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Financial Crisis and Capital Adequacy Ratio: A Case Study for Cypriot Commercial Banks

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Abstract

This empirical study analyses the determinants of capital adequacy of Cypriot banks mainly during the period of financial crisis using multiple linear regression. Specifically, the study focuses on certain features of banks (risk, liquidity, return etc.) to determine whether they affect the volatility of capital adequacy. The study provides supportive evidence that there is a negative statistically significant relationship regarding banksize and risk and a positive regarding the level of provisions and percentage of Net Interest Margin. The factors affecting the capital adequacy ratio in Cyprus are the increases in credit risk and nonperforming loans, excessive leverage, increased requirements by regulatory authorities for the implementation and fulfillment of the Basel III rules by 2019, the negative environment and lack of trust, intensive competition among banks, the small size of banks in comparison with the interbank market, low yield and target for long-term growth, poor corporate governance and the problem of information asymmetry. Moreover, in the case of Cyprus, the additional capital is a strategic hedge to secure access to deposits and money markets and "buffer" as insurance in case of unforeseen events in the future due to the previous negative experience.

JEL classification numbers: F15, F34, G21
Keywords: Capital Adequacy Ratio (CAR), Commercial banks, Liquidity, Basel, Return

1 Introduction

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Financial institutions play a crucial role in the development, growth and orderly functioning of the economy as a whole. An efficient financial system is seen as a prerequisite for rapid economic development. On the other hand, poor performance of the banking sector may lead to bank failure. The bankruptcy of a bank may have an enormous impact on an economy due to contagion that can lead to overall economic crisis (Oloo, 2011).
The global financial crisis of 2007-2009 highlighted the importance of bank managerial efficiency and effectiveness. Due to the significant influence of the banking sector on the economy, bank regulation and supervision are considered of great importance (Barth and others, 2006). Stricter bank supervision can prevent or at least reduce the frequency of bank crisis (Morgan, 1984). Such supervision aims to maintain a sufficient and satisfactory level of capital adequacy. Commercial banks must create buffer reserves to meet potential losses in a crisis period and countercyclical capital reserves as protection against excessive credit expansion that could disrupt the stability of the financial system. Usually banks have more capital than required by regulations. This is partly explained by the fact that banks operate preventively against unexpected crises. Recent studies show that factors determining the capital adequacy ratio are not limited to the requirements of the regulatory authorities, but other variables are also important.
The second part of this paper describes the banking system in Cyprus and the recent economic crisis which affected significantly the capital adequacy ratios. Part three explains how the introduction of the Basel Agreements has affected the regulatory framework regarding capital adequacy. Part four reviews the theoretical and empirical approach followed by regression analysis in the fifth part aiming to identify correlations between various financial indicators. Conclusions based on the findings are presented in part six.

2 The Cypriot Banking System

Financial sector systemic crises can often lead to a destabilization of the entire economic system. The recent global economic crisis started in early autumn of 2008 with the collapse of key financial institutions. These failures spread to all international financial markets. The Cyprus economy and the Cypriot financial system were directly and strongly affected by this crisis.

2.1 Major Causes of the Economic Crisis in Cyprus

The main causes of the economic crisis in Cyprus are highlighted below:

EU membership: In the context of becoming a member of the EU, Cyprus had to meet certain criteria such as the libelarisation of fiscal policy. The introduction of the euro has removed Cyprus pound – euro currency uncertainty but at the same time removed national monetary independence.

Bank size and credit expansion: Three years after the euro adoption, the leading Cypriot banks held assets of more than 8 times the country's GDP and had undertaken excessive risks contrary to standard principles of risk management and portfolio diversification theory.

Real estate bubble: Poor risk management and uncontrollable credit expansion caused a bubble in real estate that finally resulted in the significant hike in non-performing loans and the rapid deterioration of the economy.

Overexposure to the Greek economy: Due to historical reasons Cyprus has always had close ties with Greece. The opening of subsidiaries in Greece by the Cypriot banks and the investment of more than €4bn in Greek government bonds at a time when the Greek economy followed a downward trend resulted in serious problems for the economy of Cyprus especially following the PSI. The downgrading of Cyprus following the €4bn loss due to the PSI led to a mammoth increase in the cost of national borrowing and effectively threw Cyprus out of the international credit markets.

Expansion in other markets: The expansion in foreign markets as well as in non-traditional commercial banking activities, although profitable during the growth period, proved dangerous during the crisis.

Close association with Russia: The close association with Russia due to an attractive tax regime and loose controls over money transfers had a negative impact on the Cyprus economy.

Lack of corporate governance: The lack of effective corporate governance was also crucial during the crisis. The moral hazard due to the relationship between bankers' bonuses and short-term revenues and the bearing of losses by taxpayers, had a negative impact on how prudently executives carried out their managerial duties and responsibilities. Good governance creates value to shareholders through transparency and through creating an effective two-way line of communication between the Board of Directors and shareholders.

