

The relationship between Charter values and Capital requirements

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Abstract: As a consequence of the heavy impact of a banking crisis on the whole economy, governments have taken several steps such as government guarantees (“Too big to fail” guarantees etc.) and capital requirement to stabilize the banking industry. The capital requirement obligates banks to have a required capital to catch their possible losses. With these guarantees and obligations, the government wanted to improve the future existence of a bank. A good proxy for future existence of a bank is the charter value. This paper suggests there is a relationship between the capital requirement and charter value. With a sample of 910 banks, this research can be concludes that capital levels are a significant positive factor for determining bank charter value.

Keywords: Charter Value, Tobin’s Q, Capital requirement and Tier1 capital ratio

JEL:

1.0 Introduction

Due to the financial crisis, the structure and stability of banks have become more important. As we saw in the financial crisis, when banking or financial systems temporarily break down, this can undo years of economic and social progress. Since 1980 more than 130 countries have experienced banking problems that have been costly to resolve and disruptive to economic development (Barth and Caprio, 2000). This difficult situation has led to calls for banking reform by national governments and international organizations such as the World Bank, International Monetary Fund and the Basel Committee.

Because the international organizations wanted to reduce the possibility of a financial crisis, in 1988 the BIS (Bank for International Settlements) established the Basel 1 Accord, a framework of rules to regulate bank capital. One of the most important components of this accord was the obligated capital requirement of banks. Banks need capital buffers and reserves to stay liquid and be able to pay back their obligations to their depositors instantly. Murinde and Yaseen (2006) studied the impact of the Basel Accord Regulations on Bank Capital and Risk Behavior. Using annual observations in 1995–2003, it is found that the capital requirements significantly affect banks' investment decisions and that regulatory pressure did not induce banks to increase their capital, but did positively affect their chosen risk levels.

Besides the capital requirement, the government also gave banks government guarantees. The main two guarantees were the deposit insurance and the "Too big to fail" guarantee. These government guarantees have influenced the effects of the capital requirement (Allen 1996).

Governments and international organizations are not the only ones who are interested in the stability and structure of a bank. Stability and bank structure are also important for investors, which are particularly reflected in the stock prices and the dividend. In banking literature the term "charter value" is the term most often used to refer to the intrinsic value of the bank. A bank charter value is the discounted stream of future profits for the bank, so it is an important indication for governments and investors to see how stable and profitable the bank is. Charter value is the bank's future profit-generating potential arising from things such as efficiency, market power and customer relationships (Palia, 2004). Keeley (1990) presents empirical evidence showing that charter value is robustly negative to bank risk-taking.

This paper attempts to find empirical evidence if the charter value is influenced by the capital requirement of banks. The scope of the investigation includes all the listed banks with stock prices. The data of the banks is obtained from the data source "Bankscope". In the next chapter, the literature of the charter value and capital requirement will be described. In chapter three, the data and control variables will be described. The relationship between capital requirement and charter value will be investigated in chapter four, and finally the conclusion will be discussed in chapter five.

2.0 Literature review

As stated above, this paper attempts to find empirical evidence if there is a relationship between charter value and capital requirement. In the first section, this relationship and other effects on the relationship will be discussed. In section two, the measurement of charter value will be introduced and explained. In section three, a table summarizes evidence of other papers that discuss the charter value or its measurement.

2.1 Relation between capital requirement and charter value

As became clear in the introduction, banking crises are important not just because of the deviation they bring to one particular sector of the economy, but because this affects the entire economy. Because of this, the government pays much attention to prudential regulation (Hellman, 2000). Prudential regulation is meant to protect the banking system from the problems of bank default, and increases bank stability. Bank capital requirement in conjunction with deposit insurance and "too big to fail" guarantees are designed to promote the safety and soundness of the banking industry.

Research has been done by Allen and Rai (1996), which confirmed the relationship between charter value and capital requirement. Capital requirements force banks to have more of their own capital at risk, so the shareholders feel the inefficiency of taking risk. Clearly, once banks have enough of their own capital invested, shareholders internalize the adverse consequences of taking risk and thus will choose to invest more prudently (Hellman, 2000). If the shareholder takes more risk and loses from the investment, the bank loses charter value, because the future profits of the bank are decreasing. So, according to this research, there is a relationship between charter value and capital requirements because when there are higher capital requirements, the shareholders want to invest in more safe assets which will result in a higher charter value.

