

INTERNATIONAL BANKING SYSTEM DISTRESS:
A MACRO APPROACH FOR THE GLOBAL CRISIS OF 2008

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BOĞAZIÇI UNIVERSITY

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INTERNATIONAL BANKING SYSTEM DISTRESS:
A MACRO APPROACH FOR THE GLOBAL CRISIS OF 2008

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By
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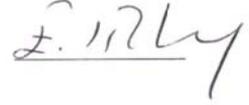
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International Banking System Distress: A Macro Approach for the Global Crisis of
2008

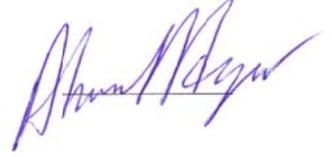
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Thesis Abstract

Süreyya Burcu Avcı, “International Banking System Distress:

A Macro Approach for the Global Crisis of 2008”

Complicated practices of 21st-century banking and excessive risk taking caused to the current global crisis. Investing on risky loans, irresponsible lending to people with poor credit ratings, creating complex financial instruments and inadequate regulatory supervision led to global financial turmoil. The speed and severity of the turmoil was very fast, it surprised the market participants and the regulators. Consequently it became a crisis of confidence in a short period of time. Governments had to intervene to prevent total collapse of the financial system. The IMF estimates that the cost of global financial crisis is approximately more than \$4 trillion as of 2010.

The main purpose of the study is to assess the fragility of national banking systems for a group of developed and emerging countries by using CAMELS approach for the period of 2005-2009. Since the period covers the pre-crisis and crisis period, policy implications of the empirical results will be discussed in the context of national banking systems' ability to deal with risks and the speed of recovering from the crisis. This study uses four of six CAMELS components for 49 countries as a group as well as three sub-groups by means of binomial logit regression. The results indicate a significant relationship between banking sector soundness and CAEL components. Capital adequacy, earning strength and asset quality come out to be significant components however liquidity does not have a significant impact on banking sector soundness. Surprisingly, the impact of earning strength on financial soundness is found to be negative at the national for the pre-crisis and crisis period. The model also captures different impacts of CAEL components on soundness of national level banking sectors among country sub-groups, the EU, other developed countries and emerging countries. Empirical findings of the pooled data and the EU are in parallel with the methodology of CAMELS approach except earning strength. However, the impact of asset quality appears to be positive for other developed countries and developing countries. While a new financial architecture is being designed for the post-crisis period, internationally coordinated strategy for new global regulatory structure should be developed cope with financial distress.

Tez Özeti

Süreyya Burcu Avcı, “Uluslararası Bankacılık Sistemi Sorunları:

2008 Küresel Krizine Makro Ölçekte bir Yaklaşım”

21. yüzyıl bankacılık uygulamaları ve aşırı risk alma mevcut küresel krize neden olmuştur. Riskli kredi yatırımları, kredi rating’I düşük olan kişilere sorumsuzca verilen krediler, yeni türetilen kompleks finansal enstrümanlar ve yetersiz bankacılık denetimleri uluslararası finansal bir karmaşaya neden olmuştur. Oluşan karmaşanın hızı ve önemi o kadar fazlaydı ki, bu karmaşa pazar katılanlarını da denetleyicileri de şaşırtmıştı. Sonuç olarak, kriz kısa zamanda bir güven krizi haline dönüştü. Hümetler, finansal sistemin tamamen çökmesini engellemek için müdahale etmek zorunda kaldılar. IMF krizin toplam maliyetinin 2010 yılının sonunda 4 trilyon dolardan daha fazla olacağını öngörmüştür.

Bu çalışmanın temel amacı 2005 ve 2009 yılları arasında bir grup gelişmiş ve gelişmekte olan ülkenin bankacılık sistemlerinin hassaslıklarını CAMELS analizi kullanarak analiz etmektir. CAMEL rating sistemi bir bankanın veya finans sektörünün sağlığını ve gücünü ortaya çıkarır. Period hem kriz öncesi hem de kriz dönemini kapsadığı için empirik sonuçlardaki politika uygulamaları genel bir dönemi ifade eder, sadece kriz dönemi politikalarını değil, istikrar dönemlerini de kapsar. Bu çalışma 49 ülkenin bankacılık sektörlerinin sağlığını CAMELS bileşenlerini ve binominal logit regresyon methodu kullanarak test eder. Sermaye yeterliliği, gelir gücü ve varlık kalitesi bankacılık sektörünün sağlığının beklirlenmesinde önemli bileşenler olarak ortaya çıkarlar ancak likidite çok etken bir faktör değildir. Sonuçlar CAEL sisteminin ulusal seviyede bankacılık sisteminin sağlığının ölçülmesinde başarılı bir yöntem olduğunu ortaya çıkarmıştır. Model CAEL bileşenlerinin ülke altgruplarının bankacılık sektörlerinin sağlığındaki farkları ortaya çıkarabilmesine imkan tanımaktadır. Tüm ülkeler ve Avrupa Birliği ülkelerinin test sonuçları, gelir gücü dışındaki tüm CAMELS bileşenleri için paraleldir. Ancak diğer gelişmiş ülkeler ve gelişmekte olan ülkelerin varlık kalitesi değişkeni bankacılık sektörü üzerinde pozitif bir etki bırakmaktadır. Kriz sonrası dönem için yeni bir finansal mimarinin hazırlandığı bu dönemde, finansal sorunlardan kaçınmak için uluslararası koordinasyonun sağlandığı küresel çapta yeni bir mevzuat hazırlanmalıdır.

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CHAPTER 1

INTRODUCTION

Banking sector safety and soundness has been an indicator of stability in economy and growth in production. Banks do not produce new goods; however they provide borrowing, lending and investments opportunities to facilitate economic activities. They play as an intermediary role between investors having access sources at hand and debtors needing sources for their initiations. Banks help flow money from places where it is abundant to places where it is scarce. Thus they help distribute wealth as much evenly as possible not only within country and also across boundaries.

Functions of banks are generally summarized as guaranteeing values, right of crediting and transfer of titles (Willis and Edwards, 1922). Accepting deposits, keeping and transferring money and granting loans shape these functions. However their secondary level functions have hands- on effect on the whole economy. Secondary functions include assistance in trade relations, money creation, guaranteeing, collecting and supplying business information and reports to customers.

All its functions make banking irrevocable for the economy. The more crucial banking functions and role are for an economy, the more important banking sector soundness is. Problems in banking systems create financial instability and shocks, reduces GDP and creates several other problems for national and international economic systems.

Financial regulation institutions, universities and other research institutions have been working on measuring the soundness of banks and distinguishing failing banks from the sound ones. The FED has been using CAMELS methods to assess

bank soundness in the US since 1978, along with several other countries. This method is so popular that, after 2005 financial soundness indicators have been pooled by the IMF. Financial Soundness Indicators provide data for CAMELS analysis of individual countries. This study uses financial soundness indicators of 49 countries to ensure that CAMELS analysis work not only for individual bank level and also for national level.

The research problem asks if CAMELS ratings work for national banking systems and the research questions investigate CAMELS components on national level. To accomplish this task, binomial logit regression was employed on financial soundness indicators. Conclusions reveal that CAMELS method is a good predictor of banking sector safety and soundness in national level.

This study starts with explaining 2007- 2010 financial crisis, its causes and the process through time. Second chapter explains CAMELS analysis, financial soundness indicators, and differences in banking systems of developed and developing countries emphasizing sample country CAMELS averages. Fourth chapter makes a summary of literature review on macroeconomic effects of banking crisis, role of central banks in bank supervision, surveillance methods, early warning methods and CAMELS rating. The fifth chapter brings an empirical approach to the study by means of binomial logit regression model to assess the relationship between banking soundness and CAMELS components. The last chapter presents the conclusion and policy recommendations. This study contributes to literature as examining the CAMELS components in national level. CAMELS rating system is a good predictor of bank safety and soundness in individual banking level. This study shows that the rating system is also reliable on national level.

CHAPTER 2

GLOBAL FINANCIAL CRISIS

One of the most catastrophic financial crises of the 21st century started in 2007, similar to the most devastating one in the 20th century between 1929- 1933 Great Depreciation (Bordo, 2008). Both crises spread to the world out of the United States. During 20th century, there have been a number of crises between the two above mentioned great crises. All crises have their own unique causes to start whereas they have many reasons in common, too. In order to understand the 2007- 2010 global crisis and to find the roots of it, it would be helpful to analyze the economic process enduring since 2000s.

Reasons and Background of the Crisis

The majority of historical crises were preceded by financial liberalization (Kaminsky and Reinhart, 1999); de facto liberalization certainly played a role in causing 2007- 2010 crisis in developed countries. It can be called de facto because de jure liberalization, which evokes legal enactment, got ground much earlier in developed countries. However issues related with regulation and technological progress are unique to 2007- 2010 crisis, different from former crises and unrelated to liberalization. Inflation or problems raised from fixed exchange rate regimes did not precipitate the crisis whereas decline in productivity growth and housing prices came into prominence. In order to have a clear understanding, this study classifies the causes of the crisis into four groups: Macroeconomic factors, deficiencies in supervision and regulation, problems in risk management and international problems (Reinhart and Rogoff, 2008).

Macroeconomic Factors

The macroeconomic factors in the US for more than a decade provided a basis for the crisis. These policies affected macro policies of other nations. This study investigates the policies under four categories as monetary policy, fiscal policy, trade policy and welfare policy.

Loose Monetary Policy

During 1990s and 2000s interest rates were always less than the expected level. After September 2001, interest rates fell fast below 2%. In following 2 years, interest rates even fell to 1% and remained still till 2004. Between 2004 and 2007 the FED increased rates from 1% to 5, 25 % in 17 steps; however rates were still less than the optimal level till 2006. Figure 1 shows the Federal funds effective rate between 2000 and 2010.

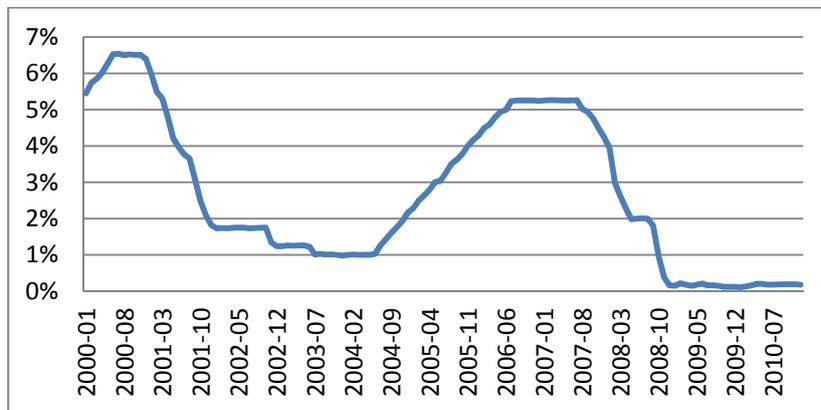


Figure 1: FED effective rate between 2001 and 2010 (FED)

The drop in interest rates can be discerned from figure 1. Rates remained always less than former years' average till the end of 2006; they were never so low after 1950s.

Thus, there was excess money in circulation up to 2006 (Taylor, 2009). Figure 2 shows federal funds effective rates between 1954 and 2010.

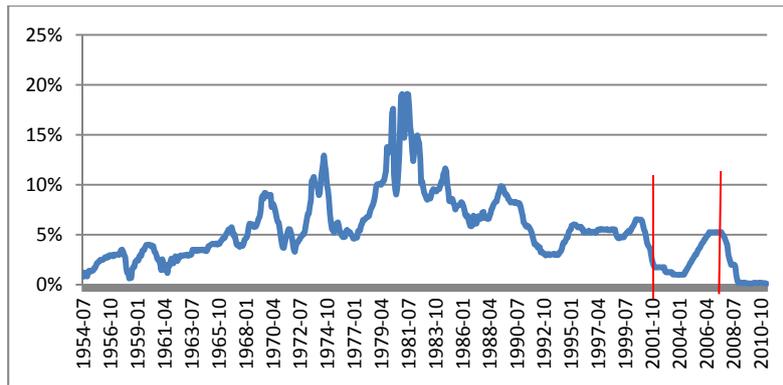


Figure 2: FED effective rate between 1954 and 2010 (FED)

As figure 2 indicates, interest rates after 2001 recession generates the lowest rates after 1960s. The downward sloping trend line after 1980s reached the minimum after 2001.

On the other hand, the increase in interest rates after 2004 is noticeable. The increase wiped away the excess money in circulation. This period accelerated financial collapses. Foreclosure rate started to increase up to 20% in 2005 and 2006 (Schloemer, Li, Ernst and Keest 2006). It can be interpreted as an intention of government to strict monetary policy and a correction towards free market. Baily and Elliot (2009) argues the FED kept interest rates low after 2001 recession with fear of sluggish job growth and a global deflation. Granted this argument, one can conclude that the fear vanished after the recession by the economic boom as in figure 3.

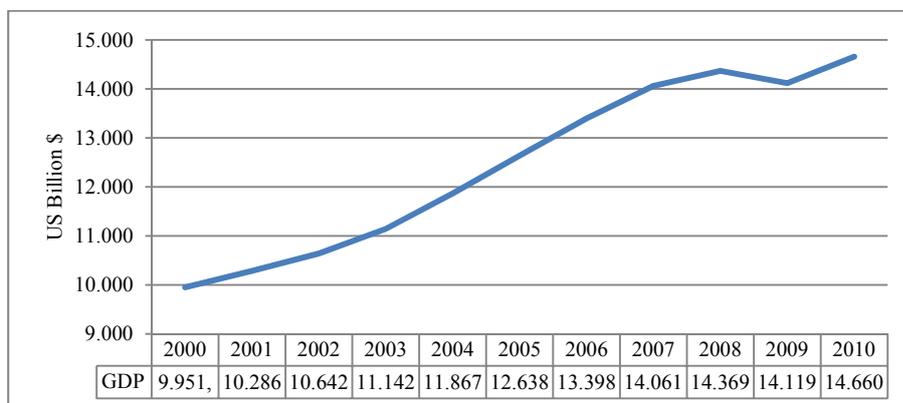


Figure 3: US GDP growth (NBEA)

Figure 3 indicates a sharp increase in the GDP growth after 2001 in the US economy. The optimism in this period made the permanent growth an expected economic prosperity for future years and it saved governments from the fear of deflation and unemployment. Not only the US economy had a boom, the international GDP level was also increasing during these years. Figure 4 shows the global GDP rates.

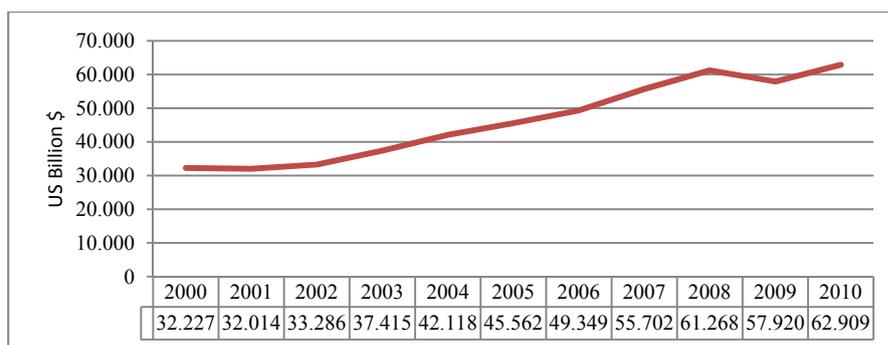


Figure 4: Global GDP growth (IMF)

Figure 4 shows a permanent growth in global output as well as the US growth. Especially after 2004, the growth accelerates based the optimism in the air.

Fiscal Stimulation Policy

Research indicates that severe financial crises are associated with severe economic downturns (Spilimbergo, Symansky, Blanchard and Cottarelli, 2008). One of the methods to rescue the economy from a recession is to implement fiscal stimulation policy. After 2001 recession, the government adopted an expenditure stimulating policy. The effects of the policy on government budget are visible in figure 5. The budget had a surplus in 2000; however the deficit increased permanently between 2001 and 2004.

