *Debt ratio* [Total Debt / Total Assets]. The analysis is based on a Difference-in-Differences Approach that builds a comparison analysis of the effect of the 2008 market collapse on two groups: Treated and Control groups based on their latest credit rating prior the crisis. After the crisis of 2008, the *Debt to Capital ratio* and the *Debt ratio* decreased on average respectively by 3.38 percentage points and 1.21 percentage points. The Treated group (Investment Grade firms) holds lower leverage ratios (*Debt to Capital* and *Debt ratios*) on average than the Control group (Speculative grade), and in the post crisis period. As for control variables: liquidity, profitability, and *Size* controls, they present a negative correlation to both leverage ratios.

A dissertação avalia o impacto da Crise Financeira de 2008 nas proporções de alavancagem das empresas norte-americanas em relação ao capital e aos ativos totais: principalmente a Dívida sobre o Capital [Total Debt / (Total Debt + Market Value of Equity)] e o *Debt ratio* [Total Debt / Ativos Totais]. A análise é baseada em uma abordagem de diferenças em diferenças que constrói uma análise comparativa do efeito do colapso do mercado de 2008 em dois grupos: grupos tratados e grupos de controle com base em sua última classificação de crédito antes da crise. Após a crise de 2008, o rácio Dívida sobre Capital e o rácio Dívida diminuíram em média 3,38 pontos percentuais e 1,21 pontos percentuais, respectivamente. O grupo tratado (empresas Investment Grade) possui índices de alavancagem (índices Dívida sobre Capital e Dívida) menores em média do que o grupo controle (Grau especulativo), e também no período pós-crise. Quanto às variáveis de controle: liquidez, rentabilidade e controles de tamanho, apresentam correlação negativa com ambos os índices de alavancagem.

JEL Classification: G32

Keywords: Leverage, Credit rating, Treated Group, Control group.

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Introduction

The Capital Structure of the company is a key element and factor toward achieving a good financial performance. Mastering the optimal weights and balance of financing has been a complex and controversial topic for several researchers in the Finance industry. As the capital structure is affected by many different factors and elements, it is sensitive to a set of conditions and drivers such as the credit ratings especially starting from the 2000s, the macroeconomic external factors such as Inflation, the manager's risk aversion and finally the firm's characteristics such as: Industry, *Size*, level of performance as mentioned in Murray et al. (2009).

One of the biggest financial crisis of all time, and probably the most famous is the 2008 financial crisis. The fall of Lehmann Bothers was mentioned as the biggest bankruptcy in history, the two biggest US home lenders: Fannie Mae and Freddie Mac were seized by the US government and millions of families found themselves with mortgage loans valuing more than their houses. Such a disturbing shock enables the reevaluation and restructuring of the capital and the financing decisions of US firms, to limit the losses and compensate for a future bounce back. This exact issue brings into the table the main objective and research statement of this paper: The impact of 2008 Crisis on the Capital Structure and Financing Decisions, mainly leverage financing on the US firms.

As it is proven in several research such as Kisgen (2006) and Graham and Harvey (2001), the credit rating level and the credit rating shifts play an important role in determining the firm's the amount of debt financing in their capital. In fact, this dissertation examines in depth the variation in firm's leverage caused by the 2008 financial crisis and evaluates this effect on two groups of companies that differ based on their credit ratings as explained later. For that purpose, the research works on a sample of data of 9787 firms representing the remaining sample of all the US market initially extracted, after dropping all missing values and merging the data with the Standard & Poor Long Term Domestic Issuer Credit Rating (Quarterly). The companies present in the final sample hold different characteristics of performance, *Size*, industry, and capital structure to build a Difference in Difference approach (DID). The DID approach compares a key variable between two groups of firms: treatment and Control groups. The Treated group has all firms that hold a Credit Rating (CR) higher or equal to BBB- in Q2 2008 (prior the September 2008 crisis), and the Control group with all the remaining firms having a CR below BBB- in the same quarter.

In fact, Treated group represents highly rated firms: Investment Grade and the Control group represents the low rated firms of the sample prior to the crisis: Speculative grade firms. The paramount objective is to assess leverage ratios such as the *Debt to Capital ratio* and the *Debt ratio* and their variations driven by the 2008 crisis. The dissertation aims to compare these two groups of firms (Treated and Control) in terms of their leverage ratios' variations in the pre and post crisis period. Thus, the regressions using the DID calculates the average differential changes in Debt to Capital and *Debt ratio* between the two groups to test the impact of the financial crisis of 2008. Added to that, the regressions show the sign of the average effect of the control variables on the leverage ratios (the dependent variables) and to test their consistency with the past literature.

The main results of the empirical study of the dissertation show that firms increase their Debt to Capital and *Debt ratio* as a reaction to the market shock (2008 crisis), as it was verified by the results of the variable: "Post Crisis" in almost all the regressions. Besides that, Treated group has on average lower leverage ratios than Control group throughout the whole tested period, and more specifically in the post crisis period. As an example, Treated group has a *Debt to Capital ratio* less by 10.48 percentage point overall compared to the Control group, and a *Debt ratio* lower by 1.94 percentage point in the period between 2006 and 2011.

Literature Review

There is not any doubt for managers and financial experts that capital structure is a very crucial key factor for the firm's stability, financial performance, and sustainable growth. Many researchers examined the most factors intervening or affecting the capital structure of the firm. Graham & Harvey (2001) show that 57.1% of CFOs admit that Credit Ratings are very crucial when they are considering the optimal amount of leverage. The authors prove that the second most affecting driver for capital structure change is Credit Ratings (CR). The results show clearly that changes in credit worthiness and scores of firms are most likely followed by major adaptations to their capital structure (CS), mainly their debt financing proportions to assets and capital.

Kisgen (2006) is one of the base papers of this dissertation as it strengthens the link between CR shifts and capital structure changes. The author analyzes two types of companies: the ones close to credit rating shifts (either upgrade or downgrade) and the firms in the middle with a stable rating. The results showed that companies which are close to CR shift tend to issue around 1% less net debt relatively to net equity annually as a proportion to total assets. Such results concern all types of firms either highly rated or the ones with low scores. As managers focus on the cost (benefit) from these shifts in terms of investment opportunities, and impact on the yield of financial securities of the firm, the situations of companies close to a CR shift present an opportunity or a signal of a compensation for these decision makers. In fact, these shifts enable the managers' willingness to restructure their financing sources and weights (Debt or Equity) to adapt to the changes. Generally, decision makers have mutual aims to boost and maximize the financial performance of the firm and guarantee its sustainability, which lead them to adjust these weights in response to major CR shifts.