In addition, the government also introduced the deposit insurance and "too big to fail" guarantees to stabilize the banks. These guarantees increased the charter value of banks and prevented against bank runs (Diamond, 1983). Unfortunately, these guarantees have also negative side effects: government guarantees encourage banks to finance high-risk, high-return projects (Demirguc-Kunt, 2002). The bank also lowers bank capital, because the governments' safety net is a substitute for capital (Keeley, 1990). This effect is also called the moral hazard effect. Capital requirement reduces some of these moral hazard effects, since this obliges banks to have a minimum amount of capital. When the bank has more capital, shareholders do not want the bank to take too much risk, because the shareholders carry the losses and because of the decreasing risk also the moral hazard effect decreases. From this we can conclude that moral hazard has a negative effect on the relationship between charter values and capital requirement (Allen and Rai 1996)

Demsetz (1996), Allen and Rai (1996) also found another effect that influences the relationship between charter value and capital requirement, namely the market rent effect. This is the effect that banks want to hold higher capital levels to preserve their access to monopoly rents and retain control. To do this, the bank has large amounts of capital and uses it to increase the future expected operation (charter value). With the high charter value, the bank wants to attract investors and increase their monopoly position. The market rent

effect has a positive effect on the relationship between capital requirement and charter value. Demsetz (1996) argues that bank with a high charter value is likely to rethink their risky investments, because the bank has charter value to lose when the bank takes risk. The bank will have the incentive to raise the bank's capital and lower the likelihood of default to increase their monopoly position.

This paper attempts to find empirical evidence if the charter value is influenced by the capital requirement of banks. The effects of government guarantees that are mentioned above, the moral hazard effect and the market rent effect are already incorporated in the charter value. Empirical evidence will point out which of these effects is stronger.

2.2 Market-based measure of charter values.

To investigate the relationship between capital requirement and charter values, it is necessary to derive a measure which will capture the totality of different governmental safety net programs. Palia (2004) and Jones (2011) suggest that the Tobin's Q is a common used measure of charter value.

2.2.1 Calculation of Tobin's Q

Tobin's Q (actually the Tobin's Quotient) was developed by James Tobin in 1969 as the ratio between market value and replacement value of the same asset. The denominator of this ratio was the price in the market for newly produced commodities. (Tobin, 1969). Nowadays there are several ways to calculate the Tobin's Q. For publicly traded banks, Tobin's Q is defined as:

$$\text{Tobin's Q} = (\text{MVE} + \text{BVL}) / \text{BVA}$$

Where MVE is the market value of equity, BVL is the book value of liabilities, and BVA is the book value of assets, which is also equal to BVL + BVE (book value of equity) (Jones, 2011 and Allen, 1996). Lindenberg and Ross (1981) empirically measured Tobin's Q for a number of firms and found it to be a useful measure to the degree of market power across industries. If all assets and liabilities were recorded at historical cost and the market always values the firm correctly, then MVE would equal BVE + charter value. By definition, MVE is the present value of the bank's expected income stream, discounted by the rate of return required by the market (RM). The expected income stream of a bank can be decomposed into expected normal profits (NP) and expected economic profits (EP):

$$\text{MVE} = (\text{NP}_t + \text{EP}_t) / (1 + \text{RM})^t$$

The discounted normal profits should equal the book value of equity because the market values of perfectly competitive financial assets and liabilities equal their book value. But the economic profits are derived from a bank's pricing power in the market. These assets are valued by the market above or below their book value. When discounting the economic profit, we have the charter value. Consequently, there will be assumed:

$$\text{Tobin's Q} = (\text{BVE} + \text{BVL} + \text{CV}) / (\text{BVE} + \text{BVE})$$

This equation above shows clearly a direct relationship between the charter value and Tobin's Q.

2.2.3 Interpretation of Tobin's Q

Tobin's Q plays an important role in many financial interactions. With this ratio, banks can easily be compared. Tobin's Q suggested that a fairly priced company needs to have a price equal to its total asset value. When the Tobin's Q ratio is less than one, it means that the bank is undervalued. Likewise, when the ratio is more than one, it indicates that the market value is higher than the total asset value and that the bank is overvalued (Chappell, 1984). Overvaluation of a bank could mean that a large number of investors want shares of that bank, because the bank has a high charter value.

Besides the formula and interpretation of the Tobin's Q, the Tobin's Q can be influenced by many factors. Allen (1996) said that Tobin's Q is a function of two factors: 1) Bank-specific variables which impact the bank's future current growth, profits, stability, risk factors and the bank structure, and 2) country-specific variables which represent the generosity of the governmental safety net, financial market development and banking industry market structure etc. These country-specific variables are hard to capture in a variable and are often already included in the charter value of the bank (so also in the Tobin's Q).

Besides all positive points, the Tobin's Q also has some pitfalls. It could be that Tobin's Q can be misleading as the market does not value the bank properly. For example, stock markets can sometimes create bubbles that lift many stocks above fundamental values. Banks are also opaque, making it difficult for investors to assess value (Yeager, 2010). Another danger of Tobin's Q is that if markets fail to discount their assets sufficiently for risk, for example, Tobin's Q increases while the high-risk assets make large profits. But Tobin's Q can fall sharply once the risk becomes clear and market valuations of those assets will decline (Jones, 2011).