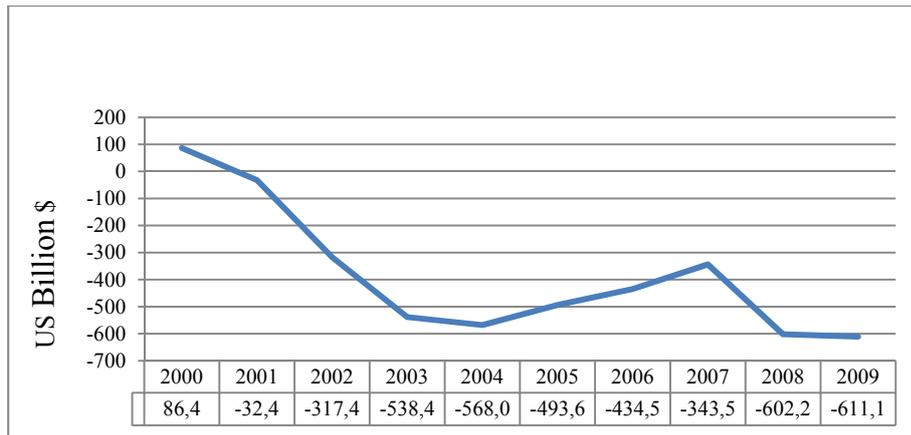


Figure 5: Budget balance in the US (Government Printing Office)

Figure 5 indicates a continuous deficit after 2001. Reasons of the deficit are several. Beside others, expenditures to support construction and housing industry and expenditures on Afghanistan and Iraq wars are the most glaring causes of the crisis (Eisenbeis, 2009). The government expenditures are shown in figure 6.

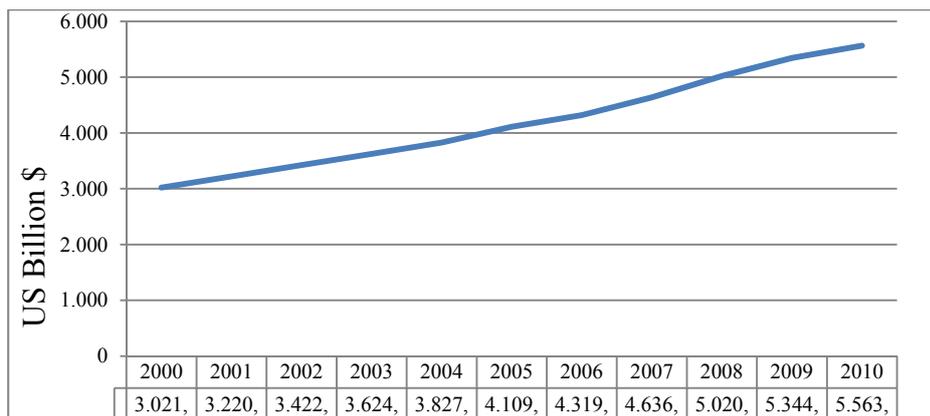


Figure 6: Government expenditures in the US (Bureau of Economic Analysis)

It is obvious that government spending is still increasing during and after the crisis. It is possible to say that government expenditures on support of housing industry turned out to be bailouts during the crisis. The US government projected the Troubled Asset Relief Program (TARP) project and it is still supporting certain industries by purchasing bonds from the markets, which is called quantitative easing (QE). In total, 2010 spending is almost doubling the 2000 numbers. Besides excess money in circulation and government support for the housing industry, the greatest item to be blamed for the high expenditure is trade deficit.

Trade Policy and Balance of Payments Imbalances

Since 1980s the US has always had a negative trade account. The reason mostly depends on US trade policy: Many US originated companies prefer producing outside of the United States and sell their products home. Figure 7 shows the trade deficit and the current account deficit of the USA.

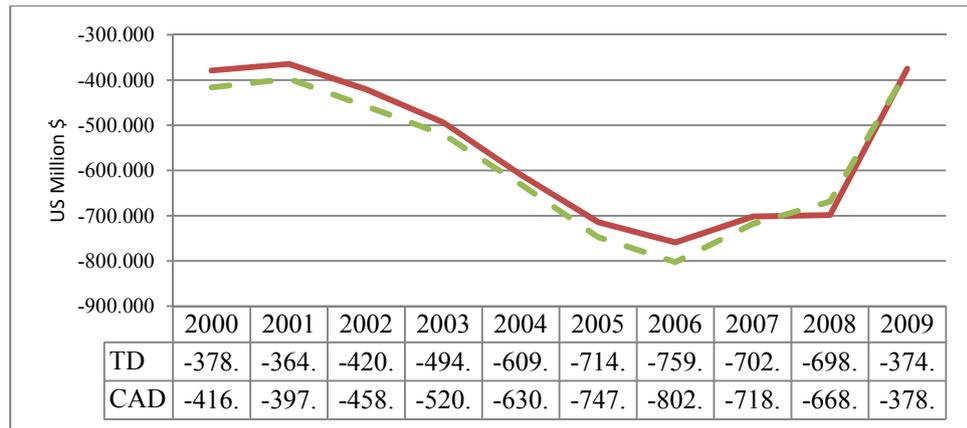


Figure 7: Trade deficit (TD) and current account deficit (CAD) of the US

(Bureau of Economic Analysis)

Table 7 shows that trade and current account deficits enlarged between 2001 and 2006 as expected. Economic disruption reduced the deficits due to reduction in consumption but deficits are expected to increase in the aftermath of the crisis. It is also remarkable that the government has positive balances of investment income and current transfers, so that current account deficit is less than trade deficit. This might be a sign of more strict fiscal policies after the crisis.

Another important issue about balance of payments is the high dollar reserves in Japan and China. The reserves were reinvested in the long-term US treasuries. These transactions not only made a downward pressure on interest rates but also increased public and private spending; thus they caused a downturn in the economy (Eisenbeis, 2009). Increases in public spending can be seen in figure 5. Along with

governmental spending, personal expenditures gained acceleration after 2001. Table 8 displays that personal expenditures continuously increased until 2008.

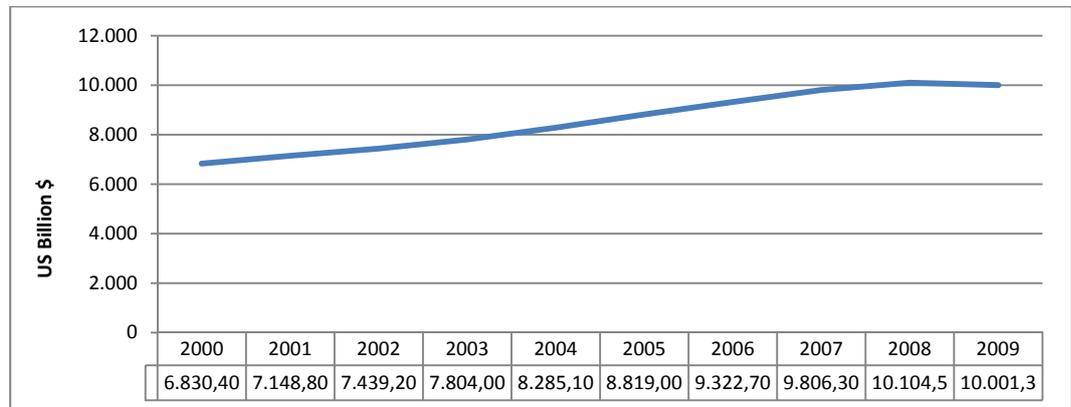


Figure 8: Personal consumption expenditures in the US (Bureau of Economic Analysis)

As figure 8 shows, personal spending increased parallel to the public spending between 2001 and 2008. After 2008 personal spending reduced due to credit crunch and recession; however bail- outs did not let the government reduce its expenditures.

Welfare Policy

Congress aimed to increase welfare of the economy depending on the abundance of money in circulation. The government chose to stimulate construction/ building sector, because the building sector requires a number of other goods or services to work with. Thus, stimulating this sector would ensure a fast growth in all sectors and provide higher GDP ratios. The home ownership, especially among lower- income families and minorities was less than expected. In order to increase home ownership, the Congress made pressure on government supported enterprises (GSEs) to increase mortgage loans (Chomsisengphet and Pennington- Cross, 2006).

The welfare policy of the government created incentives for mortgage financing after 2001 recession. First, there were important provisions for mortgage loans: Refinancing with better terms and early repayment was possible without a

penalty. Secondly, mortgage contracts were signed without recourse to the borrower. That means the house is the only collateral for the loan (Dam, 2009). It was a serious protection for borrowers; on the other hand it made room for abuse by over-borrowing. Thirdly, government support and vast securitization possibilities restrained creditors from being risk-averse.

Figure 9 shows how real estate loans increased in the USA after 2000.

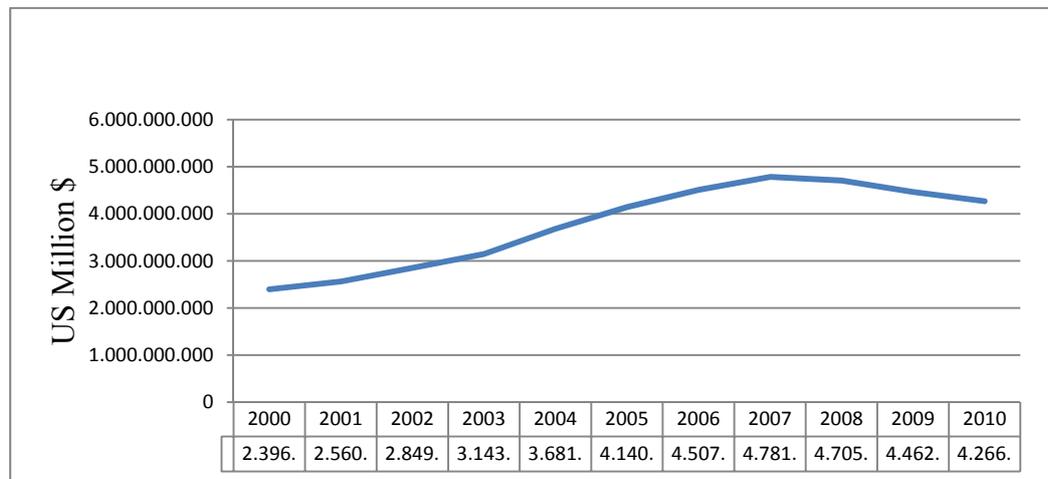


Figure 9: Net real estate loans in the US (FDIC)

It is visible from figure 9 that net real estate loans reached the top in 2007 to \$ 4, 78 million. With defaults and foreclosures, the rates have been falling down after 2007.

Baily and Elliot (2009) note that asymmetric information should be added to the scenario. As circulative money increased under expansionary monetary and fiscal policy, production increased saliently. Financial companies had to sell more in order to keep their former profits. The competition in the financial sector increased along with other sectors. Intensified competition forced financial companies to produce new products such as MBSs (mortgage backed securities). GSEs issued MBSs and purchased MBSs issued by private mortgage sellers. US Securities and Exchange Commission (SEC) defines MBSs as “debt obligations that represent claims to the

cash flows from mortgage loans or residential property”. Most MBSs are issued by Government National Mortgage Association (Ginnie Mae), Federal National Mortgage Association (Fannie Mae), and Federal Home Loan Mortgage Corporation (Freddie Mac). Existing risk management systems could not measure the true risk of these derivatives as their trade increased, and as they were taken into assets of financial companies. Risk appetite for these products was steadily increasing because of their high leverage. By means of high leverage, these derivatives earned high rates. The density of riskier loans like mortgages as well as the density of riskier assets like MBSs increased in GSEs portfolios, especially after 2004. (An and Bostic, 2007), (Baily and Elliot, 2009).

Figure 10 shows the delinquency rates of major investment groups. 4 major investment groups take place in the graph, two of whom gain much importance after 2007.

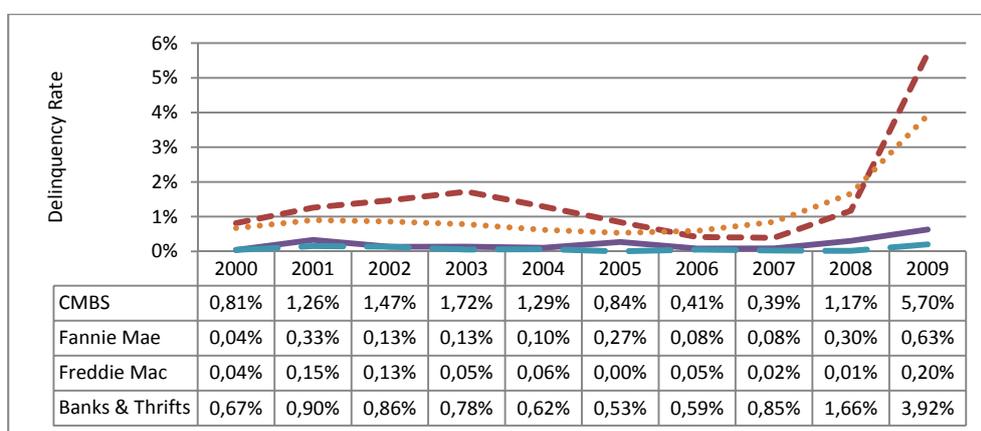


Figure 10: Delinquency rates of major investment groups (MBA)

Delinquency rates of commercial mortgage backed securities (CMBS), banks and thrifts; and two major GSEs, Freddie Mac and Fannie Mae are represented in Table 10. CMBSs and banks and thrift’s delinquency ratios increase significantly after the crisis hit. Banks and thrifts put a remarkable rate of CMBS in their asset portfolios; it

is the main reason for their delinquencies. On the other hand GSEs were protected by the government; their delinquency rate did not change much.

Lacks in Supervision and Regulation

As developing countries suffered many banking crises because of inadequate regulation and supervision, many developed countries were in the safe side in last decades, with only a few exceptions like Japan. But yet, the new off-balance sheet products and mis-rated assets were not taken into financial markets. Developed world realized the effect of derivatives just by crisis time: New products required new regulation and more supervision. This section mentions Basel Accords, securitization and off- balance sheet entities, use of tax heavens, role of rating agencies and the role of central banks in terms of regulation and supervision activities.

Basel Accords

Basel Committee on Banking Supervision was established in 1974 in the aftermath of international currency and banking market crises by the central bank governors of G- 10 countries. By 2010, they have 28 member countries represented by their central banks. The Committee is a forum for banking supervision. It provides international cooperation and harmonization by exchanging information among members; improving effectiveness of supervision techniques and setting minimum supervisory standards. The Committee does not have a legal formal supranational authority over banking. Rather, it recommends best practices for sovereign authorities. It finds the best suited supervision techniques for individual countries and encourages convergence towards common standards.

High indebtedness and economic imbalances of 1980s made Basel Committee concern in capital adequacy. G- 10 countries backed the Committee to resolve the erosion of capital standards in their banking systems by approving Basel Capital Accord (Basel I), which is a capital measurement system in 1988. The Accord provided the implementation of minimum capital ratio of capital to risk weighted assets of 8% by the end of 1992. The framework of the Accord was also accepted by non- member countries especially which operate international banks.

After the approval of the 1988 Accord, rules never stayed static, a number of changes and amendments took place until the adoption of the New Capital Framework in 2004 (Basel II). Basel II reflects all the changes made after 1988. The first being the most important, Basel II has three chapters: The first pillar is capital adequacy requirements which expands the standardized rules set in Basel I; the second one is supervisory review process which involves supervision of capital adequacy and internal assessment processes; and the third is market discipline which contains effective use of disclosure to increase safety and soundness of banking systems.

After 2007 financial market crisis, The Committee issued Basel III documents to strengthen Basel II Capital framework. The new framework includes complex securitization positions, off- balance sheet vehicles and trading book exposures. The package also covers risk management and disclosure rules for Pillar 2 and Pillar 3. The new Framework will be implemented between 2013 and 2019 (Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework, 2006), (History of the Basel Committee and its Membership, 2009), (Cangürel, Güngör, Sevinç, Kayci and Atalay, 2010).

Even though Basel rules are not compulsory, all countries are expected to comply with the rules. Inadequate capital is indicated to be one of the important reasons of the crisis. Dam (2009) and Brewer, Kaufman and Wall (2008) state that fixing resources as capital would reduce profitability of banks; however, this criterion is the most important tool that protects banks from falling into shortage in crises. Basel Accords pay much importance on capital adequacy.

Some researchers criticized Basel II implementations. Eisenbeis (2009) argues that while supervisors and regulators occupied themselves in theory of optimal capital adequacy ratio, they could not catch the dynamics of ongoing arbitrage and financial innovations in the economy. Similarly, Blundell- Wignall and Atkinson (2010) criticize the Basel III Accord in terms of addressing the fundamental problems. The authors put off- balance sheet entities as an example. They argue that off- balance exposure is downsized to only a leverage ratio, so that, the leverage ratio will be the single important reform rather than a complex scheme.