2.2 Effects of the Economic Crisis

As a result of all the above stated problems, banks were downgraded by credit rating agencies with significant loss of investor confidence and a significant increase in their borrowing costs. In 2011, the Cyprus government deficit reached 7.4% of GDP, more than double the maximum amount as per EU regulations. When the economic indicators began to deteriorate in 2011, the European Banking Authority (EBA), informed the Cypriot government that as from 2012, national banks had to create a "capital buffer" of around 9% of their Tier 1 reserves. Due to the impairment of Greek debt, this target became unattainable. Had the banks managed to successfully create this regulatory capital buffer, the impact on depositors would have been significantly smaller. As a result of fiscal mismanagement, and perhaps the close relationship with Russia, the two major banks depositors in March 2013 suffered a significant haircut. Cyprus becomes a first test case for "Bail in". The domestic economic output fell by over 5%, unemployment rose to 17% for the first time since the Turkish invasion in 1974

and Cyprus is forced to enter a very strict program of fiscal and monetary austerity in exchange for financial aid from Troika (The IMF, ECB and the EU Commission). The loss of confidence in the banking system led to 28% reduction in deposits and the temporary imposition of capital controls that lasted for nearly two years.

2.3 The Current State of the Cypriot Banking Industry

Following the difficult days of 2013, with the imposition of a bail in and capital controls, the Cyprus economy has since managed to recover faster than originally expected and all capital controls were lifted. A series of upgrades by rating agencies have restored confidence in the banking system and deposits are again on an upward trend. The major banks of Cyprus have successfully been recapitalized mainly through the participation of foreign investors. Capital adequacy ratios range from 12.4% to 15.2% and Cypriot banks have successfully passed the recent European Central Bank (ECB) stress tests.

The large drop and subsequent recovery of the capital adequacy ratios of Cypriot banks is shown in figure 1 that follows.

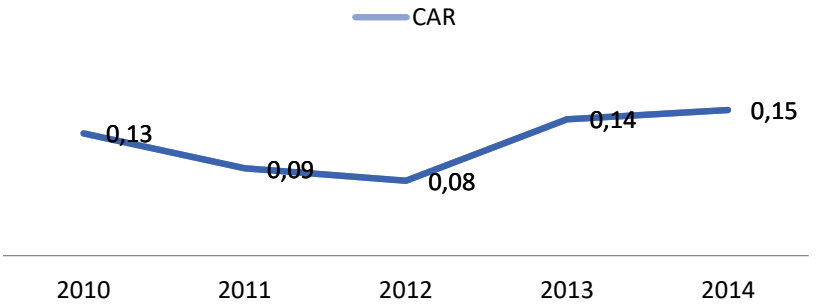
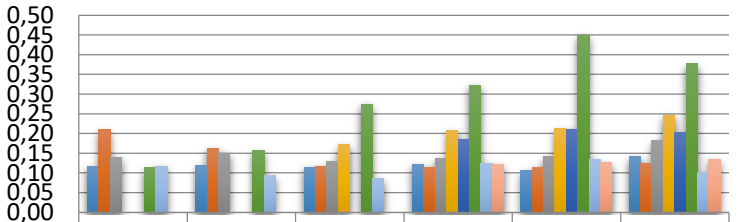


Figure 1 Capital Adequacy Ratio of Cypriot Banks

Source: Central Bank of Cyprus

Additionally, as a result of reduced lending activity and a series of Balance sheet write-offs, there is a significant decrease in the risk weighted assets (RWA) causing the capital adequacy ratio to increase. Due to the recent economic crisis, an ambitious European project was launched in 2014: the Single Supervisory Mechanism (SSM) covering the 130 major banks in the Euro zone. The main objective of the stress tests was a simulation of banks' capital based on two 3-year macroeconomic scenarios, the expected scenario and the worst case scenario, so as to assess whether the existing capital reserves of banks are sufficient over a three years' time horizon. Since the end of 2014, all banks were well capitalized, as the index rose to high levels, as shown in the table below.

Table 1: Capitalisation of Banks in Cyprus



	2009	2010	2011	2012	2013	2014
Bank of Cyprus	0,12	0,12	0,12	0,12	0,11	0,14
Cyprus Development Bank	0,21	0,16	0,12	0,12	0,12	0,12
Hellenic Bank	0,14	0,15	0,13	0,14	0,14	0,18
RCB			0,17	0,21	0,21	0,25
Alpha Bank				0,18	0,21	0,20
Eurobank	0,11	0,16	0,27	0,32	0,45	0,38
USB	0,12	0,09	0,09	0,13	0,13	0,10
COOPERATIVE CENTRAL BANK				0,12	0,13	0,14

Source: Banks' published financial statements

It is also encouraging that bank deposit outflows are now within normal levels despite the gradual lifting of all capital controls imposed in 2013. Confidence in the banking system of Cyprus has now been restored as clearly shown by the recent successes in the issue of government bonds. However, the size of the banking sector continues to be four times bigger than the island's GDP. According to the memorandum signed between the government and TROIKA in March 2013 the size of the banking sector in Cyprus in 2018 must not exceed the EU average, ie three times the island's GDP.