2.3 What evidence do other papers provide?

Researcher	Data	Measurement	Results
Allen and Rai (1996)	Compustat database	Tobin's Q and Risk-adjusted capital levels	Banks in countries with higher country-specific components (government guarantees) tend to hold higher levels of capital. However, in countries with low country-specific components the moral hazard effect dominates, as evidence of inverse relationship between charter value and bank capital levels.
Jones and Miller (2011)	FR Y-9C: Consolidated Financial Statements	Tobin's Q and measures of market power	Charter value constrains risk-taking in the banking industry because banks are reluctant to lose their stream of economic rents in the event of failure Evidence shows that banks with higher Tobin's Q held higher levels of capital.
Keeley (1990)	Compustat database	Tobin's Q and FDIC's risk	Banks with more market power, as reflected in larger market-to-book asset ratios, hold more capital relative to assets (on a market-value basis) and they had a lower default risk.
Palia and Porter (2004)	FR Y-9C: Consolidated Financial Statements	Tobin's Q, Capital variables and compensation variables	In an empirical study of the effect of bank capital and managerial incentive compensation on bank charter value they find that bank capital is by far the most significant variable and has a positive effect.

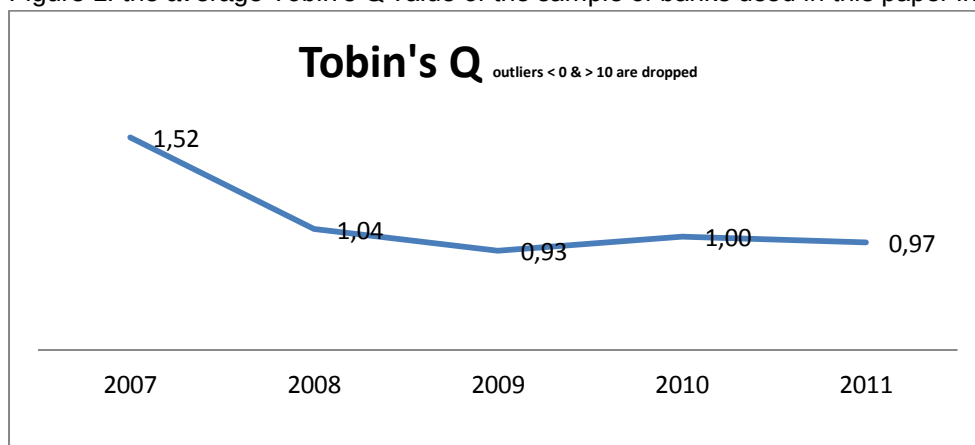
3.0 Data and descriptive statistics

3.1 Data

As became clear in the introduction, this paper attempts to find empirical evidence if the capital requirement of banks explains their charter value. For the investigation, the data source “Bankscope” will be used. Bankscope, maintained by Bureau Van Dijk, contains financial and ownership information for about 10.000 major banks. In the dataset, downloaded in Bankscope, 2436 banks are included and sorted by country (appendix 1). Appendix 1 also shows the number of banks per country. Due to obviate problems with outlier observations, banks with their Tobin’s Q ratio lower than zero or higher than five are eliminated. Besides that, the top and bottom 1% of the measurement of capital requirement is dropped because of implausible values. This last selection reduces the sample to 1309 banks, but the volatility data was not available of every bank which caused a reduction of the dataset to 900 banks. All the data is from 2010 or 2011.

Data from Bankscope is used to get a better view of the Tobin’s Q (all banks with data). In the last five years the Tobin’s Q has decreased tremendously. Due to the current financial crisis, the stock prices of some banks has more than halved over the last five years and that is directly visible in the Tobin’s Q ratio. As visible in Figure 1, current data points out that the book value of banks is higher in 2011 than the market value of banks.

Figure 1: the average Tobin’s Q value of the sample of banks used in this paper in the last five years



3.2 (Control) Variables

As explained above, the Tobin’s Q is the measurement of charter value that will be used in this paper, which is defined to be the ratio of market bank value to book bank value. The independent (control) variables will be divided in five main topics: Measures of capital requirements, current growth, profitability, risk factors and bank size. Below these five topics will be discussed, with a description of the variables and explanation of the relationship between the variables and Tobin’s Q.

3.2.1 Measures of Capital requirements

There are several reasons, grounded in existing theories, to believe that capital improves a bank's survival probability. There is a set of theories that emphasizes the role of capital as a buffer to absorb shocks to earnings (Repullo 2004 and Von Thadden 2004). One of the possible measurements of the capital requirement is the Tier 1 capital ratio; this ratio will be used as the independent variable in the analysis. Nowak (2011) and Ediz (1998) suggest that the Tier 1 capital ratio was adopted to reinforce the capital requirement of banks. According to them, the Tier 1 capital ratio is a measure that reflects the capital requirement of banks because when the banks have high Tier 1 capital ratio, they are able to survive large decreases of their assets. The Tier 1 capital ratio will be calculated as follows:

$$\text{Tier 1 capital ratio} = \text{Tier1 capital} / \text{Risk weighted Assets}$$