Securitization and Off- Balance Sheet Entities

The Reform Act of 1986 (TRA) made high cost mortgage debt cheaper than consumer debt by prohibiting interest deduction for consumer credits. Under law and declining interest rates, many people refinanced their consumer loans by mortgage loans. By the time being, it was a wise strategy to reduce costs and even to get extra cash by refinancing (cash-out refinancing). Nevertheless, this transaction increased the amount of mortgage loans, even among less-income homeowners, without thinking how to pay the loans back when interest rates go up again or remain the same (Chomsisengphet and Pennington- Cross, 2006), (Baily and Elliot, 2009), (Hernandez, 2009).

Banks did not take on the risk of mortgages, but dispersed it by issuing and selling MBSs (Mortgage backed securities). Banks charged a fee for securitization and translated long-term interest income to an immediate future income as fees by means of this method. Fee incomes were exempt from capital adequacy requirements. As mortgage sector expands, securitization increased to amount that could be internationally traded, and banks securitized low- rated or even unrated mortgage contracts, using tax heavens. These off- balance sheet entities provided a very high leverage to the financial sector, but it was impossible to calculate the leverage, because the securities were not recorded in balance sheets (Dam, 2009). Non- bank financial institutions (shadow banks) posed risk of systemic crisis more than banks because they were moderately regulated and lightly supervised (Akay and Winters, 2009). Moreover most of the securitization was transacted among GSEs and non- bank financial institutions.

Over time, financing of mortgage backed securities became more complex. Collateralized debt obligations (CDOs), structured investment vehicles (SIVs), credit default swaps (CDSs) and other new derivatives were created as new financial instruments; They were used not only as assets but also as means of dispersing risk of mortgages. Many unrated MBSs found place among the assets of financial corporations. They were written under sub- prime mortgages, which were to lose value when mortgage loans are not paid back by homeowners. But the new securities helped increase leverage more, so profits rose without enough assets (Baily and Elliot, 2009),(Brunnermeier, 2009).

Use of Tax Heavens

As numbers of mortgage contracts increased, the ratio of subprime mortgage contracts reached to a higher extent. Companies opened up shell companies in tax heavens in order to transfer mortgage securities out of the US. Rated and unrated securities were transferred to the balance sheets of shell companies. These companies wrote new securities based on the existing ones. The newly created securities were named as SPVs (special purpose vehicles). Independent of the rating of the underlying securities, all SPVs were rated evenly high because they were created by highly rated companies and it was difficult to rate all newly created assets. After the rating process is completed, SPVs were taken to the balance sheets of US companies. Because they were not created in the US, the SEC could not control the ratings of these assets. These securities lost value under the case of mortgage loan defaults.

Legally, tax heavens cannot be blamed of a reason for crisis; however, their effect on 2008 crisis is not deniable. The scenario is to blame the rating companies more than tax heavens; however debates on regulation of tax heavens still continue (The Tax Justice Network (TJN), 2009).

Rating Agencies

Reliability of rating agencies has been on debate for years. Nevertheless, loans are mostly allocated based on ratings of international agencies. Not only private firms but also public entities and sovereign countries are rated. Charges of interest may conflict and their reliabilities are suspected during the last crisis more than ever (Europe, 2010). Credit insurance and derivatives beset the rating rules. Credit agencies provided higher ratings for insured securities since they used quantitative methods to assess risk, but securities were recorded mostly out of balance sheets (Baily and Elliot, 2009), (Dam, 2009).

Role of Central Banks

Just after 2001, the FED helped provide excess liquidity in the market. It was a part of stimulation policy. This policy continued in the coming years. The FED increased liquidity more, by lowering interest rates even further. When credit spreads widened in 2007 and 2008, it was claimed to be a liquidity crisis (Eisenbeis, 2009), (Eisenbeis, 2010). Cohen- Cole (2009) argues that the FED transferred risk from institutions to taxpayers by reducing interest rates before the crisis. However, it was a crisis of market uncertainty and insolvency of major participants.

Another issue about central banks is their role: Should they provide deposit insurance or is their major role “lender of last resort” (Cecchetti, 2008). Authorities claim they should do both. But if a crisis emerges, lender of last resort facility gains more importance: Central banks should increase liquidity as soon as possible after a shock. For Example, the FED may have had to do it before Lehman’s bankruptcy.

The final issue about central banks is whether they should be financial supervisors or supervision and central banks’ roles should be separated (Cecchetti, 2007b), (Goodhart, 2002). This argument is elaborated in chapter four.

Problems in Risk Management

The third main reason of the financial crisis of 2007- 2010 is the problems in risk management. The deficiencies of risk management could be summarized as moral hazard problems and the problems in risk management methods.

Moral Hazard and Adverse Selection Problems

Government intervention in the housing market resulted with adverse selection. People got mortgage loans without income proofs and collaterals. Lack of

transparency, information asymmetries, and conflict of interests for both homeowners and financial companies in mortgage sector caused moral hazard problems. Mishkin (1995) showed the negative relationship between neutral lending and moral hazard and adverse selection. The less neutral the lending process is, the more adverse selection and moral hazard problems arise.

The mortgage market depended upon a steady flow of mortgages that could be originated and securitized. There were three risks: The cost of borrowing can go up, access to borrowing can dry up, and the assets bought with borrowed money can fall in value (Dam, 2009). All these risks realized in 2008. Beenstock (2010) states that the world will continue suffering from periodic financial instability until it is understood that the roots of the financial crisis lie in information theory.

Additionally GSEs grew with leverage under lack of corporate governance, exemplifying other financial institutions, which compete with the GSEs by adopting securitization. The said financial institutions could not be regulated and supervised well. Fierce competition rushed up this process and it ended up with bankruptcies and government bail- outs.

Risk Management Methods

Surveillance techniques are segmented as on- site examinations and off- site methods. Risk management departments mostly engage in off- site methods. Off- site surveillance can be done by monitoring screens or by econometric models. Many companies adopted quantitative risk management techniques and internal governance programs. Nevertheless, the sore point was out of the books. The techniques failed to survive the banks (Eisenbeis, 2009). As “lacks in supervision and regulation” section

indicates, the quality of the loans and assets was of question; not the quantity. Thus, the problem was not measurable, rather it was examinable.

Additionally, banks did not apply stress tests. Basel Committee recommends banks to apply them. Stress test application is quite difficult due to uncertainties; however, it is a good means of risk management and governance. The importance of stress tests revealed after the crisis. Stress testing is a technique to assess the vulnerability of the financial system: It imposes coherent structure to discuss risks and add rigor systemic analysis (Kawai and Pomerleano, 2009). If a bank passes a stress test, it is interpreted as an evidence of bank's sufficient capital to cope with worsened economic conditions. Just after the bankruptcy of Lehman Brothers, President Obama gave order to apply the tests on the 19 firms, which were already taken into Troubled Asset Relief Program (TARP) (Andrews and Dash, 2009). 10 of those banks failed in the tests and received more bail- outs.

The TARP was signed in October 2008, just after the bankruptcy of Lehman Brothers. It is a means of government to cope with the financial crisis. In order to prevent the largest financial sector companies and companies from other sectors that are leveraged and credited, the US government purchased troubled assets and shares or insured assets worth to \$ 700 billion (Eisenbeis, 2009).

As the second greatest region which was affected by the crisis, the EU has been conducting stress tests to major banks since the crisis spread to the EU even though there was no default (Blundell- Wignall and Atkinson, 2010). The details about stress tests can be obtained from The European Banking Authority (EBA) publication about stress tests in Europe in 2011. However it would not be appropriate to compare the results with the US case. Some countries in the EU have been

experiencing a debt crisis that started after the financial crisis. The pressure on European financial sector is heavier than the US. Moreover, it is not possible to talk about the coordination of banking systems in Europe. The unity in monetary policy and the separation in fiscal policy preclude coordination. All these reasons make the European banking system less predictable.

On the other hand, many experts from the sector argue that tests cannot measure changing conditions well; some argue that the worsened conditions that apply to banks during tests are not really worse than the current ones. Conditions of banks and the results obtained from tests cast shadow on the reliability of stress testing.

International Problems

It is well known that problems of financial corporations are contagious. Globalization increased trade of goods and services. Financial transactions are the major services item along with tourism in trade balances. Globalization accelerated the contagion effect. Securitization and global trade of securities, leverage, contagion of assets, institutions and countries and counterparty risk constitute international causes of the crisis.

An example to internationalization comes from a research: Taylor (2009) examined European interest rates for 2001- 2006 period found that the EU rates were of the same feature as the US rates. It is not obvious which country affect the other, but there is certainly an interaction, not only between the US and the EU, but also among almost all countries around the world.

Globalization and Securitization

The improvement in information technologies, especially in the internet, created a global network of information, which can be defined as globalization. Globalization has integrated regional economies, societies through communication, transportation and trade. In other words it provided connectedness across financial institutions around the globe. The connectedness increased steadily between 2000- 2008 period and it started reducing after June 2008 (Blanchard, 2009). However globalization would never stop connectedness among countries.

The opportunities of globalization can also be interpreted as threads. The cross- cultural exchange increased awareness in democracy, knowledge and education and economic opportunities; nevertheless it might cause homogenization of sources around the world. Similarly, expanded trade opened new markets for international production, trade and investments; new boundaries of international economy is so huge that the fierceness of competition cuts down the profits and force to create new securities for higher leverage. Securitization should be well monitored in order not to create balloons in certain sectors. The upcoming policies should be adjusted taking account this fact.

Leverage

As stated earlier, the drop and permanent looseness of interest rates and intensified international competition dropped the profitability of financial corporations.

Corporations had to increase their leverage in order to catch up the old profits. SIVs, CDOs, CDSs and all other derivatives increased the leverage, not only locally but also globally due to international asset trade. The implications of high leverage are

obvious. The higher the leverage, the higher the profits you make and the more probable you go insolvent when assets lose value (Blanchard, 2009).

Contagion across assets, institutions, and countries

The crisis spread the world gradually throughout more than a year. It started with subprime mortgages in early 2007 in the USA due to inflated house prices and unregulated hedge fund market. With the help of information technologies, it extended to financial institutions and money markets in 2007 summer.

The developed countries, whose market structures and legislation were not much different from those of the US, were affected badly from the crisis. The crisis hit especially the UK and the European countries. The tools of contagion were widely- used and unsupervised derivatives and the credit crunch. The credit crunch would unexceptionally affect the whole world; nonetheless it hit badly the countries, the developed ones, with high amount of CDOs in their banking assets.

It spread to emerging market economies by 2008 fall (Blanchard, 2009).

“Once bitten, twice shy”, the emerging markets, had already regulated and had been supervising their financial systems much better than developed countries. Balance sheets of banks in emerging countries were not subject to toxic assets such as credit default swaps and collateralized debt obligations; derivatives were also utilized less. The only problem these countries experienced is that they were caught by international credit crunch and their production and international trade declined dramatically (Boorman 2009).

Increase in counterparty risk

Counterparty risk is the perceived probability that a bank which borrowed from another bank may not be able to repay. This large risk caused a decrease in loans

among banks. Banks prefer keeping excess money on hand since September 2008 rather than borrowing; that reduces connectedness (Blanchard, 2009).

The Crisis

As a consequence of low interest rates in mortgage loans, home prices jumped up. High home prices constituted great collateral for loans. Actually creditors could not ask for any other collateral by law. As far as rates were going low and home prices are increasing, the system was floating quite successfully. Cash- out refinancing would bring in for home owners and increased sales and profit would bring in for issuers (Chomsisengphet and Pennington- Cross, 2006). After 2005, the high leverage stimulated short term borrowing which increased interest rates. That had two effects: Home prices fell down and home owners had difficulties to pay loans back. Home sales started reducing after a peak in 2005. Complex financial institutions encountered liquidity problems due to high leverage. Since MBSs did not have enough collateral, financial companies that had MBSs assets reckoned great losses (Eisenbeis, 2010). Bernanke (2008) argues that the FED warned about the systemic risk that GSEs pose; however the government did not take corrective actions.

During the crisis, the FED introduced new facilities to increase the liquidity and the government presented a bail-out package for banks and other sectors that are already in bankruptcy in order to avert the crisis (Archarya, Philippon, Richardson and Roubini, 2009). Troubled Asset Relief Program (TARP) was signed into law on October 3, 2008. It amounted \$700 billion (Harvey, 2008).

After the establishment of the TARP, the FED turned its attention to real economy and the housing market. The FED bought MBSs from GSEs to reduce their

losses (Eisenbeis, 2010). The activity of FED is called quantitative easing. Central banks buy government bonds back or other financial assets in order to increase money supply and the reserves. It is a kind of open market purchase. The purpose of quantitative easing is to keep the money in circulation without using monetary tools. Japan is the first country to use this policy. It has been using this policy since 2001: It has bought back ¥ 30 trillion- value- bonds between 2001 and 2005, and an additional \$ 60 billion in late 2010. Starting from second half of 2008, the Bank of England bought bonds from the market worth to approximately £540 billion. The ECB bought € 60 million- value- bonds. Quantitative easing activities in the US can be divided into two parts as QE1 and QE2. QE1 consists of 4 buybacks: \$ 600 billion in the second half of 2008; \$ 1, 75 trillion in March 2009; \$ 1, 7 trillion in June 2010 and \$ 30 billion in August 2010. QE2 has only one buyback until now: \$ 600 billion in the second quarter of 2011.

Remedy Recommendations

The 2007- 2010 crisis shows that there is a mismatch of macro policies within and among countries. Researchers are arguing a number of policy recommendations, some of which contradict. Assenmacher- Wesche and Gerlach (2007) claim that monetary policy should not be used to target asset prices in order to stabilize the market against possible output losses. It is difficult to prescribe macro policies; and it is impossible to recommend a unique rescue package. Each country group needs a specific recovery method.

Japan, as the leader developed country in Asia experienced the same problems and the crisis much earlier, in 1990. When comparing the recovery efforts, it is visible that the same steps are followed by today's developed world with Japan

in 1990s. They implemented monetary policy cuts and fiscal coordination with monetary policy as long as stricter regulation in financial sector. However all the reforms took more than 5 years to implement.

The USA used both fiscal and monetary policy rules loosely before the crisis. It needs more strict policies that are implemented in a harmony. The country has to follow the same stages of Japanese recovery: Fiscal and monetary coordination and more regulation. Compared to Japan, the US takes corrective actions faster than Japan. Noteworthy, Japan's banking crisis did not spread out as an infectious crisis. US does not only recovers its own economy, but also all other economies, since they are strictly connected.

The EU has emerged the monetary policy however it cannot integrate fiscal policies. There is no uniformity in EU countries; they are all in different conditions and need individual remedies. The debt crisis that hit some EU countries after the global financial crisis indicates that EU needs fiscal integration as well as the monetary one.

Countries need diverse changes but there are still common solutions. In general, increased supervision and regulation on off-balance sheet assets should be implemented, the role of rating agencies should be re-regulated and a new perspective of risk management should be enhanced. Reforms in credit rating agencies, evaluations of asset marketability, transparency in retail market for financial assets and improvements in risk management methods should be realized (Archarya, Phillippon, Richardson and Roubini, 2009), (Buiters, 2007), (Onado, 2007), (Giovanni and Spaventa, 2007). Buiters (2007) counsels avoiding complex financial assets and suggests simpler financial instruments. De la Dehesa (2007)

suggests regulation for mortgage originators and coordination among national supervisors.

Chapter 2 provides a general framework for 2007- 2010 financial crisis. The chapter classifies reasons of the crisis under four subheadings: macroeconomic factors, lacks in supervision and regulation, problems in risk management and international problems. This chapter continues with the happening of the crisis and remedy recommendations. The next chapter focuses on global banking system.

CHAPTER 3

GLOBAL BANKING SYSTEM

Countries have different attributes of financial systems: Their sophistication and fragility levels vary. As has been proven, well-functioning financial systems promote long run economic growth by allocating funds to efficient investments. This fact orients countries to improve their financial systems. When banking system breaks down or operates effectively, firms cannot obtain necessary funds for their operations and survival. If such disruptions prolong, they can cause financial crises. Number of banking crises increased after 1980s; they disrupt economic development and their resolution process is quite costly. Therefore the most important agent of financial systems is referred to be banking system. If banking fails, the whole economy drags into crises. By extension, measuring fragility or any kind of problems in banking system has crucial importance (Barth, Caprio and Levine, 2001).

A CAMELS rating is a commonly used method to measure safety and soundness of banks. This chapter focuses on surveillance methods, especially on CAMELS rating system; on financial soundness indicators and on banking systems of developed and developing countries.