Despite the significant progress made, Cypriot banks still continue to face a number of challenges in relation to regaining their position of confidence and reliability. The most important of these challenges is the problem of non-performing loans. The adoption of new attitudes within the banking industry has enabled the implementation of new ideas and the coming of new people thus promoting economic recovery.

3 Bank Supervision

3.1 The Role of the Supervisory Authorities

The main objective of the banking supervisory authorities is to safeguard the smooth operation of the financial system through setting limits on banks' risk exposure and through setting minimum capital adequacy requirements. In the

absence of such regulatory requirements, banks will tend to combine low capital adequacy ratios with excessive risk taking.

3.2 The BASEL Committee

The levels of capital reserves tend to be very volatile due to fluctuations in the prices of financial instruments thus making it extremely difficult to estimate the minimum necessary needed to protect the banks against their basic risk exposures. In order to prevent excessive risk taking by banks a safety financial framework has been created including micro and macro regulations of supervision. The Basel Committee on Banking Supervision (BCBS) emerged after the collapse of the Bretton Woods exchange-rate system in 1973. The main pillar of the Basel Committee regulatory system of intervention is the need for consistency between the various domestic supervisory systems due to their interdependence. Essentially, the Commission offers a network for close member states cooperation, promoting a spirit of cooperation between all supervisory authorities. It was within this context that the Basel Committee issued the regulatory frameworks of Basel I, Basel II and Basel III, in order to strengthen micro regulatory intervention in the operation of banks facing macro systemic risks of the financial system.

3.2.1. BASEL III

Despite acceptable levels of capital adequacy ratios in most member states following the incorporation of 'Basel II' regulations into their national laws, this has not proved enough to prevent the crisis. The credit crunch of 2007-2008 clearly indicated the inadequacy of the regulatory system. One of the main causes of the crisis was excessive leveraging of the banking system both on and off balance sheet. At the same time, many banks had insufficient liquidity reserves thus highlighting the importance of having such reserves for the smooth functioning of the banking system. Moreover, the regulatory framework did not have provisions for the prevention of systemic risk, either on a time dimension or on a cross-sectoral dimension.

Consequently, the Basel Committee, recognising the inadequacies of the regulatory framework in the banking sector, issued Basel III in 2011. Basel III was an attempt to strengthen the stability of the financial system through micro regulatory interventions for the strengthening of banks at times of crises and macro regulatory interventions for the protection of the banking system from systemic risk. The application of the provisions of Basel III is due to take place over 2013–2019 and is very complicated. It raises bank capital requirements and introduces new regulations regarding liquidity and bank leverage. Assuming strict compliance with the new regulations the international banking industry will become more stable and international banks will be provided with new opportunities.

3.2.2 BASEL III Challenges

The new regulatory framework gives a much stricter definition of capital and introduces new standards for the valuation of weighted risk assets. Increased capital requirements lead to constraints as more capital is needed in order to achieve the minimum capital adequacy levels. The main problem of applying Basel III is the effect on profitability. It is estimated by Fitch that under the new regulatory framework the 29 international systemic financial institutions (GSIFI) will need $556 in extra capital by 1/1/2019 and is expected that the average Return on Equity (ROE) will fall by more than 20%. Also many believe that a much stricter regulatory framework is to blame for the slow rate of recovery from the recent economic crisis (Santos, 2001). Bank managements must examine alternative courses of action regarding risk and opportunity management so as to successfully implement Basel III.

4 Literature Review

4.1 Capital Structure of Banks

Bank regulators use capital regulations in order to ensure that a bank's capital is sufficient to meet its risk exposure. Mishkin (2000) argue that capital requirements set by the regulatory authorities affect capital structure decisions by banks. In general, the capital structure of a bank is determined by decisions that are initiated by the banks themselves on the basis of the theory of capital structure and decisions initiated by the regulatory authorities that relate to the determination of the minimum capital requirements (Besanko and Kanatas 1996).

Under voluntary capital structure it is possible that the bank maintains a higher level of capital than the minimum capital adequacy requirements set by the regulatory authorities. There are many reasons as to why the capital ratio of a bank is maintained above the minimum required. One of these reasons is a hedging strategy. Under normal conditions, the decisions on capital structure are taken by management however the owners/shareholders are able to exercise control over the decision making process or policies of a company. The agency relationships within the banking sector are far more complicated as they include the relationship between shareholders and management, the relationship between the bank and its loan customers and the relationship between the bank and the regulatory authorities. Thus, in addition to the risk exposure and the relevant extra capital requirements, there are other critical factors affecting the capital adequacy percentage.