In order to link this impact of credit risk and capital structure with the periods of financial crisis, which is the main aim of this dissertation, the literature includes other studies that refers to the impact of credit risk variation caused by the global financial crisis of 2008 and its impact on the capital structure. Asli et al. (2015) examine the difference in the intensity of impact of financial crisis on the capital structure of firms depending on their markets: developed / developing markets. The authors show that the less legal regulations that guide the market, the more financing limitations these firms might face. In other words, in less developed and emerging markets, firms

and more specifically SMEs force more deleveraging of their capital in times of challenging market conditions because of the limitations they face to enter certain structured sources of funding that exist in high regulated markets. This implies that in developed markets, and well-structured and regulated environments, firms will not follow a deleveraging trend as much as they do in emerging markets. In fact, this outcome is tested in the empirical findings of this dissertation when examining the effect of the crisis on firms' leverage in the US market.

The dissertation uses a DID equation including a set of control variables (Liquidity, Profitability, *Size*, etc.) to underline the main drivers o change to both dependent variables: Debt to Capital and *Debt ratio*. These controls differ in their sign of impact on the leverage ratios as explained previously by different authors. Murray & Goyal (2009) discuss the main drivers of change on the capital structure among these variables. The authors examine their effect on publicly traded American firms from 1950 to 2003. The main evidence is that the leverage of the firms decreases when the profitability increases. As firms get more solid in terms of performance and more profitable, they start to prefer internal funding over external one, as tax shield does not represent anymore an interesting opportunity of gain compared to the offered gains in terms of growth, and equity market value. Other authors discuss the main effects of control variables on leverage changes. Harrison & Wisnu (2013) suggest that Property, Plant and Equipment proportion to Total Assets: (PPE / Total Assets) also referred as Tangibility and Market to Book value ratio have more intense impact on capital structure after the 2008 crisis. In other words, after 2008 crisis, the variation in fixed assets value (PPE) / Total Assets or the market value of Equity to its book value cause higher change to leveraged and non-leveraged capital than before. On the other hand, profitability has less influence on leverage compared to before its impact before the crisis. As for the sign of firms' *Size* on leverage, the authors prove that it turns to be negative just after the crisis happened. Such impact will be strengthened later by the empirical findings related to our case especially for the sign of impact of some control variables. Added to that, Baghai et al. (2014) show that CAPEX to Total Assets, PPE to Total Assets and Debt to EBITDA are factors of positive change to Leverage ratios for the companies. As for the *Size*, both papers Baghai et al. (2014) and Ramalho & Jacinto (2009) prove that the factor *Size* has a negative impact on Debt proportions of the firm. In fact, the bigger the company gets the less debt financing it needs.

The main purpose of this dissertation is to examine the impact of the 2008 Global Crisis, on firms' leverage ratios, mainly Debt to Capital and *Debt ratio*. In fact, the study assumes a DID approach that test two types of samples of US companies: Treated Group and Control group as explained later in the methodology. The dissertation uses a DID approach, similar to the one followed by Almeida et al. (2017). In fact, the selection of the control variables such as liquidity, profitability, *Size*, etc. is based on this paper. The authors analyze the impact of government (Sovereign) rating shift on the firms evolving in that local economy. They use the DID approach to compare two groups' outcomes when facing similar shocks (Sovereign rating downgrade / upgrade) in this case. The authors find that firms with a CR score at sovereign CR level tends to lean less and reduce investments from capital markets more than firms with CR score lower than the sovereign one in the case of downgrade.

To get more insight on the drivers of leverage changes following the 2008 crisis, this dissertation refers to Iqbal (2015), who focuses on a comparison analysis between two types of firms: companies with leverage below the industry average and the ones above. The author tests the variations in the capital structure of both groups. The main findings state that firms with equity and *Debt ratio*s (capital structure ratios) below the industry average, tend to increase their leverage amount in the post crisis period, whereas an opposite impact happens to firms with capital structure ratios above industry average. However, the overall amount of leverage increases after 2008 crisis.

Methodology and Data

Methodology

In this section, I present the methodology and structure of the dissertation that define the framework and steps of all the empirical study. The main goal of this work is to examine how US firms' leverage levels are sensitive to the global market crisis of 2008. The variation of leverage is captured through assessing two main leverage ratios: *Debt to Capital ratio* [Total Debt/(Total Debt + Market Value of Equity)] and *Debt ratio* [Total Debt/Total Assets]. The empirical analysis of the dissertation topic is based a comparison analysis using the DID approach between two groups of firms. The segmentation of both groups is based on their CR in Q2 2008 (the last rating prior to the

crisis date of September 2008). These two groups are defined as Treated Group (Firms with CR above or equal BBB-) and Control group (Firms with CR below BBB-). The Treated group is then representing highly rated firms using the last CR prior the crisis and refers to Investment Grade firms, and the Control group is defining the low rated firms of the sample of data and refers to Speculative Grade firms.

In fact, to underline the difference in the intensity of variation of these leverage ratios between the two groups throughout the pre and post crisis period, the entire U.S. market is selected for the study, for a period of 6 years from 1st of January 2006 to 31st December 2011. The period of pre-crisis is from January 2006 until August 2008, and all the following period starting from September 2008 is considered a post crisis period until December 2011.For that purpose, I select quarterly data for all the U.S. market firms, then drop the financial institutions and utilities using SIC codes of the industry from 4000-4999 and 6000-6999. The data includes Long Term Debt, Debt in Current Liabilities, Total Sales, Market Value of Equity, Earnings before Interest, Taxes, and Depreciation & Amortization, Capital Expenditure (CAPEX), Property Plant and Equipment (PPE), Cash & Marketable Securities (Cash), and firms' *Size* obtained by using the log of Total Assets. After that, I extract the monthly Standard & Poor's Long-Term Domestic Issuer Credit Rating from COMPUSTAT for the whole US market for the period between 2006 and 2011. Then, I merge the firms' fundamental data with the credit rating data based on quarter dates. After that, I clean and organize the remaining to keep only firms holding credit ratings to be used later in the construction of the two groups defined previously. Thus, all the lines with missing credit ratings are dropped from the data to end up with 9787 firms in our sample. The construction of the two groups based on the CR criteria results in 3636 firms in the Treated group (Investment Grade) and 6151 for the Control group (Speculative Grade).