Surveillance Methods

As discussed earlier, safety and soundness of banking system indicates a healthy economic existence. Safety and soundness of banking system is measured by supervision agencies of countries. These institutions are responsible for keeping the banks healthy. They use surveillance methods to measure safety and soundness. Surveillance methods are clustered under two big title blogs: on- site surveillance

and off- site surveillance. Off- site surveillance methods have sub- clusters which will be examined under this and the next chapters.

On- site and Off- Site Surveillance

Bank supervision is an oversight of individual banks to ensure that they operate prudently in compliance with laws and regulations. Bank supervisory agencies exploit this duty by using two main surveillance methods: On- site examinations and off- site surveillance.

Bank supervisors use on-site and off- site surveillance methods to assess a bank's safety and soundness. On- site surveillance is the main tool of banking supervision, meaning physical examination: Supervisors visit banks and examine all documents. On- site examination assesses conceivable banks deeply to reveal information that cannot be found in publicly available company sources. Individual risk management systems of banks allow supervisors to choose the optimum form of oversight and maximize the quality and effectiveness of the monitoring. Frequency of examinations varies among banks. Banks with known problems are monitored more often than the banks that are assumed to be sound. However, particular information collected by on- site surveillance decays fast (Wheelock and Wilson, 2005), (Czech National Bank (CNB)).

Off- site surveillance involves monitoring banks using publicly available data. Each bank is subject to regular analysis and assessment based on uniform criteria. Off- site surveillance based principally on two tools: Supervisory screens and econometric models. Both tools depend on financial ratios obtained from financial reports of banks. The difference lies in decision making techniques: One uses more subjective and the other uses more quantitative decision making techniques. The results of off- site surveillance is used to determine the need for

further monitoring, on- site examinations and remedial measures. The results are also used to draw up comprehensive analysis of the banking sector (Gilbert, Meyer and Vaughan, 1999), (CNB).

On-site surveillance helps reflect changes faster than off- site surveillance. On the other hand off- site surveillance has some marginal benefits: It enables supervisory agencies to compare institutions; supervisory agencies can reach source of problems more quickly; it could be foreseen whether an institution would shift from its current situation. The importance of off-site surveillance methods makes them inevitable for most supervisory agencies. Banking regulators use off- site monitoring systems to complement on- site examination by using examination resources more economically. They fill the gap between two on- site examinations: On- site surveillance is conducted once a year or two years. Supervisors benefit off- site surveillance methods to sustain the control of the banks during the time between two on- site examinations. When off- site monitoring indicates a trouble in a bank's health, on- site surveillance is conducted (Whalen and Thomson, 1988), (Gilbert, Meyer and Vaughan, 1999).

The FED uses two different off- site examination methods, one of which is called the CAMELS ratings and the other is System for Estimating Examination Ratings (SEER) (Gilbert, Meyer and Vaughan 1999). In this study, we use and examine CAMELS ratings method.

CAMELS Rating System

CAMELS is a rating system to evaluate a bank's overall financial, operational and managerial condition. During on- site examinations, regulators collect information about different parts of institutions. They assign ratings to institutions based on the information they collected (Cole, Cornyn, Gunther, 1995).

The CAMELS ratings draw a general framework for overall performance of banks. Each letter of CAMELS refers to a ratio to measure a specific part of bank safety and soundness. Capital adequacy, asset quality, management competence, earnings strength, liquidity and sensitivity are all components.

United States federal regulatory agencies adopted this rating system (uniform financial institutions rating system) to evaluate the financial conditions of federally insured financial companies in 1979; it has been on use since then. It is a standard method which has six components. The last component, S was inserted the system in 1997. Supervisors examine latest financial tables of banks each quarter and assign individual and overall grades for each component of CAMELS out of 5 (Gilbert, Meyer and Vaughan, 1999), (Gilbert, Meyer and Vaughan 2000), (Trautmann, 2005), (Cole et l, 1995b).

Capital adequacy of individual banks is stood by “C”. Financial institutions are expected to have enough capital to maintain their transactions and protect themselves against business risks. Institutions might have different rates of capital because they might have different levels of inherent risks. Whatever the minimum ratio the regulatory agency assumes, a financial institution should measure its required minimum level and keep its capital ratio above this level. The inherent risk could be based upon financial condition, capability of management, reserves, emerging problems, loans, leases, deposits, balance sheet composition, off- balance sheet activities, earnings, dividends, investments, growth rate and access to capital and other balance sheet items.

Asset quality of banks is represented by “A”. Asset quality measures credit risk associated with the loan and investment portfolios, tangible assets and off-

balance sheet transactions. Management's ability of measurement and control of credit risk is also associated with asset quality. Operating, market, reputation, strategic or compliance risks should also be considered under this component. Underwriting activities, credit administration practices, nonperforming assets on- and off- balance sheet transactions, derivatives, letters of credit, loan and investment portfolios and policies, asset concentration, administration, internal control and management information systems, volume and nature of credits are the most important determinants of asset quality component.

Management competence of banks is displayed by "M". This rating reflects capability of management to identify measure, monitor and control the risks of the institution's activities, to ensure the activities to be safe, sound and efficient in compliance with laws and regulations. This rating is the most contentious item to measure because of the vagueness of capability of management. Management capability could be related to all activities of an institution: All risks, sound management practices, personnel, policies, processes, controls, information systems and reputation.

Earning strength of banks is represented by "E". Earnings strength reflects the quantity, quality, sustainability and trend of earnings. Current earnings, retained earnings, quality and source of earnings, expenses, budgets, forecasting and management information systems, allowances for losses, interest, exchange and price exposures for the company are the main indicators of earnings strength.

Liquidity of individual banks is denoted as "L" and represented by current and prospective sources of liquidity versus funding needs determine liquidity level. An institution should be able to maintain sufficient level of liquidity to meet its financial obligations in a timely manner and fulfill legitimate banking needs. The

company should also have funds sufficient to respond the immediate changes to have enough liquidity level.

Last component “S” refers to sensitivity to market of individual banks. Sensitivity to market risk reflects the degree to which changes in interest rates, foreign exchange rates, commodity prices or equity prices may affect the earnings or financial position of an institution. Interest rates, foreign exchange rates, commodity prices, equity prices, management’s control exposure to market risk and foreign operations are the deterministic activities to assess market sensitivity (Commercial Bank Examination Manual, 1994).

As stated earlier, the components of CAMELS are used to assess banking soundness by assigning grades to each component; additionally overall health of the bank is also assessed by an overall grade of the banks. Ratings of each element and the overall ratings of each bank are measured on a scale of one to five. A bank with a composite rating of 1 is assumed to have the soundest conditions whereas a bank with a summary rating of 5 requires the highest level of supervisory attention. The meanings of each rating score can be found in table 1.

Table 1: CAMELS Ratings

Rating	Explanation
1	Strong performance, sound management, no cause for supervisory concern.
2	Fundamentally sound, compliance with regulations, stable, limited supervisory needs.
3	Weaknesses in one or more components, unsatisfactory practices, weak performance but limited concern for failure.
4	Serious financial and managerial deficiencies and unsound practices. Need close supervision and remedial action.
5	Extremely unsafe practices and conditions, deficiencies beyond management control. Failure is highly probable and outside financial assistance needed.

Source: Commercial Bank Examination Manual, 1997

Table 1 shows how basic the CAMELS rating, therefore CAMELS method is called to be practical. Whilst examining CAMELS, supervisors developed supervisory screens as rules of thumb. In a scheduled exam if a certain ratio is away from expected/ required value, this institution would be suspect. This rule might separate suspect institutions and sound ones easily (Gilbert, Meyer and Vaughan, 1999).

Financial Soundness Indicators (FSIs)

1997 Asian crises revealed major deficiencies in statistical data of international and domestic institutions. Policymakers and regulators lacked data to prevent crises (San Jose, Krueger and Khye, 2008). In order to close the gap between existing and collected data, ministers and central bank governors of the G7 established the Financial Stability Board (FSB) in 1999. The aim of the Board is to increase cooperation between national and international supervisors and to enhance the level of stability in international financial system. The FSB perform analyses to find vulnerabilities affecting the financial system (Zapodeanu and Cociuba, 2010). The IMF, a member of the FSB developed financial soundness indicators (FSIs) with the help of financial community in order to assess strengths and weaknesses of financial systems and to support macro prudential analysis. Prudential analysis can be roughly described as laws, regulations, officially sanctioned policies and procedures (Johnston, 1998); prudential supervision mechanisms are government controls and regulations on corporate activities such as permissible activities, corporate structure, ownership and maximum leverage ratios of individual banks (Flannery, 1998), (Financial Soundness Indicators (FSIs) 2011), (Financial Sector Assessment, A Handbook, 2005), (Financial Soundness Indicators, Compilation Guide, 2006). FSIs are used to address financial sector soundness, facilitating financial sector

surveillance, stability and transparency of international financial system and market discipline (Coordinated Compilation Exercise (CCE) for Financial Soundness Indicators (FSIs), 2011).

The Executive Board of the IMF decided to conduct a Coordinated Compilation Exercise for supervisors and statisticians. The Exercise was completed in 2004 for surveillance, cross country comparability, promoting compiling FSIs; disseminating FSI data (and metadata) compiled in CCE, increasing transparency and strengthening market discipline. This exercise entailed the CCE with 12 core FSIs along with metadata as of 2005 (CCE and FSI, 2011).

The core and encouraged FSIs aim to monitor the overall soundness of financial sector. The aim of the CCE is to develop capacity of member countries to complete FSIs for the surveillance of the financial systems; promoting cross- country comparability; coordinating with national authorities to compile FSIs; disseminating the data to increase transparency and strengthen market discipline (CCE and FSI, 2011). The core and the encouraged set can be analyzed in table 2.

The components of core set are scrutinized and notated, i.e. I1, I2...I12, since they are the mostly used elements in econometric analyses. As these elements are being used in this study, and the same notations will be used.

The IMF collects country wise banking system data from 62 participating countries, which submit the core set data. The countries are listed in table 3. The IMF aims to increase the number of participating countries and the number of countries that provide data for the encouraged set.

Table 2: Financial Soundness Indicators: The Core and Encouraged Sets

Core Set	
Deposit-takers	
<i>Capital adequacy</i>	I1. Regulatory capital to risk-weighted assets
	I2. Regulatory Tier 1 capital to risk-weighted assets
	I3. Nonperforming loans net of provisions to capital
<i>Asset quality</i>	I4. Nonperforming loans to total gross loans
	I5. Sectorial distribution of loans to total loans
<i>Earnings and profitability</i>	I6. Return on assets
	I7. Return on equity
	I8. Interest margin to gross income
	I9. Noninterest expenses to gross income
<i>Liquidity</i>	I10. Liquid assets to total assets (liquid asset ratio)
	I11. Liquid assets to short-term liabilities
<i>Sensitivity to market risk</i>	I12. Net open position in foreign exchange to capital
Encouraged Set	
Deposit-takers	Capital to assets
	Large exposures to capital
	Geographical distribution of loans to total loans
	Gross asset position in financial derivatives to capital
	Gross liability position in financial derivatives to capital
	Trading income to total income
	Personnel expenses to noninterest expenses
	Spread between reference lending and deposit rates
	Spread between highest and lowest interbank rate
	Customer deposits to total (noninterbank) loans
	Foreign-currency-denominated loans to total loans
	Foreign-currency-denominated liabilities to total liabilities
	Net open position in equities to capital
Other financial corporations	Assets to total financial system assets
	Assets to GDP
Nonfinancial corporations sector	Total debt to equity
	Return on equity
	Earnings to interest and principal expenses
	Net foreign exchange exposure to equity
	Number of applications for protection from creditors
Households	Household debt to GDP
	Household debt service and principal payments to income
Market liquidity	<u>Average bid-ask spread in the securities market1</u>
	<u>Average daily turnover ratio in the securities market1</u>
Real estate markets	Residential real estate prices
	Commercial real estate prices
	Residential real estate loans to total loans
	Commercial real estate loans to total loans

Source: Financial Soundness Indicators (FSIs) of the IMF, 2009.

Table 3: Participating Countries to Coordinated Compilation Exercise

Participating Countries				
Australia	Iceland	Spain	El Salvador	Poland
Austria	Ireland	Sweden	Ghana	Romania
Belgium	Israel	Switzerland	Hungary	Russia
Bulgaria	Italy	United Kingdom	India	Slovenia
Canada	Japan	United States	Indonesia	South Africa
Cyprus	Latvia	Armenia	Jordan	Tunisia
Czech Republic	Luxembourg	Brazil	Kazakhstan	Turkey
Denmark	Malta	Chile	Korea	Ukraine
Estonia	Netherlands	China, P.R.: Hong Kong SAR	Lebanon	Uruguay
Finland	Norway	China, P.R.: Mainland	Lithuania	Venezuela
France	Portugal	Colombia	Malaysia	
Germany	Singapore	Costa Rica	Mexico	
Greece	Slovak Republic	Croatia	Philippines	

Source: CCE and FSI, 2011.

This study clustered the countries in the table in three groups: European countries, other developed nations and developing countries. Cyprus, Armenia, Chile, Costa Rica, El Salvador, Ghana, Jordan, Lebanon, Tunisia, Ukraine, Uruguay and Venezuela were sorted out of the statistical analysis due to lack of data.

Banking Crises in Developed and Developing Countries

Both developed and developing countries have had several crises after 1980s. Causes of the crises can be analyzed as common and specific causes. Common causes are almost the same everywhere, independent of countries. Common causes are covered in this section. The next section covers the specific factors of crises for developed and developing countries. Common causes of crises can be examined under macroeconomic factors, characteristics of banks and characteristics of countries.

Macroeconomic causes constitute a big share of the crises. The main causes of many crises are capital account liberalization and financial liberalization.

Countries that could appropriately sequence financial liberalization and capital

account liberalization could avoid financial crises. Inappropriate sequencing combined with weak macroeconomic condition ended with crises (Ishii and Habermeier, 2002). Examples of the former can be indicated as developed countries and for the second as developing countries. A very important crisis of the inappropriate sequencing is the 1997 Asian Crisis.

Demirgüç- Kunt and Detragiache (1998) studied the relationship between crises and macroeconomic factors. The study can be summarized with the conclusions: Low GDP has a positive relationship with probability of crisis. Cross-border banking and entry by foreign banks (internationalization of banking industry) reduce the probability. High inflation increases the likelihood of crisis. However restrictive monetary policies used against inflation increases real interest rates. Real interest rates have positive correlation with crisis. Therefore restrictive monetary policies should be implemented under strict banking controls

The second cause of the banking crises is the characteristics of banking sector. Weak regulation and supervision lead crisis: Increased short- term funding, bad active- passive management, high indebtedness, bad corporate governance practices and open positions in foreign exchange accounts are the outcomes of weak regulation. Besides regulation, macroeconomic factors affect balance sheets of banks. Depreciation and liquidity are examples of that fact. Depreciation of currencies beset open positions in balance sheet accounts and sudden expansion of liquidity increases interest rates (Ishii and Habermeier, 2002), (Demirgüç- Kunt and Detragiache, 1998).

The third cause of banking crises is the structural characteristics of countries. Internationalization varied for each country. Foreign banks played a factor that

blocks crises; however they did not know the local customers well. Therefore they not only protect countries against crises, but also pose threats for the well-being of the market. Trade relations, regional unifications, openness, geographical conditions and other characteristics of countries played roles in happenings of crises (Demirgüç-Kunt and Detragiache, 1998).

The causes of crises are diversified, nonetheless developed and developing countries have their specific causes for banking crises, apart from common causes. Though each country has its own reasons for crises, it is useful to analyze the similarities and differences between developed and developing country groups.

Differences in CAMELS Ratings between Developed and Developing Countries

Developed Countries have less macroeconomic problems; they managed to sequence capital account liberalization and financial liberalization well. However they had problems with weak prudential framework; freedom of capital movements increased mismanagement practices: Excessive domestic lending and external borrowing posed a threat in certain countries. Bad corporate governance practices could be encountered. Collapse of asset price bubbles and breakdown of tightly managed foreign exchange rates deteriorated loan portfolios. Another issue is the lack of consolidated supervision: All subsidiaries, including bank and non-bank institutions should be supervised together (Ishii and Habermeier, 2002). The problem of the 2007-2010 crisis is the off-balance sheet accounts, mis-rated derivatives and commercial papers and affiliated mismanagement. Kawai and Pomerleano (2009) pinpoints three policy mistakes behind 2007-2010 crises: Flaws in financial regulation and supervision leap out among macroeconomic policy failures and weak global financial architecture.