Differences in risk preferences between owners and executives can also affect capital levels. According to Saunders, Strock and Travlos (1990), executive directors may have an incentive to reduce the risk of default as they stand to lose the most in case of bankruptcy like the loss of high salaries and other attractive benefits. Therefore executives may seek to hedge the risk of default through low leverage thus leading to a positive relationship between changes in risk and capital. (Shrieves and Dahl, 1992). Additionally, an unexpected rise in the costs of

default may force the banks to suddenly increase their capital adequacy ratio. Orgler and Taggart (1983) report that the optimum capital level for banks may depend on the netting off between the tax advantage from financing bank deposits and the tax advantage from capital accumulation. As the expected cost of bankruptcy reflects the probability of failure, banks may increase their capital levels when high risk assets increase. (Berger et al, 1995, Shrieves and Dahl, 1992).

4.2 Review of the Theoretical and Empirical Approach Towards the Determinants of Capital Adequacy

The approach towards the determinants of the bank capital adequacy ratio is becoming increasingly important. A better understanding of these determinants enables regulators to better assess possible interventions and future responses to banking problems (Francis and Osborne, 2010). Since the proper functioning and development of the banking system plays a key role in economic growth, it is imperative to understand the factors affecting decisions on bank capital structures and the dominant role of capital adequacy ratios in preventive supervision.

In the financial world opinions on the appropriate level of capital adequacy differ among experts, and between regulators and bankers. On the one hand, regulators prefer higher capital adequacy levels to ensure bank solvency. A higher level of capital adequacy will increase the bank's liquidity and reduce the possibility of bankruptcy. On the other hand, bankers often prefer lower levels of capital adequacy. The importance of minimum capital adequacy ratios needed to ensure the stability of banking systems has motivated many researchers to study the determinants of bank capital. Jeff (1990) revealed that capital adequacy is the main reference point for the safety and soundness of banks and financial institutions. Onoh (2002) argues that sufficient funds are considered as the percentage of capital that can effectively protect the banking operations from failure through loss absorption. Moreover, the amount of capital must be adjusted when it is probable that total operating costs and requirements will increase. Umoh (1991) argued that adequate capitalization is an important variable in the banking business.

Initial studies on the capital structures of banks and their determinants, focused on characteristics such as size, risk, liquidity, profitability and leverage. Some of these studies have concluded that factors affecting these decisions in the case of banks do not differ from those in the case of non-financial institutions (Gropp and Heider, 2010, Juca et al, 2012). Baltaci and Ayaydin (2014) found that capital structure is affected by the same determinants. Asarkaya and Ozcan (2007) analyzed the determinants of capital structure and identified those factors that explain why banks hold capital in excess of the amount required by the regulators.

According to the findings of all the above studies portfolio risk, economic growth, average level of capital and return on equity are positively correlated with the capital adequacy ratio and deposits negatively correlated.

4.2.1 Regulatory Capital

Due to their nature as financial intermediaries, banks may tend to hold less capital. Hence, the need for regulation. (Rime, 2001). Due to the high cost of capital retention, Mishkin (2000) argues that banks hold that amount of capital as required by the regulatory authorities. Due to high expenses, bank managers prefer to hold as little capital as possible and this equals to the amount required by the authorities. Therefore, the level of bank capital is determined by the minimum regulatory capital. Instead, Jackson et al (2002) in a review in earlier studies concluded that banks could maintain high levels of capital without the imposition of minimum capital by regulators.

According to most studies the capital adequacy ratio of banks is mainly determined by the existing regulations. But the question remains as to why banks hold capital above the minimum regulatory level. Different studies have tried to identify the determinants of additional capital holding (Lindquist, 2004, Nier and Bauman, 2006, Jokipii and Mine, 2008), and how banks adjust their capital ratios (Berger et al, 2008, Flannery and Ragan, 2008). The banks have an incentive to maintain a level of capital above the regulatory minimum, the so-called "buffer" as insurance in case of unforeseen events that cause the capital ratio to fall below the regulatory minimum (Marcus 1984, Milne and Whalley 2001).

Several factors have been identified affecting banks' decisions to hold capital adequacy above the minimum prescribed by regulators. These include internal factors, pressures from regulators, competition, market discipline, the cyclical behavior of the credit markets, economic cycles, securing access to deposits and money markets, long-term growth as well as acquisition strategies. Most studies examine internal factors such as the cost of capital, the size of the bank and the value or risk taking (Berger et al 1995, Ayuso et al 2004, Lindquist 2004, Stolz and Wedow 2005, Jokipii and Milne, 2008).

4.2.2 Risk

The relationship between capital and risk in the banking sector has been considered by many empirical studies. Regarding this relationship there are four dimensions:

1. The banks tend to increase their level of capital when their portfolio risk increases and vice versa.
2. The better the management of the bank, the greater the risk undertaken, and therefore the need for extra capital.
3. The imposition of capital requirements may increase risk-taking.
4. Differences in the relationship between risk and capital for well capitalized and marginally capitalized banks.