The DID Approach is applied to figure out the major differences between Treated and Control groups in terms of variation of their leverage ratios between 2006 and 2011. The regression equation of the DID is presented below with its components:

$$Y_{i,t} = \beta_0 + \beta_1 \times P_{t-1} + \beta_2 \times T_{t-1} + \beta_3 \times P_{t-1} \times T_{t-1} + \beta_4 \times K_{t-1} + \varepsilon_{i,t}$$

With: P_t: Dummy takes 1 for Post Crisis and 0 for Pre-Crisis; T_i: Second Dummy that takes 1 for Treated Group (Investment Grade) and 0 for Control group (Speculative Grade) then we have the

third dummy a multiplication of the variable $P_{t-1} x T_{t-1}$: which is the most relevant to the research goal and sentence that tests the impact of the post crisis on the Treated Group in a comparison with the Control group. As for the variable K: a set of controls for (Liquidity, Profitability, Leverage, Capital Expenditure and *Size*).

As for the dependent variables tested by these regressions, two leverage ratios are selected as follows: *Debt to Capital ratio*: [Total Debt / (Total Debt + Market Value of Equity)]. The Total Debt is constructed by summing Long Term Debt and Debt in Current Liabilities (Short-Term Debt). The second leverage ratio is the *Debt ratio*: Total Debt / Total Assets. The two ratios are the main indicators of firms' leverage proportions that are tested over the pre and post crisis periods for the two groups.

To get into details about the selected control variables for the regressions, I select these explanatory variables based on several previous papers: *(1) Debt / EBITDA*: Short and Long Term Debt divided by EBITDA; *(2) Cash / Total Assets (Liquidity):* measured by dividing Cash and Marketable Securities by Total Assets; *(3) EBITDA / Sales (Profitability):* measured by dividing the EBITDA on Total Sales; *(4) PPE / Total Assets (Tangibility):* Property, Plant and Equipment divided by Total Assets; *(5) CAPEX / Total Assets:* Capital Expenditure divided by Total Assets*; (6) (Size)* measured by the *log* of book value of Assets.

For comparison purposes and to split the entire data into Treated and Control group, I assign numbers to the CR extracted from 1 as the best rating (AAA) to 22 as the lowest one (SD). The Treated group (Investment Grade firms) is composed by all firms with a rating equal or below 10 as shown in Table 1 below. As for the Control group (Speculative Grade firms), it is all the remaining ones with grade higher than 10. The final composition of the Treated and Control groups is respectively 3636 and 6151.

Table 1: Credit Rating Conversion Table

Table 1 describes the conversion of the CR levels from letters (AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B-, CCC+, CCC, CCC-, D, SD) to numbers respectively assigned from 1 for the highest letter AAA to 21 for the lowest SD.

	AAA	AA+	AA	AA-	A+	A	A-
Rating Code Converted	1	2	3	4	5	6	7
	BBB+	BBB	BBB-	BB+	BB	BB-	B+
Rating Code Converted	8	9	10	11	12	13	14
	B	B-	CCC+	CCC	CCC-	D	SD
Rating Code Converted	15	16	17	18	19	20	21

The empirical findings are based on the main regression equation run each time on both selected dependent variables: *Debt to Capital ratio* and *Debt ratio*. The regression uses lagged data for the control variables for period (t-1) to estimate the ratio for the period (t). Lagged variables are used to avoid endogeneity concerns and to study the effect of the previous period changes on the structure of debt funding in the next period. The main results and evidence are presented later in Table 4 in the empirical findings part.

The second part of the empirical study considers the same regression equation but adding year and firm fixed effects to further interpret the results. Thus, I add a set of dummies that control the year from 2006 to 2011, and for firms to held constant firms' characteristics.

In order to visualize the impact of the crisis on the leverage ratios of the Treated and Control groups with different factors. In fact, I add a set of dummy variables to control the industries using the first 3 digits of the SIC codes extracted initially for each firm.

The final part of the empirical findings consists in re-defining the Treated and Control groups. The new approach is set to define the Treated and Control groups to compare the main differences in the impact of the crisis on firms leverage ratios using different assumptions. In fact, this time the Treated group is composed of firms with CR prior to September 2008 above or equal to AA- and the Control group is all firms with CR below AA- and above or equal to BBB-.

Descriptive Statistics

Table 2: Summary Statistics

Table 2 describes the summary statistics of all variables used in this dissertation approach to examine in depth the data characteristics by visualizing the statistical evidences. As *Debt / EBITDA* ratio, and *EBITDA / Sales* ratio present several extreme values that damage the accuracy of the summary statistics results and affect the results, Winsorize technique is applied for the ratio to get rid of the outliers by replacing all values exceeding the 95th percentile by the value of the 95th percentile.

				Investment (Treated Group)				
Variables	*Debt to Capital ratio*	*Debt ratio*	*Debt / EBITDA*	*Cash / Assets*	*EBITDA / Sales*	*PPE / Assets*	*CAPEX / Assets*	*Size*
Mean	0.23	0.26	8.24	0.07	0.23	0.66	0.03	13.00
Standard Deviation	0.15	0.13	5.86	0.07	0.13	0.38	0.03	2.16
Min	0	0.00	0.00	0.00	0.02	0.02	0.00	1.00
Percentile 25	0.12	0.17	4.04	0.02	0.14	0.31	0.01	6.00
Median	0.20	0.26	6.74	0.05	0.21	0.63	0.02	8.00
Percentile 75	0.34	0.35	11.03	0.10	0.31	0.99	0.04	9.00
Max	0.79	0.87	22.17	0.79	0.52	2.42	0.29	12.71
N				**3636**				
				Speculative (Control group)				
Variables	*Debt to Capital ratio*	*Debt ratio*	*Debt / EBITDA*	*Cash / Assets*	*EBITDA / Sales*	*PPE / Assets*	*CAPEX / Assets*	*Size*
Mean	0.41	0.39	13.28	0.08	0.20	0.74	0.04	7.26
Standard Deviation	0.23	0.23	9.74	0.08	0.16	0.51	0.06	1.77
Min	0	0.00	0.00	0.00	0.00	0.01	0.03	10.00
Percentile 25	0.24	0.24	6.12	0.02	0.09	0.32	0.01	11.00
Median	0.38	0.35	11.17	0.06	0.16	0.70	0.02	13.00
Percentile 75	0.56	0.49	18.31	0.12	0.27	1.00	0.05	15.00
Max	1	2.08	35.09	0.65	0.60	4.01	0.24	11.15
N				**6151**				

Table 2 presents the summary statistics of the data split into two parts: The first part concerns the Treated group which is Investment Grade firms, whereas the second part is for the Control group which is the Speculative Grade firms.