On the other hand, main characteristics of developing countries are different. Banks are the major financial intermediaries and channels for capital flows in many developing countries. Allowing weak banks to expand their balance sheet whether by domestic or foreign capital leads banking crises in developing countries. Measures to reduce weakness might be capital adequacy, loan loss provisioning, credit assessment, liquidity management, pricing of risks, improvements in management practices and increasing foreign participation. On the one hand, if weaknesses are not well analyzed or banks are implicitly or explicitly guaranteed, markets grow weak discipline in banking industry; on the other hand, controls on balance sheet growth would limit liberalization, which would complicate the access to international markets and their facilities in developing markets (Johnston, 1998). Liberalization in capital flows and innovation in the finance industry weakened regulation and supervision by increasing opportunities and profit margins (Lane, 2006), (Ishii and Habermeier, 2002).

Though financial ratios of banks do and should vary, it is needed to have standards in order to provide regulation. Therefore international community accepts Basel II and Basel III Accords. The reason of many crises is inadequate capitalization of banks. Capital requirements and other ratios should be below the determined rate. Imbalances create high risks for developing countries. Caprio and Klingebiel (1996) state that few countries scored well on bank insolvency; future research should develop a political approach to solve the problem. Lack of official international reserves is another source of crisis in developing countries, such as 1997 Asian crisis (Ishii and Habermeier, 2002).

Analysis of CAMELS Components

Bearing the differences between developed and developing countries in mind, one can easily conclude that developed and developing countries have diverse graphics for CAMELS components. This section displays graphs of selected components of CAMELS on country groups and Turkey. Turkey is added as a separate line to the graphs since it is the host country of Bogazici University. It is worth to check whether the Turkish banking sector is as sound as expected.

In order to demonstrate the differences between country groups, countries were divided into three groups: The European Union countries, other developed countries and developing countries. The graphs of I1 (regulatory capital to risk weighted assets), I4 (nonperforming loans to total gross loans), I6 (return on assets), I7 (return on equity) and I10 (liquid assets to total assets) components of 2002- 2009 averages are compared in this section. Only 5 components are graphed and statistically analyzed in this study, because they summary and quantifiable bank data and successfully represent health of banks. Additionally, the data related to other components have missing values.

The data set includes Austria, Belgium, Bulgaria, Check Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the UK as the EU countries. Cyprus is eliminated due to lack of data. Other developed countries set has 8 countries, namely, Australia, Israel, Norway, Canada, Japan, United States, Switzerland and Iceland. Developing countries are Brazil, China, Colombia, Croatia, Hong Kong, India, Indonesia, Korea, Malaysia, Mexico, South Africa, Philippines, Russia, Singapore and Turkey.

Firstly, regulatory capital to risk weighted assets is analyzed and graphed. Basel Risk Committee proposed 8% risk-based capital ratio for credit risk that has been in effect since 1993 (A New Capital Adequacy Framework, 1999). The critiques revealed advantages and disadvantages of a standard ratio. An example is Altman and Sounders (2001). The authors demonstrated that risk- based weighting of capital is much more solid than external agency or internal bank ratings since they are not objective enough to evaluate banks accurately. On the other hand Blum (1999) concludes that in order to increase the capital of tomorrow, a bank should increase the risk today. Thus a predetermined ratio could increase the riskiness of banks. After 2007- 2010 crisis, the importance of capital adequacy requirements was emphasized and the view that requires a ratio gained strength.

Among the data set submitted to the IMF by countries, China's capital ratio is worth to mention. Though Hong Kong's capital ratio is on average of developing countries, Mainland China's capital ratio was unacceptably low till 2007. The ratios for 2005 and 2006 were 2, 5% and 4, 9% respectively. It increased to 8, 4% in 2007 and increased constantly to 11, 40% in 2009.

Figure 11 displays the 8- year average capital ratio of three country groups and Turkey.

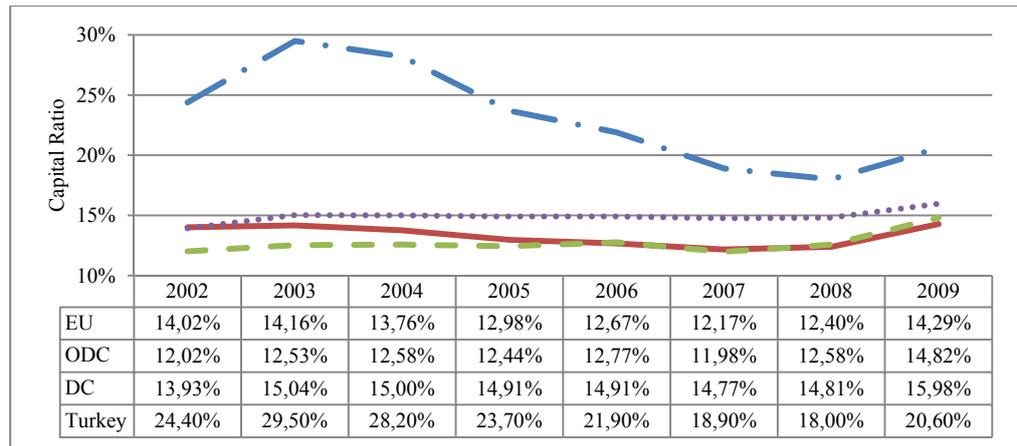


Figure 11: 8- Year- Average Capital Ratio of 3 Country Groups and Turkey (IMF)

Figure 11 demonstrates parallel shapes for three country groups. It is mentioned easily that the averages of all country groups are much higher than 8 % recommendation level of Basel Risk Committee. Moreover the differences between country group averages are not remarkably high. Other developed countries' capital adequacy was a few digits smaller than EU average until 2006, but then it forged to exceed the EU average. Starting from 2003, developing country rates have always been remarkably higher than other two groups. The most eye catching line is the average capital ratio of Turkey. The rate was much higher than other groups' ratio until 2007. The rate approximated to other countries' averages after the crisis, but they never converge. Turkey's average capital adequacy is significantly higher than others. The average of 8 years is 13, 31%, 12, 71%, 14, 92% and 23, 15 for European Union countries, other developed countries, developing countries and Turkey, respectively.

The second ratio that has been graphed is nonperforming loans to total gross loans (NPTL/TL). Nonperforming loans are the ones that banks classify as 90- days or more past due or nonaccrual. An increase in nonperforming loans reduces the capital ratio. It is also known that nonperforming loans to total loans ratio hit the

maximum in crisis. Contrary to capital adequacy ratio, there is no proposed ratio for nonperforming loans by its nature. However, the desired level is as low as possible.

The average of 8- year nonperforming loans ratio is shown in figure 12.

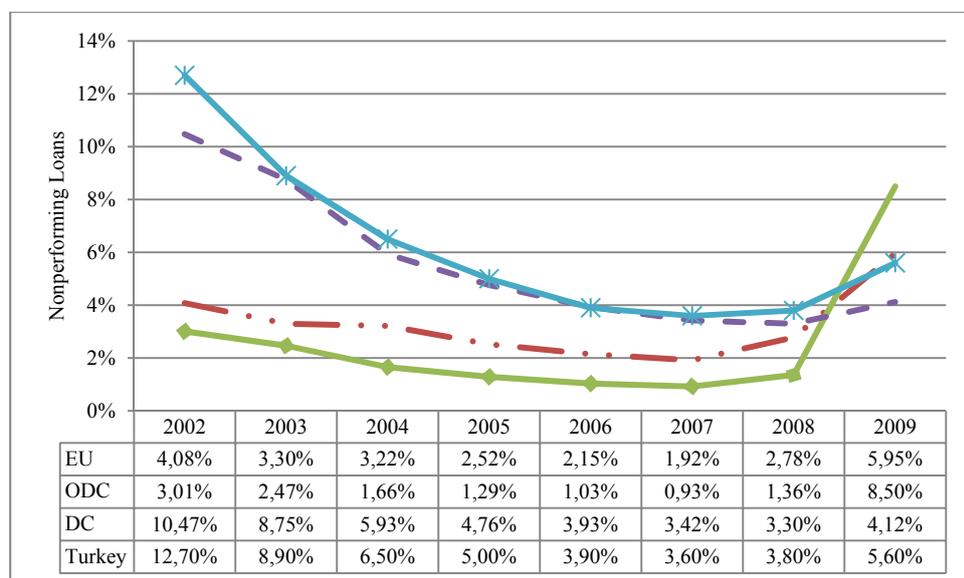


Figure 12: 8- Year- Average Capital Ratio of 3 Country Groups and Turkey (IMF)

For three country groups 2008 is a convergence year. Before 2008, developing countries have the highest nonperforming loan or bad debt ratio. EU countries followed developing countries and other developed countries had the lowest ratios. After 2008, other developed countries have the greatest ratios, the EU following it and developing countries have the least ratios. It is appropriate to say that the crisis turned the world upside down. Remarkably, Turkey's bad debt ratio has always been the highest of all. 2000- 2001 banking crisis could be blamed for the heavy burden it loaded on banking sector. But it cannot be only reason for the permanent high bad debt ratio. It is clear that a loan management problem exist in Turkey. The 8- year- averages are 3, 24%, 2, 53%, 5, 59% and 6, 25% for EU, other developed and developing countries and Turkey.

The most striking point in nonperforming loans ratio happened in Iceland during the crisis. The country's bad debt ratio was around the developed country averages in 2005 and 2006. Data are not available for 2007 and 2008. Confusingly, 2009 nonperforming loan ratio is 61, 20%. The average for all other developed countries is 9, 28%, as visible in figure 10. If Iceland was out of the group the ratio would have been 1, 85%, which is much lower than the ratios of other country groups.

The third variable graphed and analyzed is return on assets. Return on assets is the ratio of net income to total assets. The higher the return of a bank has, the higher the bank carries on its assets. Higher income is interpreted as a sign of profitability but it also signs higher risk levels. In times of crisis, returns on assets or equity might turned out to be losses.

Figure 13 visualizes the 8- year- average returns on country groups.

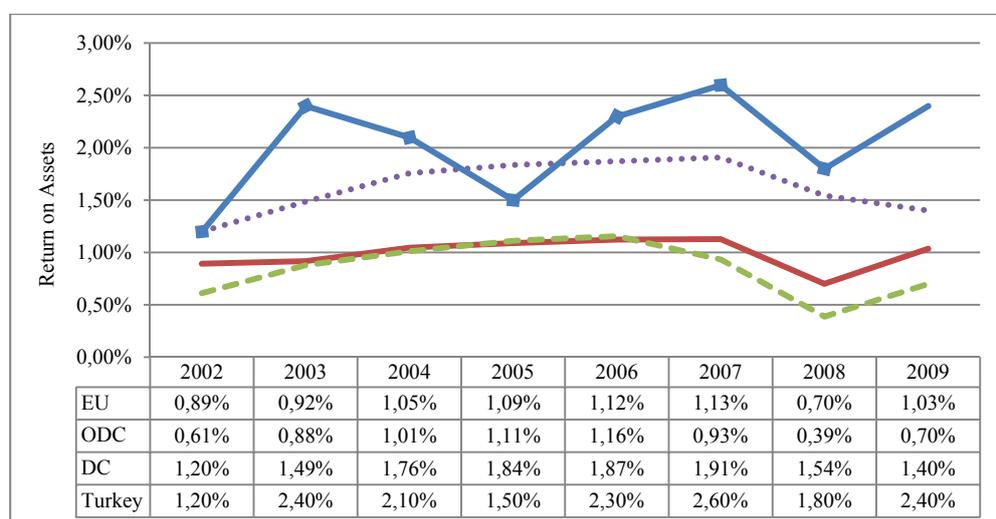


Figure 13: 8- Year- Average Return on Assets Ratio of 3 Country Groups and Turkey (IMF)

Returns on asset ratio of EU countries and developed countries are close to each other while developing nations' rates are almost doubling the returns of other countries. 2008 diminished all returns. However, the returns of EU countries and

developed countries have a tendency to increase, as developing nations returns are continuously declining. Turkey's case is out of all structures. Returns started increasing in 2002, after 2000- 2001 banking crisis wiped away sectorial returns. However there is another decline between 2003 and 2005 due to new international accounting standards and new standards on financial enterprises and insurance companies' annual consolidated balance sheets (Yetim and Gülhan, 2005). After this period is over, the returns turned out to be normal but they still remain higher than developing country rates. The average return on assets is 0, 99%, 0, 85%, 1, 63% and 2, 04% for EU, other developed countries, developing countries and Turkey.

The fourth ratio is I7, return on equity. Figure 14 represents return on equity of country groups. Expectedly, the shape of the graphs is parallel to the shapes in figure 13. The significant difference is the developing countries low returns on equity compared to higher returns on assets. The difference is in line with higher equity ratios of developing country banks. Because equity ratios are higher in developed countries, return to equity ratios are less than return to assets ratios.

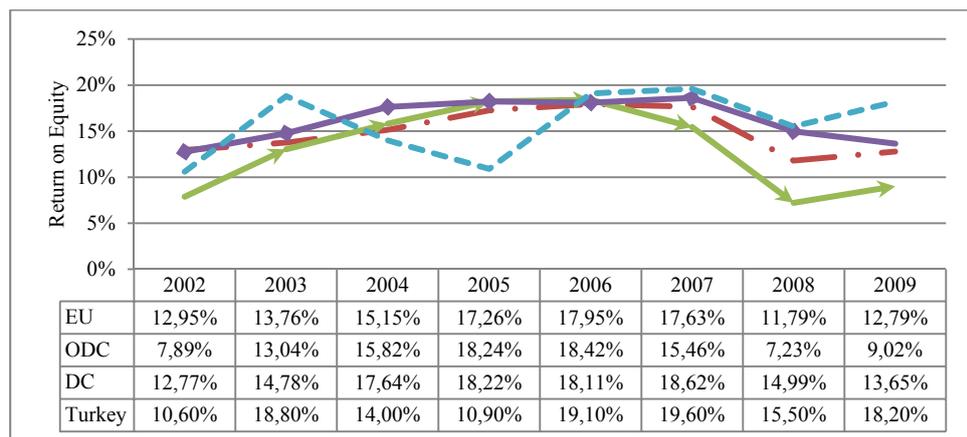


Figure 14: 8- Year- Average Return on Equity Ratio of 3 Country Groups and Turkey (IMF)

Figure 14 indicates that returns on equity are not very different for all country groups. The lines are similar to return on assets lines. As expected, ratios of other developed countries are the smallest and developing countries are the highest ones.

Turkey's case is again different from other nations: 2003- 2005 period is the duration of new regulation; the period after 2008 brings higher returns on equity even though capital ratios are still much more than averages. The 8- year- averages of return on equity are 14, 91%, 13, 14%, 16, 10%, 15, 84% for EU, other developed and developing countries and Turkey.

The last ratio analyzed in this section is liquid assets to total assets. Missing values in liquid assets time series are much, therefore the data for 2002- 2004 are not available and the data for 2005- 2009 have deficiencies. Figure 15 exhibits the rates of three country groups.

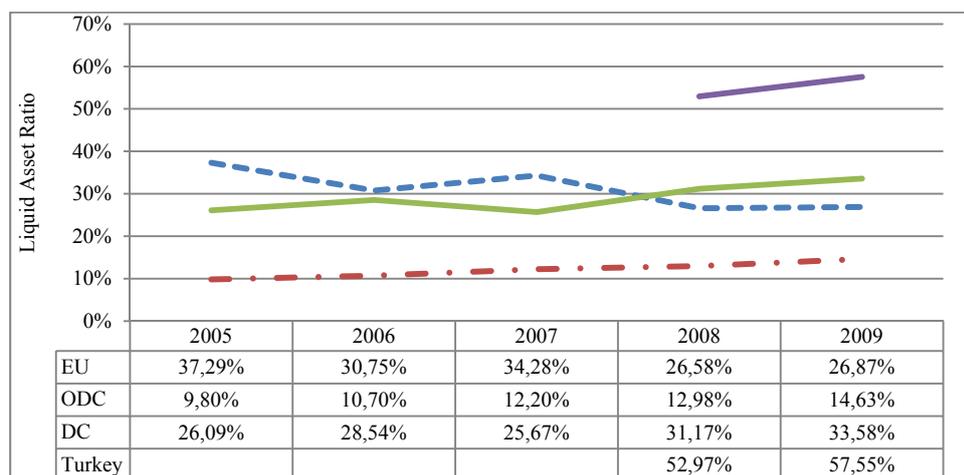


Figure 15: 5- Year- Average Liquidity Ratio of 3 Country Groups and Turkey (IMF)

As seen in figure 15, liquidity ratio of other developed countries is significantly less than other countries. Even though it has been rising continuously, it is always significantly less than other country groups. On the other hand liquidity ratios of developing countries and EU countries are more similar. They have been fluctuating before and after the crisis. Liquidity increased in developing countries, and it reduced in EU countries. Turkey's liquid assets ratio has three years of missing values between 2005 and 2007. Liquidity line is above all other countries' average lines.

