Capital Structure Determinant's of North American Banks and the Compensation Executive Program-*An Empiric Study on the Actual Systemic Crisis*

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Abstract

The works related to the capital structure of banks consider the requirements for minimum regulatory capital, established by the Basel agreements, as their key determinant. However, recent studies suggest that standard determinants of non-financial institutions – size, profitability, growth opportunity, tangible assets and payment of dividends, also have the power of explaining the leveraging level of banks. Thus, this work was aimed at checking whether, for those banks that hold own capital above the minimum regulatory value, the predictive capacity of standard determinants also applies to American banks that have business portfolio. As an original contribution, the work evaluated the role of the compensation program for executive managers in order to determine the capital structure of banks. The final sample was comprised by 30 banks, which observations refer to the period before (2003 to 2006) and during (2007 to 2010) the systemic crisis. The dynamic regression model with panel data confirmed the key assumption mentioned by means of the significance of the independent variables profitability and growth opportunity. At last, the variable of compensation program for executive managers has been evidenced as significant in the definition of bank leveraging, but with sign opposite to the expected one by the finance theory.

1. Introduction

Since the seminal article by Modigliani and Miller – MM (1958), which states that, in a world with no type of conflicts, the company value is not affected by its capital structure, scholars have been looking for identifying the determinants or conflicts that explain the financial leveraging of companies. However, until the actual systemic crisis triggered from the subprime crisis in the United States, the literature on finance was targeted to the regulatory requirements – Basel I (1998) and Basel II (2004) Agreements and deposit insurances – as the key factors in the definition of the capital structure of banks (Harding, Liang & Ross, 2006; Mishkin, 2000; Miller, 1995). To that date, it was believed that the referred requirements were enough to maintain the balance or financial solvency of such institutions and the market as a whole.

In regard to the subprime crisis, it is worth emphasizing that, as such loans are of difficult liquidation, banks have securitized them, thus enabling the sale of part of their credit risk to other institutions and investors, contaminating other developed countries (Savoia, Bergmann, Mendes da Silva & Contani, 2010). Therefore, as the risk of such credits was removed from their balance sheets, the banks were able to grant a higher volume of real estate loans based on their capital, without compromising their Basel levels (Alberini & Boguszewski, 2008).

As a consequence, this strategy ultimately originated the systemic crisis started in 2007. The Federal government reacted in several ways during this process, including the direct support to financial institutions in 2008, by creating the Troubled Asset Relief Program (TARP). In its early version, this packaged released US$ 700 billion for the purchase of subprime mortgage assets from the troubled financial institutions. The referred amount was

further used to inject capital in bank institutions (Mishkin, 2010). In spite of removing the "rotten" assets from the balance of financial institutions, this measure represented an alternative way for realizing new provisions of capital in the financial institutions, thus creating some maneuvering margin for banks. The aim was at clearing the channels that were obstructing the credit markets. Nevertheless, the effects expected from the new measures were not effective. Banks chose to increase their capital reserves instead of performing new credit operations (Júnior & Filho, 2008).

Bank for International Settlements (BIS) defines a minimum level of own capital – capital stock, capital reserves, profit reserves, other reserves and cumulated profits and losses – of 8% on the total assets weighed by the risk for commercial banks. Indeed, the top 20 banks worldwide – in terms of their own capital – considered the mean Basel index close to 14% in the end of 2009 (Fraga, 2010).

Such facts indicate the existence of a "pad" or own capital surplus above the minimum requirements defined in Basel, which even so, could not avoid the sequence of bankruptcy of American and European institutions. Thus, the Basel agreements must be seen as one of the conflicts that moves the market reality away MM irrelevance proposal; but they should not be considered as the key determinant of the capital structure of banks.

On the contrary, recent evidences suggest that the standard determinants applied to that date only on non-financial companies also have the power of explaining the financial leveraging level of banks in terms of accounting and market values. The referred studies were carried out both for banks of developed countries (Gropp and Heider, 2010; Brewer III, Kaufman and Wall, 2008; Kleff and Weber 2008), and for developing countries (Çağlayan & Şak, 2010; Romdhane, 2010; Ahmad, Ariff & Skully, 2009; Octavia & Brown, 2008; Salawu & Awolowo, 2007).

Even before the abovementioned systemic crisis, one determinant assumed a special highlight in terms of performance definition (Doucouliagos, Haman & Askary, 2007) and bank leveraging (Barton & Laux, 2010; Bhagat & Bolton, 2011), as well as on the capital structure of companies (Mehran, 1992; Smith & Watts, 1982 & 1986; Jensen & Meckling, 1976), that is, the compensation program for executive managers based on stocks and options. According to the option pricing theory, a raise of volatility makes the stock more valuable. Thus, due to its convexity effect, it encourages the managers to assume risks. In order to face their investment requirements, the managers finally choose for acquiring more debts, thus raising the risk of companies.