The first dependent variable of the regression is the *Debt to Capital ratio*: which is Total Debt divided by the sum of Total Debt plus Market Value of Equity. The Treated group has on

average a *Debt to Capital ratio* equals to 23% whereas the mean value for Control group is approximately the double, with a value of 41%. This implies that companies with lower CR (Speculative grade) use on average higher amount of leverage in proportion to the capital in the period between 2006 and 2011. As for the volatility, the low rated firms (Control group) have also higher volatility of change in their *Debt to Capital ratio* with a higher Standard Deviation 23% compared to 15% for high rated firms (Treated group).

The second dependent variable is the *Debt ratio*: Total Debt over Total Assets as explained previously in the methodology. The mean value of the Treated group (Investment grade firms) is again lower than the average value of the *Debt ratio* for the Control group (Speculative Grade) respectively 26% vs 39%. However, for the *Debt ratio*, the gap is tightened between both groups compared to the *Debt to Capital ratio*. Such a difference, might be explained by the high level of the *Market Value of equity* of the Treated group compared to the *Market Value of equity* of the Control group that could be low and affected by the low CR. In fact, the *Debt to Capital ratio* is more affected by CR levels as it is composed of a market value and not a book value.

For *Cash / Assets ratio*, the summary statistics presents similar results with a slight difference between Treated and Control groups. The mean value for the liquidity ratio is around 7% and the volatility is around 7% too, with slightly higher values for low rated firms (Control group). The profitability control variable has as expected higher average values for the Treated group which has better financial performance, where the mean value is 23% of *EBITDA / Sales* while it is 20% for the Control group. This lower rated group presents also higher volatility for the ratio with 16% compared to 13% for Treated group. As for *PPE / Assets* and *CAPEX / Assets*, both variables present mean values slightly lower for Treated group compared to the Control group, which makes sense as Control group (Speculative grade firms) needs more investing in their capital for restructuring and strengthening their performance. As for standard deviation of *PPE / Assets*, the value is higher for low rated firms (Control group) with 51% compared to 38% for Treated group. On the other side, *CAPEX / Assets* variable has a standard deviation equals to 6% for Control group vs 3% for the Treated group. The mean *Size* is as expected higher for the Treated group compared to the Control group. The total number of firms-years that fall in the Treated group during the covered period is 3636 vs 6151 firms that composes the Control group.

Table 3: Number and Percentage of Firms per type of Issuance or Reduction

The Table 3 presents further descriptive insights to show the number of firms for each case of issuance or reduction that are grouped into 4 categories: Debt Only, Equity Only, Debt and Equity and finally Neither Debt nor Equity, to visualize the weights of each scenario followed by the firms of our sample in the period selected between January 2006 and December 2011. The percentage values are calculated by dividing the number of times a specific issuance or reduction occurs over the total number of firms. A company is having an Offering or Reduction of its Debt when the value of *Total Debt* varies between two Quarters (t) and (t+1). As for the Equity Offering or Reduction, it occurs when the *Number of Shares Outstanding* varies between a period (t) and (t+1).

	Offerings		**Reductions**	
	N	**%**	**N**	**%**
Debt Only	1850	18.90%	3508	35.84%
Equity Only	3393	34.67%	1671	17.07%
Debt & Equity	2699	27.58%	1421	14.52%
Neither Debt nor Equity	1845	18.85%	3187	32.56%
Total	9787	100%	9787	100%

The results show that most companies follow an Equity Offering only by having the highest percentage in the category of Issuance with 35% and a Debt Only Reduction in the reductions category with almost the same percentage 36% of all the sample. This leads to conclude that in most cases firms favors the Equity financing over the Debt financing in the selected period for several reasons. One possibility can be directly linked to the direct effect of the crisis, that pushes managers to be more conservative towards external funding sources. The other possibility is that most of the selected period represents a foggy and perturbated market environment even before the 2008 crisis that presents uncertain conditions and early warnings that signaled many managers and investors. Thus, they might choose a more conservative financing tools due to certain limitations of debt funding sources available in the market at that period.

Empirical Findings

Parallel Trends:

Before applying the Difference in Difference approach, it is necessary to check the existence of parallel trends between the Treated (Investment Grade firms with rating prior to the crisis equal or above BBB-) and the Control groups (Speculative Grade firms with rating prior to the crisis below BBB-).

Figure 1 Parallel Trend of *Debt to Capital ratio*

Figure 1 is a parallel trend built for the first leverage ratio: *Debt to Capital ratio*. As shown below, the difference between the mean value of the dependent variable of both groups was slightly higher than 12% in the pre-crisis period and decreased by a small value to be 6% at the end of the covered period in 2011. This means, that the Crisis effect shortens the difference in the average value of *Debt to Capital ratio* between the Treated and Control groups. Although this difference is very small, there is a parallel trend.