The average liquidity ratios for country groups are 31, 15%, 12, 06%, 29, 01% and 55, 26% for EU, other developed countries, developing countries and Turkey.

Chapter 3 introduces surveillance methods and CAMELS rating system. It goes on with financial soundness indicators, which complete the CAMELS in an international point of view. The chapter continues with banking crises in developed and developing countries and their figures of CAMELS components. The next chapter stands for literature review on banking and CAMELSs.

CHAPTER 4

LITERATURE SURVEY ON BANKING AND CAMELS RATINGS

There have been several researches on banking, and regulation on banking. Even though the outcomes and policy recommendations are diverse, former research is a guide for the future. This chapter crosses over the literature review under XX titles: macroeconomic effects on banking crisis, role of central banks in banking supervision, surveillance methods, early warning systems and CAMELS ratings.

Macroeconomic Effects of Banking Crises

Banking is one of the most supervised industries, since bank failures affect the whole economy adversely. Gilbert and Kochin (1989) and Gilbert, Meyer and Vaughan (1999) concluded that local bank failures disrupt the flow of credit to local communities and depress local sales and sometimes local employment. Dwyer and Gilbert (1989) found out that the banking system can operate without runs even during recessions; however banks could restrict payments in severe runs. Such restrictions result with the same effects as disrupting credit to local communities It is also known that crises reduce money supply in the economy (Friedman and Schwarz, 1963), (Cecchetti, 2008). Reduced money supply has also a welfare reducing effect on the society.

Crises have a prolonging adverse effect on the real economy (Gilbert, Meyer and Vaughan, 1999). Bernanke (1983), Bernanke and James (1990), Bernanke and James (1994) find out that falling prices reduce the net value of banks and affect credit flows and thus real activity. Financial crisis of 1930-1933 reduced the efficiency of credit allocation, resulting higher costs and less availability of credit.

Those changes in the economy increased the length and depth of the Great Depression. Induced financial crises result in sticky nominal wages that affect real economy. Countries that have banking panics also suffer from much severe depressions. This conclusion infers that national or international failures result much deeper, more severe and long- term economic effects.

Berger, Kyle and Scalise (2000) investigate the supervisory toughness on bank lending behavior and its effect on macroeconomic health. Their study tested three hypotheses: The first one tests the toughness in 1989- 1992 credit crunch period. The second hypothesis tests the toughness in 1993- 1998 booming period. The last hypothesis measures the changes in supervisory toughness and the direction of bank lending behavior. CAMELS ratings and classified assets from bank examination and bank financial reports are used to conduct the tests. The authors found few data providing support for all hypotheses. Therefore CAMELS ratings and classified assets are weak to explain the substantial portion of bank behavior during 1989- 1998 period. They also found that regulatory changes may not have much effect on bank lending or portfolio risk, because CAMELS ratings do not influence lending or loan risk.

(Caprio and Klingebiel, 1996), (Gorton,1988), (Kaminsky and Reinhart,1999), (Demirgüç- Kunt and Detragiache, 1999, (Demirgüç- Kunt and Detragiach, 1998) associate banking sector shocks with cyclical output downturns, terms of trade deteriorations and decline sin asset prices such as real estate. In other words banking sectors shocks are associated with recessions. Claessens, Klingebiel and Laeven, (2004) reveals that intervening and protectionist regulations, such as substantial liquidity support, explicit government guarantees on liabilities of

financial institutions and forbearance from prudential regulations make banking crisis fiscally more costly. Higher fiscal spending does not accelerate the recovery process; but better institutions, such as less corruption, improved law and order, legal system and bureaucracy, rather do.

Caprio and Klingebiel (1996) worked on the reasons of banking crisis. The study is a very detailed source for banking crises. The authors mostly focused on macro-economic factors and analyzed each country one by one. The article includes the countries that had systemic banking crises, main characteristics of banking crises, analyses of crisis countries; terms of trade, trade concentration, and export levels in prior years; characterization and outcomes of the restructuring exercises.

Barışık and Tay (2010) studied financial crises in transition economies and emerging markets. They used logit models based on macroeconomic and financial data set. They found that real exchange rate, change in foreign exchange reserves, inflation, current deficit and direct foreign capital are leading indicators for crises in transition economies. Credit growth, real exchange rates and change in foreign exchange reserves are leading indicators of financial crises in emerging markets.

Hanc (1998) examined the 1980 and 1990 crises. He found common reasons effective for the crises: A variety of factors, including economic, financial, legislative, regulatory, supervisory and managerial factors, contributed bank failures. Another very important issue for the crises is flat rate deposit insurance: It encouraged moral hazard risk taking and thus failures. However, fraud is believed to play a major role in the crises, even more than excessive risk- taking. Another problem is the principle- agent problem, which depends on the differences between decisions of owners and managers of banks. The author suggests that banking

problems should be determined before serious deterioration starts, therefore monitoring, even sometimes burdensome, should be encouraged. Effective regulatory control of risk-taking and regulation should be deployed.

Another debate on banking is deposit insurance bolsters. Insurance gives depositors an incentive not to monitor their finance agencies (Flannery, 1982). Under absence of deposit insurance scheme, supervisors must act as agents of taxpayers to limit risk. Supervisory limits on bank risk reduce the likelihood of bank failures (White, 1991), (Gilbert, Meyer and Vaughan, 1999).

Role of Central Banks in Banking Supervision

The macro influences of banking system make it a crucial matter for the whole economy. Many countries have autonomous Banking Regulation and Supervisory Agencies (BRSA) to conduct supervision. For years, it has been a debate whether central banks or specialized separate institutions should be concerned about banking supervision. Goodhart and Schoemaker (1995) found significant statistical fewer failures in the banking systems of countries which do not separate monetary policy and banking supervision; however the difference between separated regimes and combined regimes are not remarkable. Peek, Rosengren and Tootell (1999) found that supervisory information reduces forecast errors of central banks and help shape a better monetary policy. The authors advocate that central banks should conduct the supervision on-hands. Flannery and Houston (1999) conclude that examinations provide supervisors valuable information and analysis. Optimal regulatory design depends on relative accuracy of private versus government methods for collecting information; whether supervisory exams of different institutions complement or substitute; which is more efficient. Goodhart (2002) concludes that it is matter of

choice of different situation for developed countries; whereas central banks should interfere with the supervision in developing countries. The quality supervisory staff and process, such as professional skills, independence from external pressures and funding might be performed under due diligence of central banks. Therefore, it is supposed to think that BRSAs need close relations with central banks.

Peek, Rosengren and Tootell (1998) measures if central banks have informational advantage to lead monetary policy. If central banks possess superior information than the public, they can create effective and socially beneficial countercyclical monetary policy. The authors test whether central banks can use the confidential information that bank supervisors collect for monetary policy. Since individual CAMELS ratings are confidential, authors used a percentage of data from CAMELS- 5 rated banks. The conclusion is that supervisory information should be available to monetary policymakers to shape a macroeconomic policy. Central banks need continuous access to this information. This fact is valid for both developed and developing countries. Lastly, the information is gathered well in stability periods rather than crisis periods. Using the same data as in the former article, Peek, Rosengren and Tootell (1999) found that the supervisory information does affect central bank forecasts, but rather reduces the forecast errors. Supervisory information affects monetary policy in the correct direction, because of the same reasons mentioned above. They also mention the question of which institution should conduct bank supervision: Central banks or other institutions? They imply that whatever the supervisory entity is, central banks should access that information on a timely manner. They also imply that central banks need “hands- on” supervisory experience to identify the bank health for effective monetary policy.

Surveillance Methods

There are two surveillance methods to identify the healthy and unhealthy banks or to distinguish the banks likely to fail. The first one is on- site examination: Examiners go to banks and review all aspects in terms of safety and soundness. Frequency of examinations varies among banks. Banks with known problems are monitored more often than the banks that are assumed to be sound. On- site examination depends on historical examination and accounting reports (Gilbert, Meyer and Vaughan, 1999), (Pettway and Sinkey, 1980). The advantage of on- site surveillance system is that it is a physical examination, so examiners analyze all details and ignorance is unlikely. On the other hand on –site surveillance is costly, because it requires professional knowledge and experience and it also charges travel and overnight costs. It is also burdensome because examiners intrude daily operations of banks and they could hamper them (Gilbert, Meyer and Vaughan, 1999).

The second method is off- site surveillance: It is mostly an estimation of future bank conditions by econometrical models; however supervisory screens can also be used to support econometric models. Supervisory screens are combinations of financial ratios derived from financial tables. Decision making process in supervisory screens is subjective: It depends on supervisors' experience. Econometric models are, similarly, combinations of financial ratios; however they depend on computations rather than judgments. Banks are assigned ratings according to their well- being and mostly, a critical point is determined as a limit. If banks cannot exceed the limit, they are assumed to be likely to fail. In other words, numbers and rankings are used for decision making (Gilbert, Meyer and Vaughan, 1999). An alternative off- site examination method was suggested as using stock

market data instead of ratings. These models assume that stock markets are efficient and they give signals when a trouble occurs (Whalen and Thomson, 1988).

Off- site examination is less costly than on- site examination. It provides safety between on-site surveillances. On the other hand, it does not give the best results because it is not a tailor- made study like on- site examinations (Gilbert, Meyer and Vaughan, 1999). Cole and Gunther (1995a) suggest that off- site examinations are more accurate than CAMELS ratings if on- site examinations are held less than twice a year. On- site examinations are usually held once each 12 or 24 months (Whalen and Thomson, 1988). Hirtle and Jose (1999) examined the frequency of on- site surveillance. Their findings are very similar to those of Whalen and Thomson (1988). The authors conclude that information obtained from on- site examination is costly, however unique. The quality of the information depends on the frequency of the examinations. The more frequent the examinations are, the more valid the information is. Additionally, the authors found that, banks with weaker CAMELS ratings (3, 4 or 5) respond more quickly than banks with sufficient ratings. This result is interpreted such that troubled banks should be examined more often than other banks to provide improvement. Cole and Gunther (1998) compared on- site and off- site monitoring systems by a probit model through publicly available data. The authors demonstrated that econometric models provide more accurate indication of failure compared to CAMELS. Similar to former researchers, they found that CAMELS ratings information deteriorate in the beginning of the second or third quarter after the on- site examination is completed.

Wheelock and Wilson (2005) used proportional hazards model with time- varying covariates to investigate if bank rating generated from on- site examinations contribute into bank failure financial information. They found that rating contribute

important information about hazard of failure. Moreover, they revealed that the probability of failure has non- linear effects. For example: If a bank downgrades from rating 1 to 2, the change is perceived rather small; however if it downgrades from 2 to 3, the change is interpreted as moving from satisfactory to unsatisfactory performance.

Early Warning Systems

Sinkey (1975) uses discriminant analysis, rather than a predictive one, to reveal the features of groups of bank ratios; to distinguish between problem and non- problem banks; and to find the overlaps between these groups. He found that banking measures such as asset composition, loan characteristics, capital adequacy, sources and uses of revenue, efficiency and profitability are good discriminators between problem and non- problem banks. Moreover, the author came up with the idea of early warning systems for banking crises and even suggested improving such systems using financial ratios and ranged the advantages of early warning systems.

Sinkey (1978) uses discriminant analysis to find out the effect of net capital ratio on troubled banks. He realized that banks failed had low net capital ratios; however most banks with low net capital ratios did not fail. That fact inclined him to find another factor that trigger troubles in bank activities. This study uncovered the effect of substandard loan classifications. Substandard loan classifications explained more than 80% of previous bank failures.

Whalen and Thomson (1988) define early warning systems and specify they use financial data to evaluate conditions of banks. There are two types of early warning systems. The first one is “failed bank studies”. These studies use characteristics of failed banks as a benchmark to identify troubled banks. The second

type of early warning system classifies banks into problem and non- problem categories. Such studies use publicly available data to predict a bank's condition. The authors, additionally, conducted a study about early warning models. The results demonstrate that relatively simple models, using a limited number of financial ratios can create good classification of risk classes. They additionally demonstrate that asset quality and earnings, as well as nonperforming loans appear to be good proxies for predictions.

Whalen (1991) used proportional hazard methods (PHM) as an early warning system to determine bank failures. The author used a collection of failed banks as a sample in his study. He utilized financial ratios, local and state level economic conditions as variables. He found out that PHM is an effective early warning tool with small type I and type II errors. The author suggests using CAMELS analysis with PHM method to obtain better results.

Simons and Cross (1991) investigated the effectiveness of market discipline as it is exercised by bank stockholders. They assessed market indicators as an early warning tool for banking crises. They used CAMELS ratings as supervision tools as stock prices as market indicators. The study shows that shareholders' returns do not anticipate bank downgrades. Similarly, lending problems do not attract attention before downgrades. Moreover, bank managers cannot anticipate the downgrades before the examinations took place.

Flannery (1998) looked for answers to questions about market reactions against prudential banking regulations. The first question is if market valuations of banking firms accurate. The second question is if investors are slower than governmental supervision in bank condition or risk exposure. The last question is if

the market valuation of banking firms irrationally contagious. Evidence shows that bank share prices behave similarly equity prices of nonbank firms: Valuations of banking firms are accurate; investors are rational and not different from other investors; and market valuation of banking firms are not contiguous.

Krainer and Lopez (2004) developed a forecasting model of ratings that combine supervisory information and securities markets data. They found that debt market variables respond for troubled banks better; equity market variables respond for banks in good condition. In addition, the authors found that supervisory information and market information are different in point of accuracy. They suggest that supervisors should pay attention to off- site monitoring systems.

Özkan- Günay and Özkan (2007) used ANN inductive algorithm to explain previous bank failures in Turkish banking sector. The purpose of the paper is to explore new predictive techniques for early warning systems in order to prevent crises. The method demonstrated to detect potential bank failures and therefore could be used along with other alternatives e. g., CAMELS and other financial or econometric models.

Davis and Karim (2008) compared early warning systems of banking crises. They assess multivariate logit model and signal extraction model. They suggest that logit is a better predictor of bank failures. However the best means of crisis prediction depends on the objectives of decision makers. Each model has different sensitivity to prediction of bank failures and false alarms.

CAMELS Ratings

Cargill (1989) investigated the relationship between CD (certificate of deposit) rates and CAMELS scores of banks. The author used CD rates as a measure of risk and CAMELS ratings as a result of an on-site examination. Evidence suggests that CAMELS ratings are primary proxies for available market information about the quality of a bank; moreover the ratings are correlated with interest rates and credit risks of banks. The outcome implies that interest rates and credit risks can also be used to measure quality of banks.

Swindle (1995) used capital adequacy component of the CAMELS rating system to assure that banks increase their capital when their capital rates are inadequate. Inadequate capital is represented by a downgrade of or remaining in a CAMELS rating of 3, 4 or 5. The outcome is affirmative: Inadequately capitalized banks increase their capital as a response to low grades. State- chartered banks response especially better than private banks. This outcome indicates a regulatory discipline.

Persons (1999) attempts to distinguish failed banks of Thailand by univariate Wilcoxon rank- sum tests and multivariate logistic regression models between 1993 and 1996. The author used CAMELS components as variables. The conclusion is that the data in auditors' report cannot distinguish failing banks from surviving ones. Failing banks have relatively lower profitability, lower foreign borrowing possibly due to poorer credit ratings, lower management quality and smaller size. The author also mentions that univariate wilcoxon rank- sum tests tandem with multivariate logistic regression high predictive ability and low expected costs of misclassification.

Hermosillo (1999) analyzed contribution of microeconomic and macroeconomic factors on banking failures in five regions, US Southwest, US Northeast, California, Mexico and Colombia. The author utilized life cycle method with CAMELS, market risk, credit risk, liquidity risk, moral hazard, regional and macroeconomic proxies and banking sector variables. The study finds out that capital adequacy asset quality (nonperforming loan ratio) are leading indicators of bank failures. Other components of CAMELS give significantly poorer results.

Wheelock and Wilson (2000) sought to identify the characteristics that make US banks more likely to be failed or to be acquired. They used competing risks hazard models with time- varying covariates. They used CAMELS components and other factors such as size, age and location for their analysis. They conclude that the lower the ratings of banks, the more likely they are acquired.