As a result, these studies evidenced the existence of a positive and statistically significant ratio between financial leveraging level vs. stock & option components of the compensation program for executive managers. However, with the crisis, it was observed that the compensation policy for executive managers of financial institutions, based on stocks and options, was linked to short-term results, not taking into account the long-term risks. More audacious investments, with expectation for short-term return, demanded a higher indebtedness level.

Based on the problem described, this work has the key purpose of checking whether the standard determinants of non-financial companies, before (2003 to 2006) and during (2007 to 2010) the systemic crisis period, with the compensation program for executive managers (based on stocks and options) between these periods, also have the power of explaining the financial leveraging level of banks at market value, in addition to the risk of assets and deposit insurances. To do that, the following major alternative hypotheses are tested:

H1: The standard determinants of the capital structure of non-financial companies have significant explanation power in bank leveraging;

H2: The assets risk has significant explanation power in bank leveraging;

H3: The deposits have significant explanation power in bank leveraging.

The asset risk and deposit volume variables are included in the regression model as proxies of the measurement of the minimum capital requirements defined by the Basel agreements. The bank assets risk is comprised by credit, market and operational risks, representing the risks provisioned by Basel II agreement, and thus should be captured by the effect of risk adjustments for the minimum capital required. By its turn, the variable deposit is represented by the percentage of the volume of funding actions performed by deposits on the total bank assets. As these operations are insured by the Federal Deposit Insurance Corporation (FDIC) – they should raise the risk of assets, and thus the financial leveraging level of banks at market level, giving higher emphasis on the need for the Basel agreements.

In regard to the specific purposes of this work, they are checked from the analysis of the following alternative hypotheses, related to the standard determinants of capital, as well as to macro-economic factors:

H4: The higher is the bank size the higher will be its leveraging level;

H5: The higher is the bank profitability the lower will be its leveraging level;

H6: The higher is the growth opportunity the lower will be its leveraging level;

H7: The higher is the tangible assets as bank guarantees the higher will be its leveraging level;

H8: The higher is the payment of dividends the lower will be the leveraging level;

H9: The higher is the compensation of executive managers of the bank the higher will be its leveraging level;

The bank financial leveraging variable, for the alternative hypotheses H1 to H9, refers to its market value. The referred analyses are carried out by American commercial banks.

2. Theoretical References

According to Kwan (2009), banks and other financial institutions are specialized businesses, which capital structure is affected by a series of conditions of the financial industry, such as governmental regulations and access to insurance instruments of the Federal government, which includes deposits. Merton (1977) defined the deposit insurance models as a sale option, offering to banks the right for selling their assets to the insurer of its deposits (FDIC) at an exercise price similar to the nominal value of its deposits. According to the option pricing theory, the value of the deposit insurance increases with the risk level raise of bank assets and their exercise price. Thus, the banks finally have incentive for maximizing the value of their deposit insurance, assuming more risks and using less own capital. By considering the reasons mentioned above, we conclude that both the asset and deposit risks have significant explanation power in bank leveraging (H2 and H3).

In regard to the standard determinants of the capital structure, the size can be considered as a proxy of the bankruptcy probability opposite factor. This means that, according to the theory of bankruptcy costs, large companies are usually more diversified than the small-sized ones. Thus, they are less exposed to financial difficulties, resulting in their lower bankruptcy costs. Due to such reason, their indebtedness capability is higher than that of small companies (Brito, Corrar and Batistella, 2007). In case of banks, Brewer III, Kaufman and Wall (2008), and Kleff and Weber (2008) believe that larger financial institutions have more facilities to access the capital market (external capital), due to their lower transaction costs. Such fact enables them to have higher financial flexibility, and thus, lower need for maintaining regulatory capital surplus (above the levels defined by the Basel agreements), when compared to smaller banks. Thus, by considering the abovementioned information, it is expected a positive ratio between the bank size vs. its indebtedness level (H4).

Recent studies on the dynamic model of the trade-off theory indicate that the leveraging is negatively related to the profitability of companies. Indeed, by contrasting the pecking order theory, according to Berger et al (2008), after analyzing 666 American banks with stocks traded in stock exchanges, between 1992 and 2006, the authors observed that in spite of the abnormal volume of profits cumulated within this period, the banks were looking for increasing more and more their percentage of own capital by issuing new stocks. Brewer III, Kaufman and Wall (2008), and Kleff and Weber (2008) also reached this same result, that is, the higher is the profitability of banks the higher will be their capability to increase the own capital by accumulation. Thus, by considering the abovementioned information, it is expected a negative ratio between the bank profitability level vs. their indebtedness level (H5).

By its turn, the static trade-off theory, the profit distribution varies positively with the growth opportunities, i.e. by keeping the profitability constant, the companies with higher investment opportunities – more profitable – pay more dividends, and thus have lower leveraging (Futema, Basso & Kayo, 2009; Gropp & Heider, 2010; Kleff & Weber, 2008). Therefore, the higher is the growth opportunity the lower will be the bank leveraging level (H6).