Santos (1999) notes that capital requirements may increase risk-taking. In agreement with Santos, Berger et al (2008), Shrieves and Dahl (1992) argue that banks that increased their capital level also increased their exposure to risk. Calem

and Rob (1999) suggest that increased capital regulation may force undercapitalised banks to engage in risk-taking that may have unintended negative consequences for the banks.
Banks will choose to hold capital above the minimum regulatory capital as there is a risk of easily falling under the minimum. Therefore, banks with capital levels close (or less) than the minimum capital requirements will choose to increase their capital and reduce their risk levels, while banks with significant capital buffers will tend to increase their level of risk, together with the level of capital buffer (Milne and Whaley 2001 and VanHoose 2007). Therefore, the relationship between capital and risk varies depending on how close the capital of banks is to the minimum capital requirements.

4.2.3. Macroeconomic Factors

A number of studies have attempted to take into account macroeconomic variables. Williams (1998) studied the effect of macroeconomic variables on the capital adequacy ratio and noted that variables such as inflation, the real exchange rate, money supply, unstable politics and return on investment determine the level of capital. Similarly, Octavia and Brown (2009) conclude that macroeconomic factors are important in determining capital structure. Hortlund (2005) studied the effect of inflation on the capitalization of Swedish banks and found that inflation is inversely related to capital adequacy. Williams (2011) also studied the relationship between inflation and capital adequacy ratio, in Nigeria. According to most studies, like the one by Ruckes (2004), a negative relationship is expected between economic development and capital adequacy ratio. At times of fast growth, bank risks are smaller and this drives banks to lower their capital adequacy ratios. At times of slow growth bank risk goes up thus encouraging banks to maintain a higher capital adequacy ratio. Lindquist (2004), Stolz and Wedow (2005), Jokipii and Milne (2008), Francis and Osborne (2010) studied the level of capital reserves in Norway, Germany, Europe and the UK respectively within the context of Basel I. Their findings show that these capital reserves increase during recession and decrease during recovery thus showing an important negative relationship between capital adequacy and the business cycle. In a study of the determinants of capital buffers, Fonseca and Gonzalez (2010) examined banks in 70 countries between 1992 and 2002. The results show a negative relationship between the economic cycle and capital buffers in seven countries, a positive relationship in five countries and no relationship in the other fifty-eight countries. Ayuso et al. (2004) argue that there are pro-cyclical effects, commercial banks being less procyclical than savings banks.

A. Return

Most studies in the literature show that profitability has a significant effect on the bank's capital. In a study of 12 banks in Europe, Australia and North America, Bourke (1989) found a positive relationship between capital adequacy and

profitability showing that banks with higher capital adequacy ratio are more profitable than banks with a smaller capital adequacy. Similarly, Berger et al (1995) and Anghazo (1997) found that US banks with relatively high capital adequacy were more profitable than other banks with lower capital adequacy ratio.

B. Size

Reynolds et al. (2000) found that the larger banks have smaller capital adequacy ratios. Similarly, Ayuso and Saurina (2004) showed that larger banks are able to operate with lower capital. This finding suggests that larger banks may benefit from diversification hence the need for lower capital ratios.

C. Competition

Following a study of 2,600 banks in 10 European countries Schaek and Cihak (2007) concluded that competition leads to higher capital holdings. They also found that the 20 largest banks in Brazil maintain a capital level around 18%, while the 20 largest banks in the world maintain a capital level of more than 14% due to high competition. Barth et al (2004), Flannery and Rangan (2008) and Berger et al. (2007) showed that bank capital levels in America and around the world is much more than that required by supervisory authorities due to supervision.

5 Empirical Analysis

This empirical study follows an analytical approach in an attempt to measure the degree that specific factors affect the capital adequacy of Cypriot banks. As already mentioned, the level of capital in a bank is affected by both regulatory provisions but also by a number of other factors. The sample selected to study the effect of these factors includes all four systemic Cypriot banks and all subsidiaries of foreign banks that were supervised by the Central Bank of Cyprus mainly during the period of financial crisis. The analysis is based on secondary data obtained from the published financial statements of the banks included in the sample for the period 2009-2014. To determine the influence of the explanatory variables on the dependent variable (CAR), the multiple linear regression model is applied as follows:

$$CARi = \beta_0 + \beta_1 SIZEi + \beta_2 PROVi + \beta_3 NIMi + \beta_4 ROAi + \beta_5 LEVi + \beta_6 LQDTi + \beta_7 RISKi + e_i$$

where CARi: Capital Adequacy Ratio of bank i
SIZE i: Size of the bank i
PROVi: The provisions index of the bank i

NIMi: Net interest as a percentage of interest receivable of bank i
ROAi: Return On Assets of bank i
LEVi: Liability to assets ratio of bank i
LQDTi: Liquidity ratio of bank i
RISK: The risk weighted assets index to total assets of bank i

In the above equation, β_0 is the constant term and β is the slope coefficient of the independent variables, while e_{it} is the error of the residuals of the regression analysis. The study tested the following seven null hypotheses on the relationship between the variables.