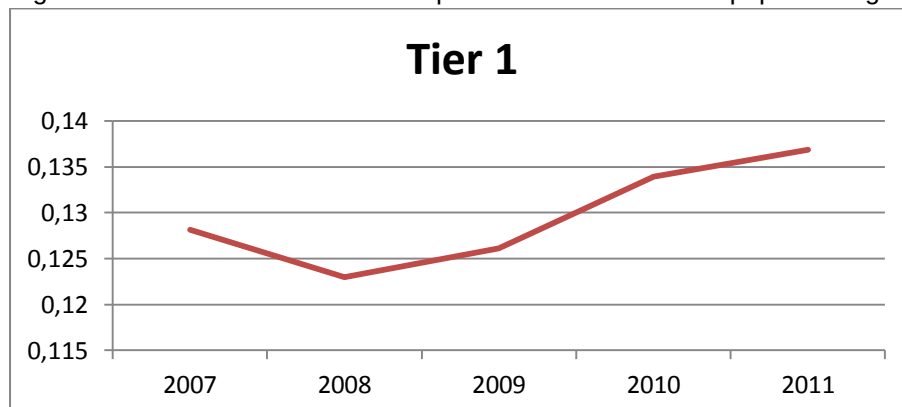
The BIS sought to relate required capital more closely to portfolio credit risks by introducing the concept of risk-weighted assets (RWA), which weighs on-book assets and off-balance sheet commitments in proportion to their presumed credit risk under the Basel agreement. Regulators set the minimum acceptable level of Tier 1 capital at 4% of RWA. (Flannery, 2007)

The Tier 1 capital includes common equity, noncumulative preferred stock, and minority interests in consolidated subsidiaries. The Risk weighted Assets are the risky and non-risky assets of the bank and weighted as follows:

Asset	Risk percentage
Cash	0%
Government securities	0%
Mortgage loans	50%
Other loans	100%
Other assets	100%

As shown in Figure 2, the Tier 1 capital ratio has increase in the last four years. This could be a reaction of the credit crisis, since some banks went bankrupt because they had too little equity to survive the large losses in mortgages loans.

Figure 2: The Tier 1 ratio of the sample of banks used in this paper during the last five years:



Although the Tier 1-ratio will be the main independent variable, there are other variables that also measure capital requirement and could affect the Tobin's Q of a bank. The capital ratio is another variable that measures the capital requirement. The capital ratio is an extended version of the Tier 1 ratio and not only measures the Tier 1 but the Tier 1 and 2 capitals together.

$$\text{Capital ratio} = (\text{Tier 1 capital} + \text{Tier 2 capital}) / \text{Risk weighted assets}$$

The Tier 2 capital is the undisclosed reserves, general loss reserves, hybrid debt capital instruments and subordinated debts together. Because of the extra Tier 2 capital, the capital ratio needs to be at least 8 percent (Jones 2000). Flannery (2007) and Adams (2010) also use the capital ratio as control variable in their research. The capital ratio will be used as control variable, to see when the capital ratio of a bank is higher if this is negatively or positively correlated with Tobin's Q.

3.2.2 Measures of current growth

The Tobin's Q is also affected by the current growth of banks. When a bank is able to grow, it is possible that the stock price of the bank is going to increase. One way to measure the current growth is to look at the asset growth. When the assets of a bank are increasing, this could mean that the consumer deposits are increasing or that the bank emerged shares. When a bank is able to emerge shares, the investors are convinced that the bank is a profitable investment. Increasing assets often means that the bank is able to grow and probably, make more money out of their assets (Xia, 2007). The asset growth will be measured by the total assets last year to the total assets year 2010, minus one:

$$\text{Total Asset Growth} = ((T_{at} - T_{at-1}) / T_{at-1})$$

When this ratio is positive (>1) the total assets have increased compare to year 2010. This could have a positive influence on Tobin's Q.

Another way to measure growth is when the consumer deposits are increasing. When the consumer deposits of a bank are increasing, this could mean that the consumers trust the bank or that it is going well with the economy, so consumers have extra money. With the extra deposit, the bank is able to make extra money to invest this money in investment projects. Park (1998) also uses deposit growth as variable. The consumer deposit growth will be measured by the consumer deposit last year to the consumer deposit year 2010, minus one:

$$\text{Consumer Deposit Growth} = ((\text{Consdept}_t - \text{Consdept}_{t-1}) / \text{Consdept}_{t-1})$$

When this ratio is positive (>1) the total assets have increased compared to year 2010. This could have a positive influence on Tobin's Q.