The bankruptcy cost theory considers that non-financial companies that hold tangible assets, such as real estate properties, machinery and equipment may offer them to creditors as debt guarantee. Thus, they have higher indebtedness capability, as these assets can be sold in case of insolvency, reducing the bankruptcy costs (Frank & Goyal, 2009; Brito, Corrar & Batistella, 2007). However, in case of financial institutions, the ratio between tangible assets vs. leveraging varies in function of the country development level. In case of developed countries, this ratio is positive; while for developing countries, it is negative. In this last case, the increase of tangible assets apparently reduces the value of banks in the issuance of new debts (Çağlayan & Şak, 2010; Gropp & Heider, 2010; Octavia & Brown, 2008). Although theoretical and empirical studies find support for the existence of negative and positive signs between tangible assets, such as guarantee and leveraging level of banks, in this work, the hypothesis considered is that the higher is the tangible assets of banks the higher will be their financial leveraging level (H7).

According to Myers (1984), in the static trade-off model, the companies adjust the payments of dividends towards their compensation goals, that is, they look for such level in a similar way as they look for the best indebtedness level. The author states that reducing the payment of dividends is a defensive measure in a period of financial troubles. Therefore, paying dividends is not attractive and neither recommended for low profitable and vey leveraged companies (Bastos & Nakamura, 2009; Futema, Basso & Kayo, 2009; Frank & Goyal, 2008). Also, according to the pecking order theory, companies prefer internal instead of external financing. Thus, Frank and Goyal (2009), and Gropp and Heider (2010) conclude that companies and banks that pay dividends are more profitable, and therefore less leveraged. By considering the abovementioned information, we have the hypothesis that dividend distribution is negatively related to the financial leveraging level of the bank (H8).

According to the agency theory, compensation programs (Sousa & Krauter, 2010; Krauter, 2009; Smith & Watts, 1982 & 1986), acquisition of stocks by managers (Jensen & Meckling, 1976) and monitoring of executive managers (Fama & Jensen, 1983; Mehran, 1992) reduce the conflict between shareholders and managers by aligning their interests, via increase of the financial leveraging, risk and wealth.

To this date, the analysis on the indebtedness level vs. compensation programs ratio was restricted to non-financial companies. However, more recent studies, such as Bolton, Mehran and Shapiro (2010), observed that, on average, while the American non-financial companies has indebtedness level around 47% of their capital structure, for financial institutions, this percentage is near 90%, and this figure reaches 95% for investment banks (Bhagat & Bolton, 2011). This high financial leveraging level results from the fact that debts in banks are subsidized by deposit insurances or other implicit redemption guarantees, in contrast with non-financial companies. Thus, the maximization of the value for bank shareholders involves the contracting of executive managers that do not have aversion to risk, and therefore, should be rewarded for this. By considering the abovementioned information, the higher is the compensation of bank executive managers – based on stocks and options – the higher will be its leveraging level (H9).

3. Method

The target population of this study refers to the 1,753 American commercial banks that held more than US$ 300 million of consolidated assets on 12/31/2009. By its turn, the final sample is small and comprised by only 30 of such banks, and that had all the data items for years from 2003 to 2010, even so representing near 60% of the total assets of banks in the population mentioned above.

Secondary data of the sample in this work has been achieved by means of the Federal Reserve and Yahoo Finance websites, as well as from international private databases provided by Columbia University – Orbis and Osiris of Van Dijk Bureau, Thompson One Banker of Thomson Financial and ExecuComp of Standard & Poor's. The software used was Gretl (Gnu Regression, Econometrics and Time-series Library), version 1.9.4.

The evidence or not of the hypotheses of this work has been achieved by descriptive statistical tests and multivariate regression with panel data. Variables used in the conduction of such tests are provided on Table 1:

Table 1. Variables used by the statistical tests

Acronym	Name	Description	Formula
ALAVM	Financial leveraging at market value	Corresponds to the percentage of the market value of the bank financial leveraging	$ALAVM = 1 - \dfrac{VMPL}{VMA}$
TAM	Size	Corresponds to the natural logarithm of the bank size, obtained by the accounting value of total assets, deflated by the Consumer Price Index (CPI) based on 2010	$TAM = Ln\,(VCA)$
LUCR	Profit	Corresponds to the percentage of bank profitability	$LUCR = \dfrac{LAIR + \text{Interest expenses}}{VCA}$
VMC	Growth opportunity	Corresponds to the percentage between the market and accounting values of the total bank assets	$VMC = \dfrac{VMA}{VCA}$