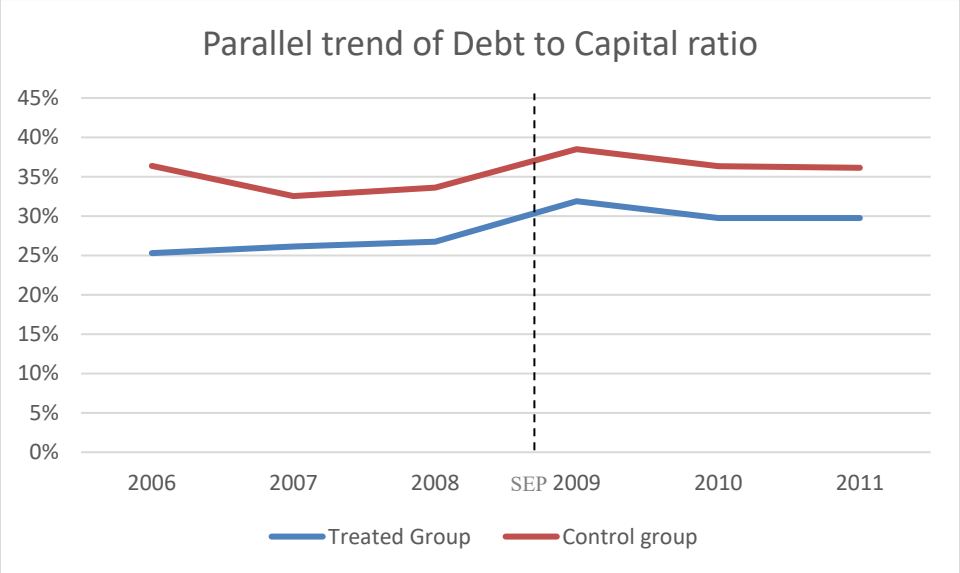
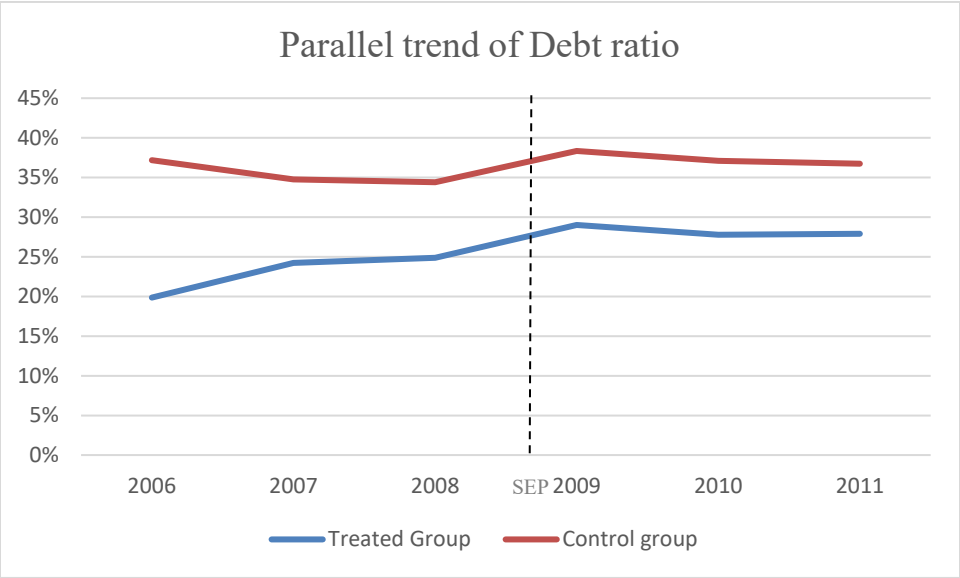


Figure 2 Parallel Trend of the *Debt ratio*

The second dependent variable represents the *Debt ratio*. The second leverage ratio has a clearer parallel trend through time. The gap between the curves of both groups decreases after the Crisis shock from 17.5% to 8% of difference. The value of the *Debt ratio* gets closer in this case between both groups as average value per year.



Results

I present in this part the main results of the regression equations using the Difference in Difference approach that are displayed and interpreted in a comparison way between the Treated and Control groups.

Table 4: Debt to Capital and *Debt ratio*s Regressions

Table 4 presents the first two regressions that concern the *Debt to Capital ratio*: [Total Debt / (Total Debt + Market Value of Equity)] and *Debt ratio*: [Total Debt / Total Assets]. The results are driven by regressing the dependent variables at time (t) on control variables lagged by one period (t-1). The results are as follows:

Debt to Capital ratio			*Debt ratio*		
	Beta	P-value		Beta	P-value
P_{t-1}	0.0338	0.0000	P_{t-1}	0.0121	0.2160
T_{t-1}	-0.1048	0.0000	T_{t-1}	-0.0194	0.1360
$P_{t-1} \times T_{t-1}$	0.00001	0.9960	$P_{t-1} \times T_{t-1}$	-0.0134	0.3560
CAPEX / Total Assets	0.1424	0.0080	*CAPEX to Total Assets*	0.1732	0.0010
Cash / Total Assets	-0.4779	0.0000	*Cash to Total Assets*	-0.3841	0.0000
Debt / EBITDA	0.0086	0.0000	*Debt to EBITDA*	0.0083	0.0000
EBITDA / Sales	-0.1834	0.0000	*EBITDA to Sales*	-0.0022	0.9140

PPE / Total Assets	0.0263	0.0000	*PPE to Total Assets*	0.0178	0.0150
Size	-0.0102	0.0000	*Size*	-0.0361	0.0000
Intercept	0.3708	0.0000	Intercept	0.5530	0.0000
Firm FE	No		Firm FE	No	
Year FE	No		Year FE	No	
Observations	2564		Observations	2564	
Adjusted R^2	0.405		Adjusted R^2	0.352	

The left part of table 4 shows the results of the first regression on the *Debt to Capital ratio*. All variables of the first regression are significant at 1% significance level, except the P_{t-1} *x* T_{t-1} variable, which is not statistically significant. The first coefficient of P_{t-1} dummy variable shows that after September 2008, the U.S. firms increase their *Debt to Capital ratio* on average by 3.38 percentage points. The T_{t-1} coefficient of Treated group is -10.48. This means that Treated group has on average 10.48 percentage points lower *Debt to Capital ratio* compared to the Control group. This confirms one of the literature outcomes stated by Murray & Goyal (2009) that on average, the more firms get solid in their performance the less debt funding they hold in their capital. However, the effect of the post crisis period on Treated group is extremely low and non-significant which is shown in the coefficient of the P_{t-1} *x* T_{t-1} dummy variable. In fact, this explains that the difference in the ratio is less relevant and even inexistant between Treated and Control groups after September 2008. Such lower difference between the two groups' ratios might be explained by the conservative approach that Control group firms take during the crisis follow due to financing limitations, solvency problems and hedging against possible insufficiency of funds that could occur to Control group (lower rated firms). That is why, they tend to decrease more than Treated group firms their leverage proportion to Capital, which results in a tighter gap between the two groups. The variables *CAPEX / Total Assets*, *Debt / EBITDA* and *PPE / Total Assets* have positive impact on the *Debt to Capital ratio*, as shown by Baghai et al. (2014). The highest positive impact on the first leverage ratio is recorded for the *CAPEX / Total* Assets. On the other side, *Cash / Total Assets*, *EBITDA / Sales* and *Size* variables impacted the *Debt to Capital ratio* negatively and drop it by different intensity as Kisgen (2006) underlines. Besides that, Baghai et al. (2014) proves that profitability has a negative impact on the market leverage, and the *Size* also on the net debt issuance of the company which is strengthening our results found in the Table 4. *The Cash / Total Assets* has the highest negative impact among all the control variables followed by *EBITDA / Sales* variable.

Harrison & Wisnu (2013) findings also confirm the empirical evidence of this table by showing in their paper that the sign of *Size* and profitability on the Capital Structure turns to be negative after the crisis. In fact, when destabilizing the capital structure in times of crisis, firms overall shrink the debt proportion to capital as a conservative reaction to the market collapse, and the difference in the value of the *Debt to Capital ratio* between the Treated and Control groups gets smaller.