$H0_1$: There is no statistical significant relationship between CAR and SIZE
$H0_2$: There is no statistical significant relationship between CAR and PROVISION
$H0_3$: There is no statistical significant relationship between CAR and NIM
$H0_4$: There is no statistical significant relationship between CAR and ROA
$H0_5$: There is no statistical significant relationship between CAR and LEV
$H0_6$: There is no statistical significant relationship between CAR and LQDT
$H0_7$: There is no statistical significant relationship between CAR and RISK

5.1 Measurement of Variables

This part of the study discusses the measurement of the explanatory variables (predictos) used in the multiple regression model.

5.1.1 Dependent Variable – Capital Adequacy Ratio (CAR)

The dependent variable in the current study is CAR. This ratio is an important strength factor for a bank as it develops through the capital. The higher the CAR, the stronger the bank and the greater will be the protection offered to investors. Sangmi and Tabassum (2010) emphasize that CAR is directly proportional to the strength of the bank in crisis situations.

5.1.2 Independent Variables

A. Size

The bank's total assets may be used to define the size of the bank:

SIZE = TOTAL ASSETS

The size of a bank can influence its capital ratio. The largest banks tend to hold less capital on average due to economies of scale and diversification, better access to finance, more advanced credit risk control techniques and better portfolio risk diversification. Additionally, larger banks will hold lower capital reserves due to a

higher expectation of a government rescue in case of economic crisis (Demsetz and Strahan 1997). A negative relationship between the two variables is therefore expected.

B. Risk Indicators

1. Provisions ratio

The risk resulting from increased provisions affects the capital adequacy of banks. For the purposes of the current study the rate of provisions is determined by the following ratio:

$$\boldsymbol{PROVISION\ (PROV) = \frac{CUMULATIVE\ PROVISIONS}{LOANS}}$$

The increase in provisions indicates a deterioration of the bank's asset quality and hence the credit risk faced by the bank becomes greater with impact on bank profits (Naceur, 2003).

2. Risk ratio

It is one of the key indicators that can be used for the risk assessment of a bank:

$$\text{B}\boldsymbol{ANK\ RISK\ (RISK) = \frac{RISK\ WEIGHTED\ ASSETS}{TOTAL\ ASSETS}}$$

Berger and DeYoung (1997) argue that the lower the capitalization of a bank the greater its tendency to risk taking due to moral hazard, as they will lose less capital in case of bankruptcy (Horiuchi and Shimizu, 1998 and William, 2003). Also, the pressure for compliance with capital regulatory standards may cause banks to increase portfolio risk. A positive relationship between the two variables is therefore expected.

C. Effectiveness Ratio

The ratio of net interest income to total interest income indicates how effective a bank is, in generating income. Managerial effectiveness is a pre-requisite for the survival and development of any business. In the current study effectiveness is defined by the following ratio:

$$\boldsymbol{NIM\ RATIO\ (NIM) = \frac{NET\ INTEREST\ INCOME}{INTEREST\ INCOME}}$$

High revenues enable banks to raise additional capital through retained earnings and give a positive message about the value of the bank (Rime, 2001) and provide easier access to markets and will act as incentives to a lower risk appetite (Saunders and Wilson 2001). Berger et al (1995) and Huizinga (2002) found a positive relationship between net interest margin and capital ratio. On the other hand, high revenues may act as an incentive to the management of banks to reduce capital because of the lower risk of default and therefore this ratio may also have a negative influence (Yu, 2000).

D. Profit Indicator: Return on Assets (ROA)

This ratio shows the profits earned on the assets of a banking institution.

$$\boldsymbol{RETURN\ ON\ ASSETS\ (ROA)} = \frac{\boldsymbol{NET\ INCOME}}{\boldsymbol{TOTAL\ ASSETS}}$$

Most relevant studies in the literature indicate a significant effect of profit on the bank's capital. Gropp and Heider (2008) concluded that the most profitable banks tend to have relatively lower levels of capital as compared to the less profitable ones.