3.2.3 Measures of performance

There is also a possibility that the Tobin's Q is explained by the measures of performance. Return on assets (ROA) and return on equity (ROE) have been used in most structure-

performance studies, but in this paper the Net Interest Margin (NIM) is used. The NIM is the difference between the investment returns and interest expenses to the average earning assets:

$$\text{Net Interest Margin} = (\text{Investment returns} - \text{Interest Expenses}) / \text{Average Earning Assets}$$

The NIM involves the deposit rates and loans both because examining either deposit rates or loan rates separately may not present the full picture since banks could operate competitively with one rate and behave non-competitively with the other. If banks are able to price their products anti-competitively, then net interest margin will be higher because it indicates an ability to charge lower deposit rates or higher loan rates. When the NIM is high, it is possible that the Tobin's Q is also higher, because the bank is more profitable and that will increase the demand of shares by investors (Goldberg, 1996).

Net interest margin depends on two main components: market structure and the degree of risk (the variance of interest rates, the average size of deposits and loans transactions). It is clear that the higher these factors will be, the higher the net margin required by the bank (Saad, 2012)

As stated above, the ROE is also a measure of performance. The difference between the NIM and the ROE is that the NIM is a percentage that the bank can make on the consumers deposits, to give this deposit to other consumers/firms in the form of loans. The ROE is a ratio of net income to shareholder's equity:

$$\text{Return on equity} = \text{Net income} / \text{Shareholder's Equity}$$

Return on equity measures a corporation's profitability by revealing how much profit a bank generates compared to the money shareholders have invested in the bank. When a bank has a large return on equity, many investors will want to have shares of that bank, and the share price will increase. Because of this, the Tobin's Q ratio of the bank will also increase. (Goldberg, 1996)

3.2.4 Measure of risk

To measure the risk of a stock, the volatility or standard deviation of the market value will be used. Stock market volatility is the fluctuation in price of the stock. When there is a high volatility, the stock price of the bank will show large increases and/or decreases. So, when a bank has a high volatility, the bank has a higher risk than banks with low volatility. Ambrosio (2008) and Adams (2010) also used the volatility of the stock as a risk measure in their research.

Another measurement of risk is the loans-to-asset ratio. The loans-to-asset ratio is a good indicator whether the banks rely on their income from loans and investment securities. A high loans-to-asset ratio could mean two things: higher risk, because loans are less liquid than other assets and higher income, because loans are usually the most profitable assets of the bank (Strahan 1998). Loans to assets will be calculated as follows:

$$\text{Loans to asset ratio} = \text{Total Loans provided to clients} / \text{Total assets}$$

3.2.5 Measure of bank size

Besides all variables that measure with ratios, the logarithm of total assets will also be included in the regression. It is important to find out if the size of the bank also influences the Tobin's Q. Adams (2010) and Bilkhir (2008) also use logarithm of total assets as measure of bank size. Besides that, size is relevant because of "too big to fail" provisions of the governmental safety net, which may apply to some banks in a country, but not all. Moreover, large banks may tend to have lower capital levels because of their greater access to public debt and equity markets, which enable them to issue capital as needed (Allen, 1996).

3.3 Descriptive statistics

The purpose of this paragraph is to get a better view of the variables with the usefulness of the dataset. Firstly, we look at a correlation between the Tobin's Q and the Tier 1 capital ratio. Secondly, a scatterplot between the Tobin's Q and the Tier 1 capital ratio will be showed to get a better view of the independent and dependent variables. Then we look at the descriptive statistics of all the variables (mean, standard deviation etc.). And finally we look at the correlation between the variables, because of the possibility of collinearity.

3.3.1 Correlation dependent and independent variable

The data in Stata is used to calculate the correlation, as visible in table 1 below. The data shows that there is a positive correlation between Tier 1 capital and Tobin's Q. This means that when the Tier1 ratio increases, the Tobin's Q also increases.

Table 1: Correlation dependent and independent variable

	Tier 1 ratio	Tobin's Q
Tier 1 ratio	1	
Tobin's Q	0,12	1

In table 1 is visible that there is a low correlation between the dependent and independent variables of 12%. This is the first evidence that there might be a relationship between these variables.

3.3.2 Scatterplot dependent and independent variable

To get a better view from the independent and dependent variable, a scatterplot between the two variables has been generated.

Figure 3: scatterplot between the Tobin's Q and Tier 1 ratio in 2011

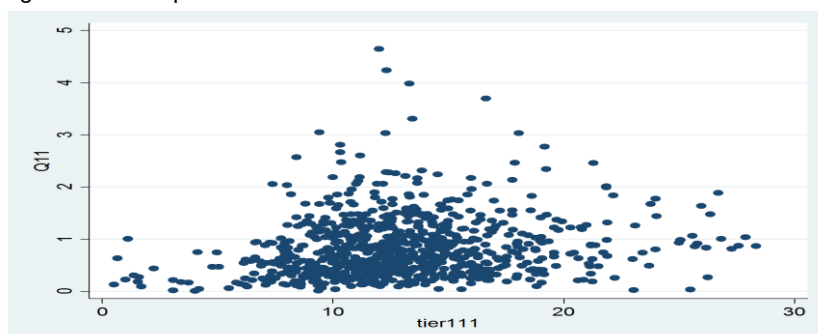


Figure 3 shows that there is also a little relation between the independent and dependent variables, because most of the dots are in the same area. Most Tier1 ratios are between the 8 and 16 percent and most of the Tobin's Q is between 0.2 and 1.5. Now we have a better view of these variables we hope the empirical regression also shows us, if there is really a relationship between these variables.