The second regression presented in table 4 is regarding the *Debt ratio*: Total Debt / Total Assets. The results are driven as the first regression by using lagged values of the control variables for period (t-1) to estimate the ratio for the period (t). Results of their coefficients betas and p-values shows these empirical implications.

On the overall level, the second regression presents more non-significant variables than the first one, with the variables P_{t-1} (that takes 1 in the Post Crisis), T_{t-1} (that takes 1 for Treated Group), $P_{t-1} \, x \, T_{t-1}$, and *EBITDA / Sales* non-significant at 5% significance level. On average, the post crisis period increases the *Debt ratio* by 1.21 percentage points compared to the pre-September 2008 period. Such a result implies that the post 2008 Crisis effect is positive on the Debt proportion to Assets on average. The second coefficient of the second variable T_{t-1} shows that Treated group has on average lower *Debt ratio* compared to the Control group. The gap between both groups' ratios is around 1.94 percentage points less for Treated group. Added to that, Treated group (Investment Grade firms) tends to have less Debt proportion to its Assets compared to Control group (Speculative Grade) in the post crisis of 2008 as proven by $P_{t-1} \, x \, T_{t-1}$ variable coefficient (less by 1.34 percentage points).

As for the effect of the control variables on the output *Debt ratio*, it is similar to their effect on the *Debt to Capital ratio*, with *CAPEX / Total Assets*, *Debt / EBITDA* and *PPE / Total Assets* with positive impact on *Debt ratio* and *Cash / Total Assets*, *EBITDA / Sales* and *Size* resulting in a negative effect as both strengthened by the literature such as Baghai et al. (2014), Kisgen (2006) and Harrison & Wisnu (2013) for the signs of these controls on leverage ratios. *CAPEX / Total Assets* has the highest positive impact among the controls on the ratio. Similarly, to the first regression, *Cash / Total Assets* has the highest and most important impact among control variables with a negative change on the ratio, followed by *Size* variable.

The main outcomes driven from both regressions on the Treated and Control groups, is that on average the Treated group holds less Debt than the Control group in proportion to the capital and total assets. As for the post September 2008 crisis effect, the first regression on the *Debt to Capital ratio* shows approximately equal levels between the Treated and Control groups as the coefficient is extremely low, close to zero. On the other hand, the Treated group has lower *Debt ratio* in the post crisis period compared to the Control group, as it is shown in the second regression of Table 4. The highest negative impact on the leverage ratios determined among control variables is for the *Cash / Total Assets* while the highest effect comes from *CAPEX / Total Assets* variable.

Table 5: Fixed Effects Regressions on Leverage Ratios

In the Table 5, I present the second part of the empirical findings by performing regressions using fixed effects on Year and Firm for both leverage ratios: *Debt to Capital ratio* and *Debt ratio* and comparing the two groups. The results are shown in the Table 5 below:

	Fixed Effects			
	Year FE		Firm FE	
	Debt to Capital ratio	*Debt ratio*	*Debt to Capital ratio*	*Debt ratio*
P_{t-1}	0.0722	0.0154	0.0607	-0.0012
	(0.0000)	(0.3010)	(0.0000)	(0.7530)
T_{t-1}	-0.0964	-0.0124	-0.0210	-0.0194
	(0.0000)	(0.3170)	(0.0920)	(0.0220)
$P_{t-1} x\ T_{t-1}$	-0.0127	-0.0161	-0.0020	0.0143
	(0.3380)	(0.2430)	(0.8000)	(0.0080)
CAPEX / Total Assets	-0.0171	0.0805	0.0028	-0.0351
	(0.7390)	(0.1310)	(0.9360)	(0.1450)
Cash / Total Assets	-0.4465	-0.3683	-0.2901	-0.1002
	(0.0000)	(0.0000)	(0.0000)	(0.0050)
Debt / EBITDA	0.0097	0.0094	0.0011	0.0020
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
EBITDA / Sales	-0.1852	-0.0056	-0.2227	-0.1002
	(0.0000)	(0.7680)	(0.0000)	(0.0000)
PPE / Total Assets	0.0501	0.0335	0.0493	0.1096
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Size	-0.0098	-0.0386	0.0270	0.0115
	(0.0000)	(0.0000)	(0.0060)	(0.0880)
Intercept	0.00001	0.00001	0.00001	0.00001
	(1.0000)	(1.0000)	(1.0000)	(1.0000)
Firm FE	No	No	Yes	Yes
Year FE	Yes	Yes	No	No
Observations	2565	2565	2565	2565
Adjusted R^2	0.475	0.413	0.191	0.198

The first dummy variable P_{t-1} (referring to the Post Crisis period) shows in both cases using firm fixed effect and year fixed effect, that the *Debt to Capital ratio* and the *Debt ratio* increase after the 2008 World Crisis. The *Debt to Capital ratio* is 7.22 percentage points higher after the crisis when compared to the period before 2008, when using year fixed effect while it is 6.07 percentage points higher in the post crisis when using firm fixed effect. As for the *Debt ratio*, it goes up by lower margins after the crisis, as the ratio increases by 1.54 percentage points when using year fixed effect, and it decreases slightly when compared to the period before the crisis, using firm fixed effect. This implies that the variation of the *Debt to Capital ratio* is more important than the variation in the *Debt ratio* using fixed effects. The first dummy variable P_{t-1} is significant at 1% significance level for the case of *Debt to Capital ratio* regressions, and not significant for the regressions on the *Debt ratio* neither at 1% nor at 5% significance level.

The second dummy variable: T_{t-1} (takes 1 for Treated group) has negative coefficients for both regressions on *Debt to Capital ratio* and *Debt ratio* applying Year fixed effect. This means that Treated group holds lower proportions of *Debt to Capital* and *Debt ratio* (Debt to Total Assets) than the Control group. In fact, Treated group has 9.64 percentage point less than Control group for the *Debt to Capital ratio* and 1.24 percentage point less for the *Debt ratio* than Control group. The coefficient of the T_{t-1} variable is significant at 1% significance level for the regression on the *Debt to Capital ratio*, whereas it is not significant for the second regression on the *Debt ratio* neither at 1% nor at 5% significance levels. The second part of table 5 shows the results using fixed effect on Firms. The numbers confirm also that the Treated group (Investment Grade) has also lower leverage ratios than the Control group (Speculative Grade) using Firm fixed effect, with both variables significant at 5% significance level. The third dummy $P_{t-1} \, x \, T_{t-1}$ is the most important variable for this dissertation topic since it shows the impact of the post crisis period on the Treated group. The coefficients of the dummy are negative and approximately the same for both *Debt to Capital ratio* regression and *Debt ratio* regression, using Year fixed effect. The results confirm the previous findings as Treated group has lower leverage ratios than the Control group after the September 2008 crisis. Unfortunately, both variables are non-significant at 5%. The control variables have a similar representation as in Table 4. The yearly fixed effect for all the firms shows that the highest intensity of change is caused by the *Cash / Total Assets* variable with a negative