E. Gearing Ratio (Leverage)

The formula for bank leverage is shown below. It is expected that when leverage increases, capital adequacy decreases (Büyüksalvarc and Abdioğlu 2011).

$$\boldsymbol{LEVERAGE\ (LEV)} = \frac{\boldsymbol{TOTAL\ LIABILITIES}}{\boldsymbol{TOTAL\ ASSETS}}$$

F. Liquidity Ratio

The liquidity of a bank implies the ability to respond immediately to its current obligations and is calculated as follows:

$$\boldsymbol{LIQUIDITY\ (LQDT)} = \frac{\boldsymbol{LIQUIDITY\ ASSETS}}{\boldsymbol{DEPOSITS\ AND\ MONEY\ MARKET}}$$

Liquidity determines the financial position of banks as it indicates the ability of a bank to fulfil its obligations towards its depositors. (Rudolf, 2009). Büyüksalvarc and Abdioğlu (2011) concluded in a positive but not statistically significant relationship between the two variables. Based on the hierarchy theory high liquidity reduces the capital ratio as banks do not have to borrow or retain more capital.

Table 2 below shows the test results of the multicollinearity problem. Cooper and Schindler (2003) argued that there is a multicollinearity problem when the value of the correlation coefficient is 0.8 or greater. Based on the correlation analysis results, it can be concluded that there are no high correlations among the explanatory variables based on the 80% rule and therefore no serious multicollinearity problem.

Table 2: Correlation Analysis

	CAR	SIZE	PROV	NIM	ROA	LEV	LQDT	RISK
CAR	1.000							
SIZE	-0.265	1.00						
PROV	-0.289	-0.20	1.00					
NIM	-0.039	0.13	0.33	1.00				
ROA	-0.138	0.05	-0.36	-0.42	1.00			
LEV	0.326	-0.53	-0.15	-0.27	0.09	1.00		
LQDT	-0.329	0.21	0.52	0.33	-0.57	-0.24	1.00	
RISK	-0.432	0.09	0.55	0.66	-0.10	-0.14	0.36	1.00

Descriptive statistics are presented in table 3 below. It shows the mean, the median, min and max values, and skewness and kurtosis of individual variables.

Table 3: Descriptive Statistics

	CAR	**SIZE**	**PROV**	**NIM**	**ROA**	**LEV**	**LQDT**	**RISK**
Mean	0.17	7460553	0.11	0.46	0.00	0.89	0.14	0.57
Standard Error	0.01	1916659	0.02	0.02	0.00	0.03	0.02	0.04
Median	0.14	678325	0.10	0.51	0.01	0.92	0.13	0.65
Standard Deviation	0.08	11499955	0.10	0.15	0.02	0.16	0.12	0.23
Kurtosis	4.24	2	4.85	-0.51	2.85	30.55	1.41	-0.43
Skewness	1.99	2	1.65	-0.35	-1.34	-5.32	1.09	-0.83
Minimum	0.09	3327	0.00	0.14	-0.07	0.02	0.01	0.10
Maximum	0.45	42636568	0.47	0.72	0.04	0.99	0.52	0.93

Skewness and kurtosis are two commonly listed values of the shape of the distribution. Skewness is a measure of the symmetry in a distribution. Skewness essentially measures the relative size of the two tails. Kurtosis is a measure of the combined sizes of the two tails. It measures the amount of probability in the tails. All explanatory variables are approximately normally distributed. Capital levels in the case of Cypriot banks were above the regulatory minimum (8%) during the period 2009-2014. The lowest Capital Adequacy Ratio was 9% and the

highest 45%, with 14% being the average, showing that banks in Cyprus maintain a higher CAR than that dictated by the Supervisory Authority.

5.2. Results of Multiple Regression Analysis

Multiple regression examines the effects of the multiple predictors or independent variables on a single outcome variable. The following three tables show the results of the regression analysis. Table 4 presents summary statistics of the multiple regression model.

Table 4: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			Durbin-Watson
				R Square Change	F Change	Sig. F Change	
0.891	0.794	0.613	0.02619	0.794	4.395	0.027	1.810

The Coefficient of correlation (R) can be considered as a measure of the quality of the prediction of the dependent variable. The value of 0.891 indicates a good level prediction. The Coefficient of determination (R-square) is the proportion of variation in the dependent variable (CAR) that is explained by the independent variables. Hence, 79.4 percent of the variation in CAR can be explained by independent variables in the model. The adjusted R-square is used to test the overestimation of R square because of the small sample. The estimates show an error of 0.026, which cannot be considered as very large. The Durbin – Watson statistic d = 1.810 lies between the two critical values of $1.5 < d < 2.5$, and therefore it can be assumed that there is no first order linear autocorrelation data of multiple linear regression model. It can also be concluded that the overall model is statistically significant, or that the variables have a significant combined effect on the dependent variable and the null hypothesis is rejected (H0: There is no influence of the independent variables to the dependent variables) since the sig. (or p-value) is .006 which is below the .10 level (see table1 appendix).
Table 5 shows the effects of the individual independents.