GAR	Guarantees	Corresponds to the percentage of guarantees in relation to the accounting value of the total bank assets	$GAR = \dfrac{ATT}{VCA}$
DIV	Payment of dividends	Corresponds to the percentage between the accounting value of dividend payment and total bank assets	$DIV = \dfrac{DIV}{VCA}$
COMP	Compensation program for executive managers	Corresponds to the natural logarithm of the compensation of executive managers, deflated by the CPI index, based on 2010	$COMP = Ln\,(COMP)$
RISC	Risk	Corresponds to the assets risk	$RISC = \left[VOL_{year} \; x \left(\dfrac{VMPL}{VMA} \right) \right]$
VMDP	Market value of deposits	Corresponds to the percentage of the market value of deposits	$VMDP = \dfrac{TDP}{VMA}$
VMNDP	Market value of non-deposits	Corresponds to the percentage of the market value of non-deposits	$VMNDP = ALAVM - VMDP$
DUMMY	Systemic crisis period	Corresponds to the identification of the period before and during the systemic crisis	0 = Years before the systemic crisis 2003 to 2006 1 = Years during the systemic crisis 2007 to 2010

Where:

ATT: Tangible assets = Securities or bonds, such as cash & banks + federal government bonds + bank deposit certificates + other bonds and securities + fixed assets

COMP: Compensation of executive managers = Fixed compensation + variable compensation + post-employment benefits + benefits due to role exercise termination + compensation based on stocks and options + (number of stocks or quotas directly or indirectly held vs. quotation on 12/31)

LAIR: Earnings before income tax

TDP: Total value of deposit operations

VCA: Accounting value of total assets

VMA: Market value of assets = VCPE + VMPL

VCPE: Accounting value of the total liabilities

VCPL: Accounting value of the net equity

VMPL: Market value of the net equity = Number of stocks x quotation on 12/31

VOL$_{year}$: Standard deviation of the daily return of stocks x $\sqrt{252}$, where 252 = approximate number of business days in one year

4. Results

According to Table 2, it is possible to observe that the period before the systemic crisis (2003 to 2006) has the highest arithmetic mean values for the variables profit (LUCRO), growth opportunity (VMC), payment of dividends (DIV) and compensation program for executive managers (COMP). By its turn, the period during the systemic crisis (2007 to 2010) exhibits the highest arithmetic mean values for the variables leveraging at market value (ALAVM), guarantees offered via tangible assets (GAR), assets risk (RISC) and market values of deposit operations (VMDP). Such fact indicates a positive ratio, coherent with the finance theory, between the dependent

variable leveraging at market value (ALAVM) vs. the independent variables size (TAM) and guarantee (GAR), as presented in the alternative hypotheses H4 and H7, respectively. In addition, the variable leveraging at market value (ALAVM) holds negative ratio with the variables profit (LUCR), growth opportunity (VMC) and payment of dividends (DIV), as expected by the finance theory and mentioned in the alternative hypotheses H5, H6 and H8.

Table 2. Annual arithmetic mean values of the model variables

Variable	2003	2004	2005	2006	2003-2006	2007	2008	2009	2010	2007-2010	2003-2010
ALAVM	0.758	0.763	0.791	0.785	0.774	0.851	0.906	0.921	0.901	0.895	0.834
TAM US$ billion	116.5	144.0	159.7	181.0	150.3	202.3	221.9	223.9	236.8	221.2	185.8
LUCR	0.033	0.032	0.037	0.044	0.037	0.070	0.020	0.010	0.012	0.028	0.032
VMC	1.229	1.216	1.156	1.157	1.189	1.050	0.991	0.965	0.976	0.996	1.093
GAR	0.382	0.366	0.360	0.351	0.364	0.349	0.374	0.391	0.402	0.379	0.372
DIV	0.010	0.009	0.007	0.009	0.009	0.008	0.004	0.002	0.003	0.004	0.007
RISC	0.053	0.043	0.036	0.042	0.044	0.041	0.067	0.070	0.036	0.054	0.049
VMDP	0.683	0.690	0.720	0.711	0.701	0.762	0.804	0.857	0.844	0.817	0.759
COMP per capita US$ million	16.84	21.92	25.21	23.91	21.97	17.03	12.83	11.71	12.90	13.62	17.80
Own capital pad	0.01	0.01	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.03	0.02

Also according to Table 2, we observe the confirmation of the sine-qua-non condition for the performance of this study for all the years, that is, the existence of an own capital 'pad' for the 30 banks sampled. This analysis is made based on the comparison between the percentages obtained from the ratio between the accounting value of own capital vs. total assets of banks, and the minimum percentage required by Basel I (1998) and Basel II (2004) agreements. The values provided represent a percentage difference above the minimum requirement of 8%.

By its turn, Table 3 shows the composition, in terms of percentage, of the compensation for executive managers. By considering the period 2003 – 2010, we observe that the higher concentration of compensation is based on stocks and options – 81.42%. However, this component of the compensation has participation even higher during the period before the systemic crisis – 2003 – 2006 (87.53%), when compared with the period during the systemic crisis – 2007 – 2010 (71.17%). Then, it is evident that the value of stocks causes strong impact on the total amount of compensation for such executive managers.