3.3.3 Descriptive statistics of the sample

Table 2 Descriptive Statistics:

Variable	Observations	Mean	Standard Deviation	Min	Max
Tobin's Q	1,309	0.97	0.88	0	9.00
Tier1-ratio (%)	1,309	13.56	5.39	2.22	45.5
Capital ratio (%)	1,294	15.60	5.70	2.22	98.54
Consumer deposit growth(%)	1157	0.25	1.14	-0.87	27.68
Assets Growth (%)	1,301	0.08	0.17	-0.34	1.25
Net interest margin (%)	1,305	3.61	2.45	-2.18	61.65
Return on Equity(%)	1306	3.57	24.68	-41.3	52
Volatility	917	0.48	0.65	0	8.16
Loans-to-assets	1305	60.71	14.73	0	97.54
Logarithm total assets	1,309	15.23	2.25	10.80	21.75

Table 2 gives a good view of all the variables. The average Tobin's Q is 0.97 in 2011. This was already visible in the graph above. This number tells us that in 2011 the book value of banks were higher than the market value. Besides that, we can see that the tier 1 ratio is 13.56%. This means that the Tier 1 ratio is much higher than the required 4%. The average of the capital ratio is mostly higher than the Tier 1 capital ratio, 15.6%. As we know, there are three topics that had two variables (profitability has ROE and NIM as variables). Only one of those two variables will be in the regression, because else the independent variable will not be significant. We can see that ROE has a much larger standard deviation. This could lead to remove that variable from the regression. The empirical part will point out if this is the case.

To see if these descriptive statistics are relative reliable, they will be compared with descriptive statistics of other papers. The paper of Jones (2011) also uses the Tier1 capital ratio and the Tobin's Q and will be compared with my data. The main differences between the papers are the years (1988-2008 vs. 2010-2011) and number of observations (28.784 vs. 1.309), so there might be some differences. Below we see some descriptive statistics from the paper of Jones:

Table 3 Descriptive Statistics J.Jones 2011:

Variable:	Obs.	Mean	Std. Dev.
Tobin's Q	28773	1.06	0.09
Tier 1 capital	19314	8.64	2.33
Logarithm total assets	28784	14.36	1.64

When looking at the differences between the variables, there are two main differences. First, the average Tobin's Q of Jones is much higher than in my data (1.06 vs. 0.97). A reason for this could be that the data we use is only of two years and since we are in a financial crisis, the Tobin's Q is lower. Another difference is that my average Tier1 capital ratio is much higher in my data (13.56 vs. 8.64). A reason for this is that the Tier1 capital ratio is required to be higher in 2011 than in 1988-2008 (according to the Basel III framework). The other figures are approximately the same.

3.3.4 Correlation between (control) variables

Before go to regressions, firstly we look for collinearity, because a regression seriously can be disturbed if an independent variable is strongly related to a linear combination of other independent variables (Nieuwenhuis 2009). Because of this, a correlation matrix is made of the (control) variables (table 4). The conclusion of this was that there is a large correlation of 0.92 between the Tier 1 and the Capital ratio. Because of this large correlation, the Tier 1 ratio become very insignificant, so the capital ratio will not be included in the regression.

There is also a relative large correlation between the two measures of current growth (33%) and between the measures of profitability (-31%). Empirical data points out if these variables are significant if they are together in a regression.

Table 4 Correlation (control) variables:

Variable	T_Q	Tier1	C-ratio	D. Growth	A. Growth	NIM	ROA	Volatility	L-To assets	Ln Ta
T_Q	1									
Tier1	0.11	1								
C-ratio	0.13	0.92	1							
Deposit Growth	0.05	0.03	0.06	1						
A.Growth	0.28	-0.04	0.00	0.33	1					
NIM	0.21	0.28	0.27	0.04	0.11	1				
ROA	0.22	0.17	0.16	0.01	0.25	0.19	1			
Volatility	0.01	-0.02	-0.05	-0.05	-0.08	0.01	-0.31	1		
Loans-to assets	-0.10	-0.27	-0.29	-0.08	-0.15	0.1	-0.1	0.20	1	
Ln. Ta	0.04	-0.29	-0.21	-0.04	0.08	-0.34	0.16	-0.17	-0.19	1

4.0 Results

Now we have a better view of the relationship between the Tobin's Q and the Tier 1 ratio, we will look at the regression equation. With this regression equation we will be able to draw conclusions about our research question. The regression includes the Tobin's Q separately on our measures of capital requirement (Tier1) and several control variables (X) as in the equation below:

$$\text{Tobin's } Q_{it} = a + B1 \cdot \text{Tier1 ratio}_{it} + B2 \cdot X_{it} + e_{it}$$

This regression is explaining the whole Tobin's Q. The error term (e_{it}) explains everything that is not explained by the (control) variables. So if the variables explain forty percent, the error term is explaining sixty percent. Hence, the smaller the error term, the better Tobin's Q is explained by the variables.