Table 5: Effects of Individual Independents

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	0.293	0.120		2.439	0.021		
SIZE	-2.801	0.000	-0.045	-0.244	0.007	0.530	1.886
PROV	0.011	0.077	0.014	0.064	0.049	0.412	2.426
NIM	0.245	0.021	0.453	2.025	0.052	0.364	2.747
LEV	-0.102	0.005	-0.196	-0.967	0.342	0.443	2.259
ROA	1.067	0.044	0.287	1.655	0.109	0.605	1.652
LQDT	-0.199	0.034	-0.299	-1.486	0.148	0.450	2.221
RISK	-0.215	0.086	-0.605	-2.507	0.018	0.313	3.193

Tolerance must be greater than 0.1 (or VIF < 10), which is true to all the above variables. Unstandardized coefficients show how the dependent variable changes with the independent variable when all other independent variables are held constant. The test sig. = 0.000 < 0.05, therefore the null hypothesis is rejected for each of the variables. We can see that the size of the bank (.021), the provisions index (0.049), the net interest as a percentage of interest receivable (0.052), and risk (.018) are significant predictors (or significantly related to) of Capital Adequacy Ratio.

The standardised beta indicates the strength and direction of the relationships (interpreted like correlation coefficients). Size, LEV, LQDT, and RISK are negatively to CAR [(-0.045),(-0.196),(-0.299),(-0.605) respectively] while PROV, NIM, and ROA are positively related [(0.014),(0.453), (0.287) respectively]. Inspection of individual predictors reveals that size (Beta = -2.801, $p < .05$), the provisions index (Beta = 0.011, $p < .05$), the net interest as a percentage of interest receivable (Beta = 0.245, appr. $p < .05$), and risk of the bank (Beta = -0.215, $p < .05$) are significant predictors of Capital Adequacy Ratio. The other individual predictors are significant at higher levels.

Table 6 shows whether there is a positive or negative relationship between the independent and each explanatory variable and whether it is statistically significant.

Table 6: Type of a Relationship

CAR	Sign	
SIZE	-	Statistically significant relationship at the 1% level
PROV	+	Statistically significant relationship at the 5% level
NIM	+	Statistically significant relationship at the 10% level
LEV	-	Statistically insignificant relationship
ROA	+	Statistically insignificant relationship
LQDT	-	Statistically insignificant relationship
RISK	-	Statistically significant relationship at the 5% level

Table 7 presents the aggregated data over the five year period of the banking sector in Cyprus. Aggregated data indicate that the banking sector as a whole is well capitalized. Over the five year period, the average capital adequacy ratio was 11.8%, well above the minimum requirement. Nonperforming loans (NPLs) remain relatively high, reflecting the economic slowdown in Cyprus in the period after 2009. The Cypriot banking sector remains relatively large despite the reduction in size during the five year period and well-developed.

Table 7: Aggregated Data of the Cypriot Banking System

Year	CAR	SIZE	NPL/LOANS	NIM	ROA	LEV	LQDT	RISK
2010	0.13	154105188	0.08	2941800	0.01	0.93	0.15	0.15
2011	0.09	135803715	0.09	3307791	-0.04	0.95	0.09	0.09
2012	0.08	122925342	0.21	2819711	-0.04	0.96	0.12	0.12
2013	0.14	77603543	0.44	2204380	-0.03	0.94	0.12	0.12
2014	0.15	75610737	0.48	2125980	0.00	0.90	0.13	0.13

6 Conclusions

The recent financial crisis has led to increasing capital requirements in the Cypriot banking sector so as to achieve financial stability. Capital adequacy is considered one of the most important indicators of a bank's ability to protect itself and its shareholders against default. The level of this indicator is partly affected by regulatory decisions but it is also affected by a number of other factors. Multiple regression has been conducted to examine and analyse the factors that affect the capital adequacy ratio (CAR) of banks in Cyprus and empirical support has been

established for a number of hypotheses cited in the relevant literature. The current study focused on a number of bank characteristics like risk, liquidity and return, in order to establish whether these factors affect the variability of capital adequacy.
According to our findings, there is a significant negative statistical relationship between CAR and size and risk and significant positive statistical relationship between CAR and provisions and net interest margin, as expected. The factors that affected CAR in the banking sector of Cyprus, were the increase in credit risk and non-performing loans, excessive leverage, extra regulatory requirements in accordance with BASEL III, the negative environment and lack of confidence, intensive competition among banks, the small individual size of banks in relation to the total industry size, very low rate of return and development prospects, lack of effective corporate governance and information asymmetry. Furthermore, in the case of Cyprus, extra capital is a strategic hedging instrument for gaining access to deposits and the capital markets. It is also a buffer reserve acting as insurance against unforeseen events in the future due to the very bad experience in the past. However strict supervision may lead to increased risk taking in order to meet the capital requirements and also slow development. Bank managers will be faced with many challenges in the future as they have to study alternative strategies and solutions regarding risk management and also manage opportunities. They must strike a balance so that the level of own funds does not prevent the long-term sound development of Cypriot banks.

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Appendix

Table 1: ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	0.107	7	0.015	3.690	0.006
Residual	0.120	29	0.004		
Total	0.228	36			