Table 3. Components of compensation for executive managers (%)

Years/Compensation composition (%)	2003	2004	2005	2006		2003-2006
Fixed compensation	2.64	2.14	2.05	2.13		2.22
Variable compensation(1)	7.37	6.88	5.92	19.79		10.25
Compensation based on stocks and options	89.99	90.98	92.03	78.08		87.53
Total	100	100	100	100		100
Years/Compensation composition (%)	2007	2008	2009	2010	2007- 2010	2003-2010
Fixed compensation	3.00	4.07	6.06	5.87	4.53	3.08
Variable compensation(1)	23.69	26.47	23.62	23.42	24.29	15.50
Compensation based on stocks and options	73.32	69.46	70.32	70.70	71.17	81.42
Total	100	100	100	100	100	100

Note 1: The variable compensation is comprised by post-employment benefits, benefits due to role exercise termination, bonus and other variable compensation forms

According to Table 4, the years 2006 (US$ 46.99), 2005 (US$ 43.26) and 2004 (US$ 43.84) had the highest

mean values of the stock prices. This result is consistent with that shown in Table 2 about the variable compensation for executive managers (COMP). The period before crisis – 2003 to 2006, and more specifically 2005 (US$ 25.21 million), exhibited the highest mean salary per capita. After that period, there was a reduction in the compensation for executive managers, by starting the recovery in 2010 (US$ 12.90 million). Even so, the mean compensation for executive managers during crisis – 2007 to 2010 – was US$ 13.62 million only, representing a fall of 38% in relation to the mean value of the period before crisis – 2003 to 2006 (US$ 21.97 million).

Table 4. Annual arithmetic mean values of stock prices (US$)

2003	2004	2005	2006	2003 to 2006	2007	2008	2009	2010	2007 to 2010
39.37	43.84	43.26	46.99	43.36	34.71	23.15	21.52	25.61	26.25

According to the alternative hypothesis H9, it was expected that the higher was the compensation for executive managers of the bank the higher should be its leveraging level. However, Table 2 exhibited a result opposite to the expected one. The highest percentages of leveraging at market value (ALAVM) occurred during the systemic crisis – 2007 to 2010 (89.5%), while the highest mean values of compensation for executives occurred during the period before crisis – 2003 to 2006 (US$ 21.97 million). Such fact, may be understood in terms of the behavior of stock prices, shown in Table 4, which indicates the highest mean values in the pre-crisis period – 2003 to 2006 (US$ 43.36), thus confirming the relation that the higher is the stock price the lower is the leveraging at market value (ALAVM) of banks.

The ratio between independent variables vs. the dependent variable of leveraging at market value (ALAVM) was analyzed based on a multivariate regression model with data in balanced panel, which represents a mix between time series and cross section, considering the existence of data for all the years (2003 to 2010) and units (30 banks) of cross section (Wooldridge, 2008). By using the ordinary least squares tests, assumption tests were carried out about normal distribution, heteroscedasticity and non-linearity, which results are shown in Table 5. We must emphasize that the dependent variable leveraging at market value presented one-year offset (ALAVM_1), aiming at preventing reverse or Granger causality (Wooldridge, 2008; Gujarati, 2006).

Table 5. Ordinary least squares test (MQO) with panel data

Grouped MQO, using 210 observations / Included 30 units of cross section

Time series length = 7 / Dependent variable: ALAVM / Robust standard error (HAC)

	Coefficient	Standard Error	t-ratio	p-value	
const	2.19019	0.235809	9.2880	<0.00001	***
DUMMY	0.0185051	0.0056316	3.2859	0.00121	***
TAM_LN	-0.0549894	0.0190656	-2.8842	0.00437	***
LUCR	-0.447891	0.0988133	-4.5327	0.00001	***
VMC	-0.941525	0.132572	-7.1020	<0.00001	***
GAR	-0.155505	0.0431204	-3.6063	0.00039	***
DIV	-0.610952	0.381072	-1.6032	0.11051	
RISC	-0.569698	0.150075	-3.7961	0.00020	***
VMDP	0.0664831	0.041802	1.5904	0.11337	
COMP_LN	-0.00288088	0.00196533	-1.4659	0.14431	
sq_TAM_LN	0.0017017	0.000553741	3.0731	0.00242	***
sq_VMC	0.181426	0.0425337	4.2655	0.00003	***
sq_GAR	0.143373	0.0373409	3.8396	0.00017	***
sq_RISC	3.02163	0.868997	3.4771	0.00063	***
sq_LUCR	5.5408	2.79987	1.9789	0.04924	**

ALAVM_1	-0.0925558	0.0216252	-4.2800	0.00003	***
Mean dependent var.		0.835452	D.P. dependent var.		0.098508
Square residue sum		0.085496	Regression E.P.		0.020993
R-square		0.957844	R-square adjusted		0.954585
F(15, 194)		293.8661	P-value(F)		1.7e-124
Likelihood log		521.6940	Akaike Criterion		-1011.388
Schwarz Criterion		-957.8343	Hannan-Quinn Criterion		-989.7383
rho		0.248139	Durbin-Watson		1.317775

Notes: (**) and (***) reflect significance at levels of 5% and 1%, respectively.