Gasbarro, Sadgune and Zumwalt (2002) used unique Bank Indonesia CAMELS data set, which is not publicly available, to measure the changing relationships between financial characteristics of Indonesian banks and CAMELS ratings during 1993-1997 period. The authors like Peek, Rosengren and Tootell (1998) found that the importance of CAMELS components change between stability periods and crisis periods. During stable periods, four of the five components provide insights to financial soundness, only liquidity component did not indicate significance in 5 % level. In crisis periods only one component, earning, indicated significance. Therefore, the authors conclude different CAMELS factors gain importance in different economic environments.

Berger and Davies (1998a) divided the information from bank examinations into 3 groups. The first is auditing information, which is gathered from verifying the

honesty and accuracy of the banks' books. The second is regulatory discipline, which is about the treatment of the bank by regulators. The third is the private information which is related to the condition of a bank. The authors compared cumulative abnormal market returns, in which CAMELS ratings remained unchanged, upgraded or downgraded. They found that banks with unsatisfactory ratings (3, 4 or 5) have higher information effects for all information types than prior examination results. This result shows that market conditions are better reflectors for unsatisfactorily rated banks. Evidence also suggests that downgraded banks reveal unfavorable information about themselves. Both market returns and CAMELS ratings indicate the same effect under this situation.

Berger, Davies and Flannery (1998b) compare the timeliness and accuracy of government supervisors with market data. Authors use CAMELS ratings as supervision outcomes. They also use Moody's ratings for BHC's (bank holding companies) senior subordinated debentures, the BHC's abnormal stock returns, and the changes in the proportions of equity owned by institutional investors and insiders. These data are used to measure changes in the assessment of BHC condition by rating agencies, shareholders, institutional owners and bank insiders. They found that supervisory assessment is more accurate for future forecasts of changes in performance than bond rating agencies and equity market indicator, especially just after the examinations. Additionally supervision and bond rating agencies both have some information *ex ante* that is useful to one another. Differently, supervisory assessments and equity market indicators are interrelated. Probably, this is the reason that authors compare cumulative abnormal returns to CAMELS ratings in other studies.

Bongini, Laeven and Majnoni (2002) measured bank fragility in East Asian countries during 1996-1998. Three sets of indicators, namely accounting information, stock market prices and credit ratings, were used from publicly available data. They used CAMELS analysis as a statistical tool. Accounting information or credit ratings did not reflect financial situation very well. However, stock market information responded changing financial conditions faster than other factors. Additionally, they found that if information processing is expensive, as in developing countries, authorities should use multiple indicators rather than relying only one.

Rahman, Tan, Hew and Tan (2004) used CAMELS method to find the financial distress indicators in Indonesia, South Korea and Thailand banks. The authors used logistic regression analysis in their study. They found that capital adequacy, loan management and operating efficiency are three common performance dimensions found to be able to identify problems in the three countries.

Crystal, Dages and Goldberg (2001) sought whether foreign bank ownership contributes bank soundness in Latin America. They used bank specific data, CAMELS ratings, and possible implications of foreign ownership on CAMELSs. The conclusion is that the smaller the country, the greater the soundness enhanced by foreign ownership. Thus, as the country gets bigger, the soundness effect of foreign ownership reduces. Another outcome is that, independent of the size of the country; foreign banks have greater loan growth, and greater loss absorption capacity. Therefore foreign banks are said to be an indicator of soundness in developing countries.

Cole and Gunther (1995a) compare CAMELS ratings in predicting failure with an off- site monitoring system based on publicly available data. Findings suggest that off- site monitoring system provides more accurate indication on survivability of the banks unless banks are subject to an examination at latest in two quarters. More than two quarters of time makes CAMELS ratings much less accurate than off- site monitoring systems. The reason for the success of off- site monitoring systems depends on the timeliness and the data they are based on. The authors suggest using off- site monitoring systems more often, as a conclusion.

Ohsinsky and Olin (2005) examined troubled banks which have 4 and 5 CAMELS ratings to predict future bank states. Troubled banks are measured whether they will continue with the same grade, upgrade or downgrade. Authors used univariate trend analysis to distinguish banks' future states. Their model forecasts the failing banks with the highest probability of failure. The model helps for two purposes: The first, it helps banking authorities for long- term strategic planning and deposit insurance planning, and second it helps bank regulatory agencies to decide on a policy of bail- outs or leaving the bank on its own to recover.

Nurazi and Evans (2005) use CAMELS ratings to predict bank failures in Indonesia. The authors used multivariate logistic regression and multiple discriminant analysis. They conclude that multivariate logistic regression in tandem with multiple discriminant analysis is a good early warning system. The authors concluded that all CAMELS components and bank size are statistically significant predictors of bank failures.

Poghosyan and Čihák (2009) analyzed the causes of distress in European banks in 1996- 2007 period and estimated an EU- wide early warning system for

bank distress. The authors reveal that establishing the plausible thresholds for weak banks is possible. The thresholds can be settled into CAMELS covariates, especially in capitalization, asset quality and profitability. A set of criteria could be developed to create an early warning system. Out of CAMELS scope, depository discipline is revealed to be a very important signaling effect for distress. Similarly, stock prices are also found to be good signals. In addition, more concentrated banking markets are found to be likely to have distress.

Curry, O'Keefe, Coburn and Montgomery (1999) analyze the effects of bank regulatory intervention for the troubled banks between 1978 and 1998. Troubled banks are distinguished by a downgrade to C4 and C5 or the issuance of a formal enforcement action. The study results that enforcement actions perform better on the areas where bank management can control; and less on the areas where bank management has less control. The control areas are loan- loss provisioning, net loan charge- offs and dividend allocations. Non- control areas are external capital injections and some degree asset growth.

Pasiouras, Gaganis and Zopounidis (2006) investigated the impact of bank regulations, supervision, market structure and bank characteristics on individual bank ratings by using country level and bank level data from 71 countries and 857 banks. The authors found out that less cost efficient banks with higher than average level of provisions to income and lower liquidity cause lower ratings. Higher equity to assets, as well as banks in developed countries results in higher ratings. Many rules, policies and activities such as entry requirements, capital requirements, disclosure requirements, foreign banks entry, auditing requirements, fraction of entries denied, restriction on bank activities, economic freedom, explicit deposit insurance scheme,

deposit insurer power, official disciplinary power, liquidity and diversification guidelines have significant impact on individual ratings.

Jordan, Peek and Rosengren (1999) investigated the impact of supervisory information on troubled US banks to discover the effects of disclosure policy on crises. They found out that improved disclosure on troubled banks provided conditions for market discipline. In contrast to what previously believed, transparency does not cause destabilization. Disclosure, even, helps evaluate peer banks of troubled ones in the same geographical region. They, especially, suggest that troubled banks' ratings and action plans should be publicized to increase the transparency and avert problems derived from troubled banks.

There are some drawbacks of CAMELS ratings as well as their benefits. The first one is that all outcome and examination material used for CAMELS rating is highly confidential. The data are assumed to be private information circumstantial of their effect on market (Hirtle and Lopez, 1999). It is proven that the data reveal supervisory (private) information to the market, and may affect the stock returns (Berger and Davies, 1994). Therefore, only supervisors and bank executives can reach the data. That puts researcher in difficult situations to find basic data for their research.

Hirtle and Jose (1999) emphasize the trade- off between timeliness of on-site surveillance and costs. This is the second drawback of CAMELS system. The longer the time after a bank's examination passes, the higher the likelihood that conditions in the bank changes. This concern is solved by more frequent examination. Cole and Gunther (1995) revealed that CAMELS analyses are better than off- site surveillance systems only if on- site examinations are conducted at least every six months. If the

frequency of on- site examinations exert six months, than econometric models are more useful because of their timeliness and the data they are based on. On- site examinations are usually conducted once every 12 or 18 months. Only doubtful banks are controlled every six months. Krainer and Lopez (2004) found that market variables respond better for healthy banks than supervisory information. Therefore they suggest using off- site surveillance methods as well as on- site methods.

Another very challenging issue is the trade- off between safety and soundness indicators and efficiency in finance industry. Developing countries try to increase efficiency levels up to a maximum. Fierce competition has a tendency to reduce regulations and soundness. Developing countries have to balance the two pans of the scale (Caprio and Klingebiel, 1996). The global financial markets had to pass over the safety rules in order to compete with their rivals before the 2007 crisis.

This chapter views outcomes of former research and ideas of several researchers on banking, regulation, early warning systems and specifically on CAMELS ratings. Though other early warning and rating systems exist, CAMELS method is very useful and it is referred by major regulatory authorities in the world. Thus, we set our analysis on CAMELS rating systems to compare the banking sector soundness of country groups in the next chapter.

CHAPTER 5

SOUNDNESS OF NATIONAL BANKING SYSTEMS: AN EMPIRICAL APPROACH

This chapter explains the research methodology and the data used to analyze the relationship between CAMELS ratings and soundness of national banking systems during 2007- 2010 crisis. Binomial logit regression model is employed to assess safety and soundness of banking systems empirically between 2005 and 2009. The first part of the chapter explains binomial logit model, the second part introduces methodology and explains the data while the third part focuses on discussion of empirical findings.

Binomial Logit Model

Binomial logit regression model is used to define a relationship between a dependent variable and independent variables. The dependent variable should be discrete. In other words, the model is appropriate to use when the response takes one of only two possible values representing success or failure (Rodriguez, 2007). The general form of the binomial logit model is:

$$\text{Prob } [y_i = j] = \frac{\exp(\beta_j' x_i)}{\sum_j \exp(\beta_j' x_i)}, \quad j=0, 1 \quad (1)$$

where x_i represents covariates and β represent regression coefficients.

This is a stochastic structure: 2 possible outcomes can occur. In order to identify the parameters of the models, the normalization is imposed

$$B_0 = 0 \quad (2)$$

Chamberlain (1980) proposes the logit model for panel data as

$$\text{Prob } [y_i = j] = \frac{\exp(d_i)}{[1 + \exp(d_i)]} \quad (3)$$

where $d_i = \alpha_i + \beta' x_i$

The binomial logit regression model with fixed effects is utilized to test the relationships between variables. Dependent variable values are defined as success and failure or 1s and 0s. 0s denote success, which represents an increase in the GDP growth and 1s denote failure, which represent a decline in the GDP growth.

Methodology and Data

In this study, binomial logit model is utilized to examine overall financial safety and soundness of the national banking systems in 49 countries. We accept GDP growth as a proxy for safety and soundness of national banking systems. Lack of safety and soundness causes banking crises: In the long run GDP growth depends banking soundness. The increase in GDP growth is defined as success (0) and the decrease in GDP growth is defined as failure (1). The potential research model is defined as following (Tam and Kiang, 1992):

$$Y = \frac{1}{1 + e^{-y}} \quad y = C_0 + \sum C_i X_i \quad (4)$$

CAMELS approach is utilized to examine the safety and soundness of banking systems at country level during 2005- 2009 period. In the review of existing literature, the basic relationship between CAMELS and bank safety and soundness is based on the studies of Nurazi and Evans (2005), Bongini, Laeven and Majnoni (2002), DeYoung, Flannery, Lang and Sorescu (2001) and Persons (1999). However,

approach in this study differs than the studies in the literature. A macro approach is applied to analyze safety and soundness of national banking systems. In this study five variables belonging to four CAMELS components are selected to represent each component. Based on the model in study of Nurazi and Evans (2005), the following model is adjusted in terms of capital adequacy (C), asset quality (A), earnings strength (E) and liquidity (L):

$$Y = f(C, A, E, L) \quad (5)$$

The core set of IMF Financial Soundness Indicators has 12 variables collected under six CAMELS rating components. IMF defines CAMELS components as: regulatory capital to risk weighted assets (I1-CA) for C, nonperforming loans to total loans (I4-NPTL) for A, bank return on assets (I6-ROA) and bank return on equity (I7-ROE) for E and liquid assets to total assets (I10-LATA) for L. Variables I6 (ROA) and I7 (ROE) are used for proxies of earnings strength, because earnings and thereby returns are crucial for banking industry. Moreover, return on equity and return on asset variables are used one in each time for all models in the analysis.

In this study, CAEL approach is applied due to lack of reliable and consistent variables for management 'M' and market sensitivity 'S' at national level. Large amount of missing values exist under M component. Moreover, the management competence component is based on examiners' subjective evaluation of non-quantifiable measures such as management styles, policies and procedures (DeYoung, Hughes and Moon, 2001). Thus, the M component is eliminated from the model. Another omitted component is market sensitivity (S), which was added to

CAMELS rating system in 1997. Similar to the management component, there is huge lack of data under this component, too.

The variables in the adjusted model represent four components of CAMELS, namely capital adequacy, asset quality, earnings strength and liquidity (CAEL).

These components are mostly based on quantifiable indicators of financial performance, such as capital, liquidity and profitability ratios and nonperforming loans. The regression model can be written as:

$$Y_{it} = \alpha + \beta_{1it}CA_{it} + \beta_{2it}NPLTL_{it} + \beta_{3it}ROA_{it} + \beta_{4it}ROE_{it} + \beta_{5it}LATA_{it} + \epsilon_{it} \quad (6)$$

where subscript i denotes countries and t represents time period.

Based on the literature review and the availability of the data, Table 4 summarizes determinants of safety and soundness of national banking systems.

Table 4: CAEL components as banking sector indicators

Determinant	Proxy Variable	Definition	Source	Effect
C	Capital Adequacy	Regulatory capital to risk weighted assets (CA)	IMF	+
A	Asset Quality	Nonperforming loans to total loans (NPTL)	IMF	-
E	Earnings Strength	Return on assets (ROA)	IMF	+/-
		Return on equity (ROE)	IMF	+/-
L	Liquidity	Liquid assets to total assets (LATA)	IMF	+

Regulatory capital to risk weighted assets (CA) liquid assets to total assets (LATA) are expected to have positive impact on safety and soundness of banking sectors of countries. In contrast, non-performing loans to total loans (NPTL) has negative effect on financial soundness. Return on assets (ROA) and return on equity (ROE) variables may have an ambiguous effect on financial soundness. Traditionally, increase in return on assets or return on equity is good indicators for financial

soundness of a bank and are expected to have positive impact. However, the source of increase in return on assets and return on equity should also be taken into account. If high return is due to excessive risk taking, this may jeopardize the safety and soundness of banks.

Total number of countries providing data to the IMF Financial Soundness Indicators is 62. Among all, 49 countries are selected in this study. The core set data of 49 countries belonging 2005- 2009 period was retrieved from IMF (<http://fsi.imf.org/>). The countries in this research are classified under three groups: The European countries (EU), other developed countries (ODC) and developing countries (DC). The EU group has 26 European Union countries excluding Cyprus due to missing data. The number of other developed countries is 9, including Australia, Canada, Iceland, Israel, Japan, Norway, Singapore, Switzerland and the United States. The developing country group consists of 14 nations, namely Brazil, China, Hong Kong, Colombia, Croatia, India, Indonesia, Korea, Malaysia, Mexico, Philippines, Russia, South Africa and Turkey.

The correlation among independent variables is tested before models are run. Table 5 presents the correlation matrix among five independent variables.

Table 5: Correlation Matrix among Variables

	CA	NPTL	ROA	ROE	LATA
CA	1,00000				
NPTL	0,059	1,000			
ROA	0,219	0,154	1,00000		
ROE	0,596	0,26860	0,81985	1,00000	
LATA	0,879	0,16373	0,09798	-0,07004	1,00000

The information about the correlation is useful because a high correlation between two independent variables could result multicollinearity and can be solved by

entrance of only one variable to the model (Persons, 1999). There are two high correlations among two pairs of variables. The highest correlation belongs to CA and LATA (88%). The reason may be that both variables involve with cash inflows to banks. Another very high correlation comprises between ROA and ROE (82%). The correlation is expected since the numerators of the two ratios are the same and the denominators are proportional to their numerators.

In order to avoid multicollinearity in the model, ROA and ROE are used one at a time. Moreover LATA is excluded from two versions of the model due to considerable amount of missing data and its correlation with another independent variable. The nature of the CAMELS ratings causes five components to be related. A sound bank will have favorable grades from all components and a poor bank will have lower grades. Therefore multicollinearity must be recognized but need not to detract from the significance of the study (Gasbarro, Sadguna and Zumwalt, 2002). Consequently, four models are developed to test the hypotheses of the study.

$$Y_{it} = \alpha + \beta_{1it}CA_{it} + \beta_{2it}NPTL_{it} + \beta_{3it}ROA_{it} + \beta_{4it}LATA_{it} + \varepsilon_{it} \quad (7)$$

$$Y_{it} = \alpha + \beta_{1it}CA_{it} + \beta_{2it}NPTL_{it} + \beta_{3it}ROE_{it} + \beta_{4it}LATA_{it} + \varepsilon_{it} \quad (8)$$

$$Y_{it} = \alpha + \beta_{1it}CA_{it} + \beta_{2it}NPTL_{it} + \beta_{3it}ROA_{it} + \varepsilon_{it} \quad (9)$$

$$Y_{it} = \alpha + \beta_{1it}CA_{it} + \beta_{2it}NPTL_{it} + \beta_{3it}ROE_{it} + \varepsilon_{it} \quad (10)$$

Research hypotheses are developed to test relationship between safety and soundness of national banking systems and selected CAEL variables. Research questions and research hypotheses are shown in Table 6.