With this regression we attempt to find the variables that explain the Tobin's Q most. The regression is calculated with Stata. To get the best regression, all the country specific variables are excluded by the `xi: regression (i.countycode)` command. This command excludes the country specific variables of every country. Without the county specific variables, the regression is much more reliable and explains the Tobin's Q more than with the country specific variables. In the regression, four different models will be discussed that explain the Tobin's Q:

1. Tier 1 capital ratio

This regression has the Tobin's Q as dependent variable and Tier1 as independent variable. With this regression, there is visible if there is a relationship between the dependent and independent variable.

2. Regression with all variables

This regression has the Tobin's Q as dependent variable, Tier1 as independent variable and all control variables included. As stated before, there were three topics which included two variables (current growth, profitability and risk). The descriptive statistics showed that some of the variables had high standard deviation. This model shows if the variables with the high standard deviation are insignificant due to high standard deviation.

3. Regression with highest significance of topic

This regression has the Tobin's Q as dependent variable, Tier1 as independent variable and the significant control variables from model 2. Now each topic has only one variable and this improves the significance of the model.

4. Completely significant model

This regression explains Tobin's Q most (all variable significant).

Table 5 Regression:

Dependent variable:	Tobin's Q			
Model	1:	2:	3:	4:
Tier1 capital	0.02* (0.004)	0.003 (0.005)	0.02* (0.005)	0.02* (0.005)
<i>Current Growth</i>				
- Deposit growth		-0.07 (0.04)		
- Asset growth		0.51* (0.15)	0.51* (0.14)	0.51* (0.14)
<i>Profitability</i>				
- Net interest margin		0.09* (0.02)	0.09* (0.02)	0.09* (0.02)
- Return on assets		0.00 (0.002)		
<i>Risk</i>				
- Volatility		-0.13* (0.05)	-0.10** (0.05)	-0.11** (0.05)
- Loans to assets		-0.001*** (0.002)		
Log. Total assets		0.03** (0.01)	0.24*** (0.01)	
Observations	1309	776	910	910
R ²	0.43	0.50	0.46	0.46

*statistically significant at the 1 percent level

**statistically significant at the 5 percent level

***statistically significant at the 10 percent level

The regression results in Table 5 shows the results of each model. Model 1 includes only the Tobin's Q and the Tier 1 capital ratio. The model shows that there is a relationship between the Tobin's Q and the Tier1 ratio of 0.02. When the Tier1 ratio increases by one percent, the Tobin's Q is increasing by 0.02. Further there is visible that the R² of model 1 is 0.43.

$$R^2 = SSR/SST$$

R² is a statistic that will give an explanation about the goodness of the model. When the SSR (sum of square residuals) is high, the model explains much. When the SSR is low, the model explains less, hence the higher SSR the better.

Model 2 includes all (control) variables and has the highest R² (0.50). This model is explaining the most, because of the high SSR. Unfortunately many variables, including Tier1 capital ratio, are insignificant. As we knew, there were three topics with two (control) variables. This model shows the insignificant variable of the two. The insignificant variables are: deposit growth, return on assets and loans-to-assets and will be removed from the regression. Model three includes all variables except the three removed variables. Model 3 has slightly a lower R² (0.46), because the three removed variables together had a positive effect on the Tobin's Q. Unfortunately, model 3 shows that the Logarithm of total assets is not significant anymore (significant at 10%). Model 4 uses the same variables as model 3 only excluded logarithm of total assets and changes very little. The R² is still 0.46.

5.0 Summary and conclusions

5.1 Summary

As a consequence of the heavy impact of a banking crisis on the whole economy, governments have taken several steps such as government guarantees ("Too big to fail" guarantees etc.) and capital requirement to stabilize the banking industry. The capital requirement obligates banks to have a required capital to catch their possible losses. With these guarantees and obligations, the government wanted to improve the future existence of a bank. A good proxy for future existence of a bank is the charter value. This paper suggests there is a relationship between the capital requirement and charter value. With a sample of 910 banks, this research can be concludes that capital levels are a significant positive factor for determining bank charter value.

5.2 Conclusions

As we saw in chapter 2, theory suggests that there is a possibility of a relationship between charter values and capital requirement. The government introduces capital requirement and government guarantees to improve the stability of banking industry. We saw that the government guarantees had two effects on the charter value: the moral hazard effect and the market rent effect. The moral hazard effect was negatively correlated with the capital requirement and the market rent effect was positively correlated with the capital requirement. As we saw in chapter 3, the dependent and independent variable were positively correlated. This was the first sign that there might be a relation between the charter value and capital requirement. Besides that, the scatterplot showed that most dots were in the same area, which could be another indicator of this relation.