Residue normality test

Null hypothesis: the error has Normal distribution

Test statistics: Chi-square(2) = 4.45006 with p-value = 0.108064

White Test for heteroscedasticity

Null hypothesis: without heteroscedasticity

Test statistics: LM = 166.311 with p-value = P(Chi-square(129) > 166.311) = 0.0149635

Effect from heteroscedasticity continuous via: Robust standard errors (HAC)

Non-linearity test (squares)

Null hypothesis: the relation is linear

Test statistics: LM = 20.6661 with p-value = P(Chi-square(14) > 20.6661) = 0.110499

By its turn, Table 6 shows the final panel model. The presence of the dependent variable offset among the regressors characterizes a dynamic model. Thus, as the more leveraged banks in a specific year tend to remain leveraged in the year after, we considered a dynamic model with panel data. The dynamic panel by Arellano and Bond (1991) of this work considers the following final equation, by considering the significance of the independent variables:

$$ALAVM = 2.11165 - 0.0972054\ ALAVM(-1) + 0.0236453\ DUMMY - 0.0508633\ Ln\ (TAM) +$$
$$0.00158895\ Ln\ (TAM)2 - 0.335069\ LUCR + 5.79664\ LUCR2 - 0.927318\ VMC + 0.183924\ VMC2 -$$
$$0.106521\ GAR + 0.10581\ GAR2 - 0.845427\ RISC + 4.29445\ RISC2 + 0.0887244\ VMDP - 0.0029019\ Ln$$
$$(COMP) \tag{1}$$

Table 6. Dynamic model with panel data

1-step dynamic panel, using 210 observations / Including 30 units of cross section

Including equations in levels / H-matrix as per Ox/DPD / Dependent variable: ALAVM

	Coefficient	Standard Error	z	p-value	
ALAVM(-1)	-0.0972054	0.021145	-4.5971	<0.00001	***
const	2.11165	0.210305	10.0409	<0.00001	***
DUMMY	0.0236453	0.00714897	3.3075	0.00094	***
TAM_LN	-0.0508633	0.0167794	-3.0313	0.00244	***
LUCR	-0.335069	0.108056	-3.1009	0.00193	***
VMC	-0.927318	0.136869	-6.7752	<0.00001	***
GAR	-0.106521	0.0430282	-2.4756	0.01330	**
DIV	-0.486597	0.337186	-1.4431	0.14899	

RISC	-0.845427	0.200927	-4.2076	0.00003	***
VMDP	0.0887244	0.0329344	2.6940	0.00706	***
COMP_LN	-0.0029019	0.00166954	-1.7381	0.08219	*
sq_TAM_LN	0.00158895	0.000487585	3.2588	0.00112	***
sq_VMC	0.183924	0.0449812	4.0889	0.00004	***
sq_GAR	0.10581	0.0350356	3.0201	0.00253	***
sq_RISC	4.29445	1.18393	3.6273	0.00029	***
sq_LUCR	5.79664	2.74143	2.1145	0.03448	**
Squares residue sum	0.089015		Regression E.P.	0.021421	

Notes: (*), (**) and (***) reflect in significance at level of 10%, 5% and 1%, respectively.

Number of instruments = 42

Test errors AR(1): z = -3.6983 [0.0002]

Test errors AR(2): z = -1.78017 [0.0750]

Sargan Test for over-identification: Chi-square(26) = 66.7537 [0.0000]

Wald Test (set): Chi-square(15) = 23442.2 [0.0000]

Residue normality test

Null hypothesis: the error has Normal distribution

Test statistics: Chi-square(2) = 4.51278 with p-value = 0.104728

As a result, we observe that, except for the independent variable guarantee (GAR), all the other independent variables are significant. In regard to the dependent variable with 1-year offset leveraging at market value – ALAVM (-1), it was included in the model by aiming at preventing reverse causality of the model. The significance and negative value of its linear coefficient indicate that the higher is the leveraging in previous year the lower will be the leveraging in the year after. By its turn, the significance and positive value of the linear coefficient of the DUMMY variable indicates that the leveraging at market value (ALAVM) during the systemic crisis years (2007 to 2010) was greater than during the years before it (2003 to 2006).

In regard to the variables which function was confirmed as quadratic, and not linear, its inflection point is achieved by means of its first derivative (x = -b / 2a). According to Table 6, all the quadratic functions are convex (ax2 + bx + c), that is, their second derivative is positive and their first derivative is descending, and then ascending. In case of convex functions, their inflection point corresponds to a minimum point. The significant variables that have quadratic and convex function are: size (TAM), growth opportunity (VMC), guarantee (GAR), risk (RISC) and profit (LUCR).

In case of the variable size (TAM), the behavior of the negative sign occurs for smaller banks only, that is, at left of the minimum point of 16.01 (value corresponding to the natural logarithm of the accounting value of deflated total assets) – e.g. First Midwest Bank, First Financial Bank, Cathay Bank, Umpqua Bank, Susquehanna Bank etc. However, the larger banks, at right of the minimum point – e.g. JP Morgan, Bank of America, Citibank, Wells Fargo etc., have behavior according to the finance theory, thus confirming the hypothesis H4: the higher is the bank size the higher will be its leveraging level.