Table 6: Research Hypotheses

Research Questions	Research Hypotheses
1. Does the safety and soundness of banking system depend on capital adequacy?	<p>H₀: There is negative relationship between the safety and soundness of a national banking system and its capital adequacy.</p> <p>H_A: There is positive relationship between the safety and soundness of a national banking system and its capital adequacy.</p>
2. Does the safety and soundness of banking system depend on asset quality?	<p>H₀: There is negative relationship between the safety and soundness of a national banking system and its asset quality.</p> <p>H_A: There is positive relationship between the safety and soundness of a national banking system and its asset quality.</p>
3. Does the safety and soundness of banking system depend on earning quality?	<p>H₀: There is negative relationship between the safety and soundness of a national banking system and its earning quality.</p> <p>H_A: There is positive relationship between the safety and soundness of a national banking system and its earning quality.</p>
4. Does the safety and soundness of banking system depend on liquidity?	<p>H₀: There is negative relationship between the safety and soundness of a national banking system and its liquidity.</p> <p>H_A: There is positive relationship between the safety and soundness of a national banking system and its liquidity.</p>

Empirical Results

Binomial logit regression model with ordinary least squares is used to determine the relationship between national banking systems and CAEL ratings for 49 countries over the period of 2005 and 2009. Four models are run for pooled data, as well as country groups to test the sensitivity of the country characteristics of the EU, other developed countries and developing countries. Empirical results of binomial logit model for the pooled data are presented in Table 7.

Table 7: Binomial logit model for the pooled β

Independent Variable	Model			
	I	II	III	IV
	Coefficient	Coefficient	Coefficient	Coefficient
Constant	-3,938*** (-4,549)	-1,019*** (-4,080)	-4,558*** (-5,498)	-1,494*** (-8,127)
C	0,231*** (3,673)	0,095*** (3,706)	0,236*** (3,881)	0,105*** (4,176)
A	-0,001 (-0,124)	0,001 -0,083	-0,001** (-0,268)	-0,001 (-0,080)
E ₁	-0,236*** (-3,702)		-0,241*** (-3,911)	
E ₂		-0,098*** (-3,777)		-0,107*** (-4,249)
L	0,001*** -2,998	0,001** -2,519		
Model Statistics				
X ²	38,39***	40,87***	29,22***	34,48***
Pseudo R ²	0,158	0,169	0,121	0,142
Log-likelihood	-102,00	-100,76	-106,59	-103,96

Notes: E₁ is defined as ROA, E₂ is defined as ROE; Parameters are statistically different from zero at the 1, 5 and 10 % confidence levels, two tailed t test. ***, ** and * indicate significance at 1 %, 5 % and 10 % respectively.

As table 7 exhibits, the first version of the model uses CA, NPTL, ROA and LATA as independent variables. The coefficient of capital adequacy (C) is significant at 1% confidence level and has positive effect on banking soundness as expected. Similarly, asset quality (A) has the expected sign which is negative. This finding supports the hypothesis that there is negative relationship between asset quality and soundness of banking system. However the relationship is insignificant. Earning strength is tested by return on assets (E₁) for the first model. The coefficient of return on assets (ROA) is significant at 1% confidence level. However the sign of the relationship is

negative. This could be due to the securities used to increase profits and are exempted from capital adequacy requirements. The coefficient of liquidity is significant at 1% confidence level and its impact on the dependent variable is positive as expected.

Second version of the model is very similar to the first one. Coefficient of capital adequacy (C) is significant at 1% confidence level. Asset quality (A) has a negative impact on banking soundness but it is insignificant. Earning strength is tested by return on equity (E_2) for the second model. Similarly, the coefficient of return on equity (ROE) is significant at 1% confidence level and it has a negative sign. The coefficient of liquidity is significant at 5% confidence level and its impact on the dependent variable is also positive.

Similar results are obtained for the other two versions of the model. Coefficient of capital adequacy (C) has a common feature; it is significant at 1% confidence level in all versions of the model. Coefficient of asset quality (A) is significant at 5 % for the third version; however it is insignificant for the fourth version of the model. Nonperforming loans to total loans ratio has a negative impact on bank soundness. Coefficient of earnings strength (E) is significant at 1% level. Similar to the first two models, earnings strength has a negative relationship with banking soundness.

The X^2 test shows the overall fit of the data to the model. All versions of the model are at 1% confidence level significant. It can be concluded that the CAMELS analysis is a good fit to measure the banking system soundness.

As a second step, the differences among three country groups are examined. In order to emphasize the country specific differences, the same test is applied on each group. Firstly, the results for EU country group can be found in Table 8.

Table 8: Binomial logit model for the EU countries

Independent Variable	Model			
	I	II	III	IV
	Coefficient	Coefficient	Coefficient	Coefficient
Constant	-3,165*** (-2,911)	-0,637* (-1,833)	-3,570*** (-3,328)	-1,190*** (-4,655)
C	0,209** (2,451)	0,058* (1,887)	0,190** (2,408)	0,075** (2,458)
A	0,240 (0,018)	0,591 (0,043)	-0,001 (-0,257)	-0,001 (-0,156)
E ₁	-0,221** (-2,197)		-0,297 (-0,900)	
E ₂		-0,063** (-2,089)		-0,081** (-2,707)
L	0,001** (2,776)	0,001** (2,093)		
Model Statistics				
X ²	29,077***	27,698***	21,220***	23,344***
Pseudo R ²	0,2036	0,194	0,149	0,163
Log-likelihood	-56,870	-57,560	-60,798	-59,737

Notes: E₁ is defined as ROA, E₂ is defined as ROE; Parameters are statistically different from zero at the 1, 5 and 10 % confidence levels, two tailed t test. ***, ** and * indicate significance at 1 %, 5 % and 10 % respectively.

The empirical results for the EU countries reveal similar relations between financial soundness and the CAEL variables. The coefficient of capital adequacy (C) is significant for 10% confidence level for the second version and 5% confidence level

for all other versions. Asset quality (A) is insignificant and it has ambiguous effects on national level banking soundness. The first two models have positive, the last two models have negative impacts on the dependent variable. Earning strength has a negative impact on banking soundness, the coefficient of earning strength (E) is insignificant for the third version of the model, and it is significant at 5% confidence level for all other versions. Liquidity is significant at 5% confidence level and it has positive effects on national level banking safety and soundness.

Similar to the pooled data, the EU country group shows significant chi-square coefficients at 1% confidence level. It can be interpreted as the CAMELS rating is a good fit to measure the banking system soundness.

Consequently, a better understanding can be developed as looking at other developed and developing country groups. The second country group is the other developed countries. The results of the test for other developed countries are shown in Table 9.

Table 9: Binomial logit model for the other developed countries group

Independent Variable	Model			
	I	II	III	IV
	Coefficient	Coefficient	Coefficient	Coefficient
Constant	-15,151** (-2,619)	-11,512** (-2,296)	-15,274*** (-2,867)	-11,632** (-2,444)
C	1,017** (2,453)	0,834** (2,367)	1,023** (2,560)	0,840** (2,441)
A	0,452 (0,980)	0,109 (0,382)	0,450 (0,990)	0,107 (0,392)
E ₁	-1,478** (-2,694)		-1,481** (-2,728)	
E ₂		-0,152 (-1,337)		-0,154 (-1,384)
L	0,658 (0,053)	0,860 (0,074)		
Model Statistics				
X ²	21,376***	19,411***	21,374***	19,406***
Pseudo R ²	0,508	0,461	0,507	0,461
Log-likelihood	-10,372	-11,355	-10,374	-11,357

Notes: E₁ is defined as ROA, E₂ is defined as ROE; Parameters are statistically different from zero at the 1, 5 and 10 % confidence levels, two tailed t test. ***, ** and * indicate significance at 1 %, 5 % and 10 % respectively.

Table 9 gives different results from the EU results. The coefficient of capital adequacy (C) is significant at 5% confidence level for all versions of the model. Capital adequacy affects banking system soundness positively. Asset quality confusingly has positive effects on banking soundness; however the effects are insignificant. Coefficients of return on assets (ROA) are significant at 5% confidence level and their effects on dependent variable are negative. Coefficients of return on equity (ROE) have negative effects on the dependent variable, too. But they are

insignificant. Liquidity has a positive relationship with banking soundness but its effects are insignificant, too.

X^2 test results are similar to the earlier results. All models are significant at 1% level. It can be interpreted as the CAMELS ratings of developed country group significantly affect banking soundness.

Table 10 shows the results for developing countries.

Table 10: Binomial logit model for the developing countries group

Independent Variable	Model			
	I	II	III	IV
	Coefficient	Coefficient	Coefficient	Coefficient
Constant	-4,938* (-2,046)	-3,548 (-1,402)	-5,406** (-2,522)	-4,263* (-1,816)
C	0,369** (2,176)	0,236 (1,583)	0,344** (2,162)	0,232 (1,696)
A	0,085 (0,463)	0,116 (0,638)	0,025 (0,137)	0,059 (0,324)
E ₁	-1,646** (-2,231)		-1,326* (-1,948)	
E ₂		-0,134* (-1,770)		-0,104 (-1,484)
L	0,002* (1,940)	0,002* (1,815)		
Model Statistics				
X^2	15,142***	12,286***	10,187**	8,031*
Pseudo R ²	0,282	0,229	0,190	0,150
Log-likelihood	-19,286	-20,713	-21,763	22,841

Notes: E₁ is defined as ROA, E₂ is defined as ROE; Parameters are statistically different from zero at the 1, 5 and 10 % confidence levels, two tailed t test. ***, ** and * indicate significance at 1 %, 5 % and 10 % respectively.

Table 10 gives similar results as other developed countries. Coefficients of capital adequacy (C) are significant at 5% for versions 1 and 3; coefficients are insignificant for versions 2 and 4. Asset quality (A) has positive effects on dependent variable but the coefficients are not significant. Return on equity (ROA) has a negative relationship with national level banking systems and it is significant at 5% confidence level for the first version of the model and 10% confidence level for the second one. Return on equity (ROE) also has a negative relationship with the dependent variable and it is significant at 10% confidence level for version two and insignificant for the version four. Liquidity has a positive relationship with banking soundness; however it is insignificant.

Similar to other developed countries, X^2 test supports the outcomes. The first two versions of the model are significant at 1% level. Model 3 is significant at 5% and the last version is significant at 10% level. It can still be interpreted that the CAMELS ratings of developed country group significantly affect banking soundness.

All country groups have similar outcomes. Capital adequacy (C) is the most important component of CAMELS ratings for the pooled data and classified groups. It has always significant and positive effects on banking soundness. The coefficient of capital adequacy for the pooled data is significant at 1% confidence level; group coefficients are significant at lesser confidence levels.

Asset quality coefficient has confusing results. It indicates a negative relationship with the banking safety and soundness for the pooled data; however it has a positive relationship with the dependent variable for all country groups. None of the coefficients are significant; however the sign of the relationship is ambiguous.

It can be interpreted that the CAMELS components cannot capture the expected relationship between asset quality and banking sector soundness.

As discussed earlier, coefficient of earning strength has a negative impact on banking system soundness for the pooled dataset and country groups. The pooled data has 1% confidence level significance but the level of significance is less for country groups. Yet some versions of the model do not show significance: The coefficients for the third version of the model for the EU data, second and fourth versions of the model for other developed countries, and the last version of the model for developing countries have insignificant results. Nonetheless, it can be said, the CAMELS capture the relationship between earning strength and banking soundness.

A positive impact of earning strength would be normal on banking systems soundness, but high returns mean high riskiness. It is expected that crisis periods yield a negative relationship between earnings and banking sector soundness. The nature of the relationship may change among stability and crisis periods.

Liquidity has positive effects on banking soundness. The coefficient is significant for the pooled data and for all country groups but other developed countries. A possible for the insignificance can be the case of other developed countries' sensitivity for liquidity. Countries, such as Australia or Canada, which were not hit badly by the crisis, had already enough liquidity. On the other hand the US, which was badly affected by the crisis, increased the liquidity immediately after the bankruptcy of Lehman Brothers. Therefore the quarterly measured liquidity ratios do not reflect the fluctuations in the market.

Even though country groups have slight differences, in general all tables indicate that CAMELS ratings reflect the changes in banking sectors in national

level. Even though there are some deviances from the expected relationships, the models used in this study provide significance relationships between the majority of CAMELS components and banking safety and soundness. Parallel to the findings in the literature, the CAMELS are good predictors of banking sector safety and soundness.

This chapter starts with explaining binomial logit model, which is the statistical tool of this study. Secondly, data and methodology in conducting this study is explained. The last part of the chapter is empirical results. The analysis concluded with the success of CAMELS rating model as a predictor of banking safety and soundness. Next chapter summarizes and concludes the study.

CHAPTER 6

CONCLUSION

The importance banking sector makes banks crucial intermediary agents in business world. All sectors depend on banking transactions; banks are concerned with deposits, loans, money transfers, investment opportunities, foreign trade contracts and transfers, business reports and many other business transactions in order to assist companies in their work. All business might come to a stop point if banking activities are damaged.

By nature, a bank's standing against certain situations affect other banks. A change in banking system of a country is felt by others. The change may force other national banking systems to respond to it. Crises and booms are contagious among banks: their activities, thus activities of all economic agents depend on each other.

In order to increase economic growth and stability by means of sustainable production, states and governments pay great attention to banking systems. In order to prevent malfunctions in the banking systems, they found regulatory agencies and intensify supervision. Researchers work to find the most sensitive tool that could realize potential problems before they disrupt economy. Regulatory agencies employ these techniques and impose new rules according to economic developments.

One of the most popular methods to measure safety and soundness of banks is CAMELS ratings. Along with many other countries and financial regulation institutions, the FED uses CAMELS technique to assess the soundness of banks in the US.

The purpose of this study is to assess safety and soundness of national banking systems for pre-crisis and crisis period by applying CAMELS method. In order to measure the effects of CAMELS components, financial soundness indicators were employed. The IMF collects and publishes financial soundness indicators of 62 countries since 2005. The indicators are the country averages of certain financial ratios. In order to come to a conclusion, the ratios were processed in binomial logit regression with fixed effects model.

This study explains 2007- 2010 financial crisis; CAMELS and banking sector in different country groups and literature review on CAMELS and banking studies. Chapter 5 brings an empirical approach to explanations. The relationship between banking soundness and CAMELS ratings are hypothesized and tested.

The outcomes point out that CAEL rating is a significant predictor of banking sector soundness in national level data. Capital adequacy (C) is the most important component; it affects banking system soundness for all countries with maximum significance. It is understandable why the Basel Risk Committee gives so much importance on capital adequacy. The importance of this component is expected to continue in the future.

Asset quality (A) component comes out as a statistically insignificant variable and its effect is ambiguous on national level banking systems. One possible reason of ambiguity is the confusing increase of nonperforming loans during the crisis. The general tendency in financial regulation is that nonperforming loans ratio should be kept under control by prudential monitoring and supervision.

Earning quality (E) component has surprisingly negative impact on national level banking soundness. The relationship between earning quality and banking

soundness is statistically significant. A possible reason for the negative relationship between earning quality and banking system safety and soundness could be the low earnings ratios measured just after the crisis. Ratios were very low, even negative, however; banking sector soundness were increasing, since balance sheets were cleared off toxic assets and capital ratios were increased. This was a very strong effect to offset all positive relationship between returns and banking sector soundness that belong to pre- crisis period.

The last component of CAEL is liquidity (L), which has a positive impact on national level banking soundness. The relationship between liquidity and banking sector soundness is statistically significant for countries except other developed country group. A possible reason could be the diverse liquidity levels of banks in these countries during the crisis. Some badly affected countries increased their liquidity levels so much that the ratios could not capture the effects of crisis on banking sectors.

A new post- crisis financial architecture is being on debate. To implement a new regulation, the banking authorities will measure the strength of banking system by means of several off- site surveillance methods in national level. This study concludes that CAEL is a good predictor of national level banking soundness. Use of IMF financial soundness indicators may also be increased by new studies.

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