impact sign for both ratios, and both variables are significant at 1% significance level. The *liquidity* control variable continues to show negative impact on both ratios also when applying Firms fixed effect as shown in the second regression in Table 5. Added to that, *profitability* control variable which is the *EBITDA / Sales* strengthens the previous results found in the previous regressions and affects the leverage ratios negatively too. These results underline the assumptions of the previous literature, mainly Baghai et al. (2014) results, Kisgen (2006) and Ramalho & Jacinto (2009) that show that liquidity and profitability are indirectly correlated with the amount of leverage proportions of the firm.

The second regression in Table 5 regarding the fixed effect on Firms confirms the same outcomes, where *liquidity* and *profitability* negatively affects the leverage proportions to capital and to total assets, with significant variables at 1%. As for the *Size* control, while it has a negative effect on the leverage ratios in the case of Year fixed effect regressions, it demonstrates a positive impact on the leverage ratios when applying a fixed effect on Firms. The *Debt / EBITDA* control variable has a positive impact on both ratios in both cases of fixed effects and all the variables are significant at 1%.

Table 6: Industry Fixed Effect using SIC codes

In the Table 6, I perform a fixed effect regression on industry using the SIC codes initially extracted and creating a set of dummy variables that control industries based on their common characteristics. The results are shows below for both leverage ratios:

Industry Fixed Effects using SIC codes		
	Industry FE	
	Debt to Capital ratio	*Debt ratio*
P_{t-1}	0.0545	0.0049
	(0.0000)	(0.4300)
T_{t-1}	-0.1047	-0.0559
	(0.0000)	(0.3170)
$P_{t-1} x T_{t-1}$	-0.0071	0.0068
	(0.5000)	(0.4500)
CAPEX / Total Assets	0.0968	0.1718
	(0.0250)	(0.0000)

Cash / Total Assets	-0.2656	-0.3300
	(0.0000)	(0.0000)
Debt / EBITDA	0.0045	0.0060
	(0.0000)	(0.0000)
EBITDA / Sales	-0.2076	-0.0195
	(0.0000)	(0.2100)
PPE / Total Assets	0.0785	0.0690
	(0.0000)	(0.0000)
Size	-0.0090	-0.0311
	(0.0050)	(0.0000)
Intercept	0.00001	0.00001
	(1.0000)	(1.0000)
Observations	2565	2565
Adjusted R^2	0.331	0.402

The results shown in the Table 6 are similar to the previous ones. The post crisis period engenders the increase of both leverage ratios when compared to the pre-crisis period using Industry fixed effect. In fact, *Debt to Capital ratio* is 5.45 percentage points higher in the post crisis period when comparing to before September 2008, while the *Debt ratio* is 0.49 percentage points higher after the crisis. As for the second coefficient of T_{t-1} dummy, it strengthens again the assumption that high rated firms (Treated group) have less leverage proportions on average than low rated firms (Control group). The Treated group holds 10.47 percentage points less *Debt to Capital ratio* compared to the Control group and a *Debt ratio* lower by 5.59 percentage points than the *Debt ratio* for the Control group. As for the Treated Group leverage ratios after the September 2008 crisis, opposite sign effects are shown this time in the coefficients of $P_{t-1} \, x \, T_{t-1}$ variable: as The Treated group holds lower *Debt to Capital ratio* than the Control group in the post crisis period but higher *Debt ratio*. Among the three dummy variables, only the second dummy variable T_{t-1} (takes 1 for the case of Treated group) is significant at 1%, while the other two dummies are non-significant.

The control variables have overall the same impact on both ratios as *Liquidity*, *Profitability* and *Size* controls have negative effects on leverage for the average per industry and CAPEX / Total Assets, PPE / Total Assets, *Debt / EBITDA* holding positive impact on both ratios. The sign effect continues to be aligned with the previous empirical outcomes and the previous papers mentioned.

Table 7: Debt to Capital and *Debt ratio* regressions using new Treated and Control groups

Table 7 presents the last regression of the empirical findings, where a new Treated and Control groups are assumed as explained previously. The new construction of Treated and Control groups is only assuming a sample of firms with CR above or equal to BBB- where the Treated group (Investment Grade) is all firms with a CR prior to September 2008 above or equal AA- and Control group (Speculative Grade) are the ones with a CR below AA- and above BBB-. The results of the regressions for both leverage ratios are presented below:

Debt to Capital ratio			*Debt ratio*		
	Beta	P-value		Beta	P-value
P_{t-1}	-0.1176	0.0030	P_{t-1}	-0.0911	0.0350
T_{t-1}	-0.1160	0.0000	T_{t-1}	-0.0241	0.1790
$P_{t-1} \, x \, T_{t-1}$	0.0269	0.0140	$P_{t-1} \, x \, T_{t-1}$	-0.0084	0.3560
CAPEX / Total Assets	0.2938	0.0080	*CAPEX / Total Assets*	0.3072	0.0067
Cash / Total Assets	-0.4708	0.0000	*Cash / Total Assets*	-0.3698	0.0000
Debt / EBITDA	0.0072	0.0000	*Debt / EBITDA*	0.0082	0.0000
EBITDA / Sales	-0.2391	0.0000	*EBITDA / Sales*	-0.0461	0.1090
PPE / Total Assets	0.0258	0.0040	*PPE / Total Assets*	0.0210	0.0300
Size	-0.0516	0.0000	*Size*	-0.0688	0.0000
Intercept	0.7372	0.0000	Intercept	0.5530	0.0000
Observations	2564		Observations	2564	
Adjusted R^2	0.366		Adjusted R^2	0.352	

The results of the Table 7 are reflecting the top-rated firms' reactions to the world crisis in terms of debt proportions to capital and assets. The P_{t-1} coefficient shows that firms have lower *Debt to Capital* and *Debt ratios* after September 2008 in a comparison to the period before September 2008, by respectively 11.76 and 9.11 percentage points. As for the second coefficient, the Treated group has lower leverage proportions to Capital and to Total Assets than the Control group. This empirical evidence underlines again the fact that the higher firms get in the CR scale the lower dependence they have to leverage funding compared to relatively lower rated companies. Consequently, the Treated group presents again lower ratios on average than the Control group. As for the third and most important measure, $P_{t-1} \, x \, T_{t-1}$ which is the Treated group in the post crisis period, the Treated group has higher *Debt to Capital ratio* but at the same time lower *Debt ratio* than the Control group after 2008 crisis, and the variables are significant at 5% level. Top rated firms of the sample (Treated group) hold higher *Debt to Capital ratio* by 2.69 percentage point than the relatively low rated firms (Control group). One of the possible explanations might be due to the direct plummeting of the *Market Value of equity* of high rated companies in the market.