In case of the variable profit (LUCR), its sign is coherent with hypothesis H5: the higher is the bank profitability the lower will be its leveraging level. Nevertheless, its quadratic variable exhibited antagonistic behavior for banks at right of the minimum point of 0.03 (value corresponding to the percentage of bank profitability) of its convex function. This means that for larger banks with profitability above 3% – e.g. JP Morgan, Bank of America, Citibank, Wells Fargo etc., the leveraging was greater than in smaller banks. However, we must emphasize that profitability above 3% for these banks occurred between 2003 and 2007 only; their profitability was below 2% in 2008 to 2010.

In regard to the variable growth opportunity (VMC), it has behavior compatible with the expected one according to hypothesis H6: the higher is the growth opportunity the lower will be its leveraging level. We must emphasize that no bank was identified at right of its minimum point of 2.52 (corresponds to the percentage between the market and accounting values of total bank assets). Thus, all the banks sampled have negative ratio between the

variables growth opportunity (VMC) vs. leveraging at market value (ALAVM).

Variable guarantee (GAR) has sign opposite to the expected one according to the finance theory and hypothesis H7: the higher is the tangible assets, such as bank guarantees, the higher will be its leveraging level. However, its quadratic variable has positive sign and banks at right of its minimum point of 0.50 (corresponds to the percentage of guarantees vs. accounting value of total bank assets) are the same as the large ones – e.g. JP Morgan, Bank of America, Citibank, Wells Fargo etc.

In regard to the variable risk (RISC), its coefficient is significant and confirms the hypothesis H2: the risk of assets has a significant explanation power in the bank leveraging. Its negative relation with the dependent variable leveraging at market value (ALAVM) indicates that as more volatile are the bank assets, they tend to enter in less debts or increase their own capital share. By one side, this result is compatible with the argument that the assets risk captures the effects from adjustments of the minimum regulatory capital of banks, defined by Basel agreements. By the other side, this negative relation may be interpreted in terms of the traditional capital structure theories, such as agency cost and static trade-off. Assets more risky may reflect the effect from de "assets replacement" encouraged by the shareholders – agency cost. However, banks with more risky assets can be associated to a higher probability of bankruptcy. Both arguments lead to the decision of banks for reducing their leveraging level. Finally, we must emphasize that banks at right of the minimum point of 0.10 (corresponds to the bank assets volatility), and that have behavior antagonistic to the expected one, are justly the larger ones – e.g. JP Morgan, Bank of America, Citibank etc.

The variable market value of deposits (VMDP) is significant according to the expectation of hypothesis H3: deposits have a significant explanation power in bank leveraging. As mentioned in item 2 – theoretical reference, according to the option pricing theory, the value of deposit insurance increases with the increase of risk level of bank assets and their exercise price. Thus, the banks are encouraged to maximize the value of their deposit insurance, thus assuming more risks and employing less own capital. According to the trade-off theory, as the security instruments offered by the government reduce the cost of financial troubles of banks, they tend to be more leveraged than the non-financial companies. Therefore, it is expected a positive ratio between the market value of deposits (VMDP) vs. leveraging at market value (ALAVM), which is a fact observed in the positive coefficient presented.

In regard to the variable compensation program for executive managers (COMP), it has low significance level (10%) and sign opposite to that of hypothesis H9: the higher is the compensation for executive managers the higher will be its leveraging level. A possible reason for such result refers to the concentration of executive managers' compensation (mean value of 81.42% between 2003 and 2010) in stocks and options – see Table 3. By considering that stock price reduction occurred during the sampled period, the amount of wealth of executive managers also dropped, thus no incentives existed for increasing the leveraging and the consequent increase of assets risk. In regard to its negative sign, we checked that, during 2009, a lower amount of payment per capita of executive managers occurred (US$ 11.71 million); but, in this same year, occurred the highest percentage (92.10%) of leveraging at market value (ALAVM), as observed in Table 2. Indeed, 2009 exhibited the lowest mean value of stocks sampled (US$ 21.52) – see Table 4.

At last, the variable payment of dividends (DIV) was the only one that was not evidenced as significant, and has been excluded from the model. Such fact made the proof of hypothesis H8 unfeasible – as lower is the leveraging level as higher will be the payment of dividends.