In chapter 4, four regression models regressions were created. Each of those models had the Tobin's Q as dependent variable and the tier1 capital ratio as independent variable. The conclusion was that every model had a positive Tier1 capital ratio, this means that the Tier1 capital ratio is positively correlated with the Tobin's Q. The Tobin's Q was explained by the Tier1 capital ratio by 0.02. So when the Tier1 capital ratio is increasing by one percent, the Tobin's Q will increase by 0.02. Further empirical data points out that asset growth has by far the largest impact on the Tobin's Q (0.51). This means that if the total assets are increasing by one, the Tobin's Q will increase by 0.51. Another conclusion is that the net interest margin also has a small effect on the Tobin's Q (0.09). A striking feature about the regression is that the volatility has a negative effect on the Tobin's Q. When the volatility increases by one, the Tobin's Q will decrease by 0.11. This is a normal reaction, because volatility is risk, when the risk is increasing, the charter value (discounted stream of future profit) is decreasing.

The theory suggested that there were two effects that influence the effect of capital requirement on charter value: moral hazard and market rent effect. The moral hazard effect was negatively correlated with the capital requirement and the market rent effect was positively correlated. Empirical data points out that there is a positive relation between capital requirement and charter value, this means that the market rent effect is a stronger effect than the moral hazard effect, or the moral hazard effect is not strong enough to make it negative. Overall empirical data points out that there is a positive relationship between the charter value and capital ratio.

6.0 Literature

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7.0 Appendix

Appendix 1: All countries included in the regression inclusive number banks per country

USA	881	EGYPT	13	PORTUGAL	4
JAPAN	117	SOUTH AFRICA	13	BULGARIA	4
RUSSIAN FEDERATION	64	SPAIN	13	IRAN	4
INDIA	60	KAZAKHSTAN	12	PALESTINIAN TERRITORY	4
UNITED KINGDOM	51	GREECE	12	CYPRUS	4
KOREA REP. OF	38	IRAQ	12	GUYANA	3
FRANCE	37	HONDURAS	11	UGANDA	3
DENMARK	36	SUDAN	11	LUXEMBOURG	3
TAIWAN	34	SYRIA	11	TANZANIA	3
PAKISTAN	34	AUSTRIA	11	ROMANIA	3
SWITZERLAND	33	SAUDI ARABIA	11	GEORGIA REP. OF	3
INDONESIA	32	SINGAPORE	11	IVORY COAST	3
BANGLADESH	30	KENYA	10	SLOVENIA	3
GERMANY	30	OMAN	10	LITHUANIA	2
ITALY	28	AUSTRALIA	10	LIECHTENSTEIN	2
KUWAIT	27	VIETNAM	9	BARBADOS	2
UNITED ARAB EMIRATES	25	EL SALVADOR	9	MAURITIUS	2
BRAZIL	25	ECUADOR	8	CAPE VERDE	2
NORWAY	24	ISRAEL	8	BAHAMAS	2
THAILAND	24	ARGENTINA	8	NICARAGUA	2
TURKEY	23	QATAR	8	ARMENIA	2
NEPAL	23	MEXICO	8	IRELAND	2
BOSNIA-HERZEGOVINA	21	MOLDOVA REP. OF	8	HUNGARY	2
PERU	19	MOROCCO	8	ST. KITTS AND NEVIS	2
PHILIPPINES	19	MONTENEGRO	8	KYRGYZSTAN	2
NIGERIA	18	NETHERLANDS	8	TRINIDAD AND TOBAGO	2
BAHRAIN	18	SWEDEN	7	PARAGUAY	2
POLAND	17	GHANA	7	SURINAME	2
UKRAINE	17	CHILE	7	BELIZE	1
CHINA-PEOPLE'S REP.	17	ZIMBABWE	6	SWAZILAND	1
MALAYSIA	17	BELGIUM	6	NIGER	1
TUNISIA	17	LEBANON	6	NAMIBIA	1
CANADA	16	FINLAND	6	MONACO	1
SRI LANKA	15	MALTA	5	BURKINA FASO	1
JORDAN	15	PANAMA	5	LAOS	1
CROATIA	15	BOLIVIA	5	UZBEKISTAN	1
COLOMBIA	14	JAMAICA	5	SAINT LUCIA	1
BERMUDA	14	SLOVAKIA	5	GAMBIA	1
MACEDONIA (FYROM)	14	ZAMBIA	5	PAPUA NEW GUINEA	1
HONG KONG	14	BOTSWANA	5	TOGO	1
SERBIA	13	COSTA RICA	4	CZECH REPUBLIC	1
VENEZUELA	13	MALAWI	4	BENIN	1