Generally, firms with high might be directly linked to more complex factors such as bigger companies' networks, partners, contracts values, and other financial elements that collapses due to the crisis. Therefore, the *Market Value of equity* of Treated group may be sensitive to shrinks more than the *Market Value of Equity* of the Control group. This effect results in a higher proportion of *Debt to Capital*. In fact, on the other side, the *Debt to Assets* is lower for the Treated Group in the post crisis period. This contradictory signs between both ratios, strengthens that the main driver for these results is not directly the debt volume variations. Thus, it could be the value of the *Market value of Equity* and the *Total Assets* that is reflecting this gap between Treated and Control groups. As for the control variables, the same results in terms of sign effect on leverage ratios is found in Table 7. *Liquidity*, *Profitability* and *Size* have negative impact and decrease both leverage ratios and *CAPEX / Total Assets*, *PPE / Total Assets*, *Debt / EBITDA* continue to have a positive boost to the *Debt to Capital* and *Debt ratio*.

Limitations and Improvements

The dissertation has certain limitations that should be taken into consideration for future research. The limitation of availability of Credit Ratings tightens the time horizon of the dissertation as CR are rare to be found before 2005 for the US firms and even harder for other regions. The use of control variables might be enriched by other relevant controls for more solid results such as: the *Asset Market-to-Book ratio* and *P/E ratio* that could capture the market effect during the crisis periods. Finally, the literature has certainly some limitations of further resources that take the topic of global crisis and Firms' leverage change into account.

I suggest for future research studies, to expand this dissertation topic more to the macroeconomic level, by adding variables as GDP growth rate, Inflation, Industry growth rate, as these factors vary in crisis times and affect the monetary policy, industries' growth thresholds and result in changes in the managers funding sources to adapt. Thus, analyzing the effect of certain macroeconomic aspects and monetary policy changes on leverage funding could bring new outcomes. Finally, I suggest comparing firms' reaction to the 2008 crisis with their reaction to the new covid 19 crisis to figure out the major changes in companies culture when dealing with global crisis.

Conclusion

Capital Structure has been for a long time a controversial topic in the business field. In fact, one of the managers' main issues is to find the optimal capital structure equivalent to specific conditions of the market and capacities of the firm they manage. This responsibility raised the attention to them, and to several researchers to gather as much empirical evidence as possible to figure out the major factors building an optimal balance of capital.

Some of the intervening factors that affect the balance of weights between leverage financing and equity financing is market crisis, that affect mainly the credit rating levels of firms and results in a capital restructuring and more specifically Debt proportions' adjustments as a response to the crisis. Several papers discussed the relationship between credit rating scores and capital structure change as explained in the literature part of this dissertation. To understand better the impact of market collapse on firm's financing decisions and more specifically in terms of leverage financing, this empirical study is focusing on analyzing the impact of the 2008 Financial Crisis on US firms leveraged capital using two leverage ratios: *Debt to Capital* and *Debt ratio*. The analysis is assuming a Difference in Difference Approach (DID) that compares the major variations of the leverage ratios for two different groups: The Treated group and the Control group.

The results of the DID approach shave similar outcomes as in most cases, both leverage ratios increased in the post crisis period. In fact, the crisis stimulates the increase of the *Debt to Capital* and the *Debt ratio*. Added to that, the results show strong evidence that the Treated group holds less debt proportions to capital and to assets than the Control group on average as most of the coefficients of the Treated group dummy are negative. The Treated group holds a lower *Debt to Capital ratio* that the Control group by -10.48 percentage points and by -1.09 percentage points for the *Debt ratio*. The Treated group holds also lower leverage ratios in the post crisis period compared to the Control. However, the empirical findings prove that this dummy variable is non-significant in most of the cases unlike the first two dummies controlling the Time and Group. As for the control variables, the results perfectly confirm the sign of effect of these variables on the dependent variables (leverage ratios) as mentioned in the literature. The *liquidity*, *profitability* and *Size* controls are negatively correlated to the leverage proportions as stated in the literature by Harrison & Wisnu (2013). In fact, all the regressions, even the fixed effect regressions on Firm,

Year and Industry prove this negative impact. The *Cash / Total Assets* has the highest negative impact among the controls. As for *Debt / EBITDA*, *PPE / Total Assets* and *CAPEX / Total Assets*, they all have a positive impact and increase both leverage ratios which also underlines the previous literature of Kisgen (2006) and Baghai et al. (2014). The last part of the empirical findings re-defines the composition of the two groups of this study. In fact, the new Treated group is composed of all firms with CR above or equal AA- and the new Control group is all firms with CR below AA- and above or equal to BBB-. The results of this regression confirms again the previous findings, as firms hold lower leverage ratios in the post crisis period compared to the period before September 2008. Moreover, it confirms that the higher the CR of the firm, the lower leverage ratios it holds, as again the Treated group has lower *Debt to Capital* and *Debt ratio* than the Control group respectively by -11.60 and -2.41 percentage points. The difference in the last regression, is that the variable $P_{t-1} \, x \, T_{t-1}$ referring to the impact of the post crisis period on the Treated group is significant at 5% level. The regressions shows that the Treated group has higher *Debt to Capital ratio* than the Control group by 2.69 percentage points and less *Debt ratio* by -0.84 percentage points than the Control group. As the signs are opposite, this might lead to think that the effect is triggered by the *Market Value of Equity* and the *Total Assets* and not directly linked to the *Total Debt* of both groups. One of the possibilities can be that the Market Value of Equity of high rated firms (Treated group) might be more sensitive to the collapse of the market since it is more affected by complex financial networks of partners, investors and high volume of transactions. In fact, the Treated group may be more exposed to market risk, bigger investments, etc. The control variables continue to strengthen historical findings such as Baghai (2014) results, Kisgen J. Darren (2006) and the paper of Ramalho & Jacinto (2009) in terms of signs of impact on the leverage ratios.

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