Based on the results mentioned, Table 7 indicates the confirmation of the following alternative hypotheses from the multiple regression tests with panel data, considering both the significance level and the adequacy of the sign of variables independent from the finance theory:

Table 7. Alternative hypotheses confirmed from the regression tests

Alternative hypothesis		Expected sign	Sign achieved	Hypothesis confirmed?
H1	The standard determinants of the capital structure have significant explanation power on bank leveraging.	N/A	N/A	YES
H2	The assets risk has significant explanation power on bank leveraging.	-	-	YES
H3	Deposits have significant explanation power on bank leveraging.	+	+	YES
H4	The greater is the bank size the higher will be its leveraging level.	+	-	NO
H5	The higher is the bank profitability the lower will be its leveraging level.	-	-	YES
H6	As higher is the growth opportunity the lower will be its leveraging level.	-	-	YES
H7	The greater are the tangible assets, such as bank guarantees, the higher will be its leveraging level.	+	-	NO
H8	The higher is the payment of dividends the lower will be the leveraging level;	-	Excluded	NO
H9	The higher is the compensation for executive managers of the bank the higher will be its leveraging level.	+	-	NO

N/A: Not applicable

5. Conclusion

Until the systemic crisis, occurring in the period 2007 to 2010, the capital structure of banks was basically addressed by taking into account the effects from Basel agreements, as well as the specific characteristics of funding by deposits. As they have government guarantees, the referred operations encouraged the assumption for a higher risk level of assets, and thus generated the consequent need for increasing the level of own capital of the banks.

However, after the bankruptcy and financial troubles faced by a number of such institutions, other studies started to analyze the influence of standard determinants of capital structure on the financial institutions. Works, like the ones by Octavia and Brown (2008), and Gropp and Heider (2010), indicate that, in case of banks that have a pad of own capital above the minimum value established by the Basel agreements, explanation variables, such as size, profitability, growth opportunity, guarantees, payment of dividends and assets risk, as well as control variables, such as actual GDP growth and market return, are equally relevant in the definition of capital structure of banks.

By its turn, even before the abovementioned systemic crisis, studies – such as the ones by Barton and Laux (2010), and Bhagat and Bolton (2011) – already indicated the compensation policy for executive managers as being a significant variable for understanding the leveraging level of banks. Based on the information above, this work was aimed at checking whether the standard determinants of capital structure have significant explanation power on bank leveraging, in addition to the variables related to Basel agreements, such as assets risk and deposit insurance.

Thus, the target population of this work refers to banks that hold business portfolios in the United States. By its turn, the initial sample composed by the top 100 banks was identified based on the criterion of their total assets on 12/31/2009, provided by the Federal Reserve website. However, by considering the data availability for the same banks within the period 2003 to 2010, the final sample was reduced to 30 American banks, corresponding to 240 observations. The methodology used included descriptive statistics and multiple regression tests with panel data.

As final result, it was proven the major hypothesis H1, by which the standard determinants of the capital structure of non-financial companies have significant explanation power on bank leveraging. Such conclusion has been obtained from the confirmation of alternative hypotheses H5 – the higher is the bank profitability the lower will be its leveraging level, and H6 – the higher is the growth opportunity the lower will be its leveraging level.

In regard to variables related to theories applicable to financial institutions, namely risk (RISC) and deposit insurance (VMDP), both of them presented results coherent with hypotheses H2 – the assets risk has significant explanation power on bank leveraging, and H3 – deposits have significant explanation power on bank leveraging.

In case of the independent variable assets risk (RISC), its negative relation with the dependent variable leveraging at market value (ALAVM) indicates that as more volatile are the bank assets, they tend to enter in less debts or increase their own capital share. Indeed, Table 2 indicates that the percentage of own capital pad, calculated on the basis of accounting values, was higher during the systemic crisis period (2007 to 2010) with mean value of 3%, compared to a mean figure of 2% in the previous period (2003 to 2006). Also confirming such result, the positive and significant sign of the DUMMY variable coefficient indicates that leveraging, calculated from market values, was greater during the systemic crisis period (2007 o 2010), such fact is due to the reduction in the value of stocks during this same period – see Table 4.

This result indicates that the assets risk (RISC) captures the effects from adjustments of the minimum regulatory capital of banks, defined by the Basel agreements, as well as the more risky assets may result from the "assets replacement" effect, encouraged by shareholders, thus corroborating the traditional capital structure theories, such as agency cost and static trade-off.

By its turn, the negative ratio between the compensation program for executive managers (COMP) vs. leveraging at market value (ALAVM) results from the ongoing reduction of the compensation for executive managers during the period 2003 to 2010 – see Table 2. Its low significance level (10%), in relation to the variable leveraging at market value (ALAVM), is due to the random behavior of stock prices, which impacted, in an inappropriate way, the compensation policy of banks. As shown in Table 3, the most relevant component in the compensation program for American executive managers is based on stocks and options (81.42%). The fact is that during the analysis period, the value of stocks presented a declining bias, as shown in Table 4, in which the mean value of stock prices between 2003 and 2006 was US$ 43.36, and between 2007 and 2010 it was US$ 26.25, thus characterizing near 40% reduction.

Finally, we must emphasize this work is not aimed at exhausting the subject addressed and reaching to definitive conclusions. It has the basic purpose of better understanding the determinants of the capital structure of financial institutions and give rise to higher interest on this industry by people engaged in working and developing this segment. In addition, by considering the relevance held by the executive managers' compensation subject, we suggest the performance of future studies that cover questions related to the diversification of managers' compensation, once compensation incentives – such as purchase options – lead them to assume postures more prone to risks due to the maximization of their utility function.

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