

ERASMUS UNIVERSITY ROTTERDAM
ERASMUS SCHOOL OF ECONOMICS
MSc Economics & Business
Master Specialisation Financial Economics

**SOVEREIGN GUARANTEES, BANK FAILURES AND RECEIVERSHIP:
Solution or increasing risk?**



Author: G.A.L. Bakker
Student number: 259234
Thesis supervisor: Prof. Dr. W.F.C. Verschoor and Ph.D. Candidate A.Lizyayev
Finish date: May 2010

PREFACE AND ACKNOWLEDGEMENTS

Every time I am close to commence a job in the trading and investment world, markets are shocked by a major crisis. This may be regarded as coincidence, but it is more likely to say that the frequency and impact of crises is exaggerating. Certain asset bubbles preceding crises may have been long time unrecognized. It is not just a matter of inflation that amounts involved in particular fraud cases, bank failures and foreclosures are at unprecedented levels.

In my first couple of years at university, next to following as much as possible courses for my studies Economics and Dutch Law, I started as a professional day trader. At the time the markets were experiencing turmoil caused by Enron and WorldCom. From this moment on, crises and their causes got my special attention. It did not take long before the next major crises showed up. Governments all over the world offered support to banks losing billions in various asset categories. The consequences of these guarantees seem to be underestimated as well as the impact of prolonged lower asset prices caused by deleveraging banks and households.

The main question with regard to this thesis is: “What has been done and what should be done?” The answer to this question may change capitalism and will add to the current debate about the New Normal.

Finally, first of all I would like to thank my thesis supervisors, Prof.dr W.F.C. Verschoor and Ph.D. Candidate Lizyayev. I highly appreciate their willingness to supervise my thesis as well as their patience while doing research and writing. I wish them prosperity and success in their own research efforts and personal lives. I also want to thank the often forgotten many economists that delivered so many insights on this particular topic. Be lauded with a reference at the end of this thesis!

NON-PLAGIARISM STATEMENT

By submitting this thesis the author declares to have written this thesis completely by himself/herself, and not to have used sources or resources other than the ones mentioned. All sources used, quotes and citations that were literally taken from publications, or that were in close accordance with the meaning of those publications, are indicated as such.

COPYRIGHT STATEMENT

The author has copyright of this thesis, but also acknowledges the intellectual copyright of contributions made by the thesis supervisor, which may include important research ideas and data. Author and thesis supervisor will have made clear agreements about issues such as confidentiality.

Electronic versions of the thesis are in principle available for inclusion in any EUR thesis database and repository, such as the Master Thesis Repository of the Erasmus University Rotterdam

ABSTRACT

The history of sovereign debt crises is limited when compared to banking crises. Nonetheless the impact of sovereign debt crises is immense. Globalization, cross-border banking and international commitment increased the importance of stability, uniform regulation and crises prevention. Both banking crises and sovereign debt crises require urgent solutions. The effectiveness of often applied ad-hoc measures should be considered at forehand. After a theoretical exposition of regulation we analyze the more and less important determinants of banking crises causing sovereign debt crises. Some careful conclusions can be drawn from the nationalization and guarantee variables. The focus is on the solvency of countries rather than the more often applied output gap. The debt to GDP behaved as in earlier research. History showed that banking crises can lead to extreme deviations in debt to GDP. Significant changes in debt to GDP do not always lead to sovereign debt crises. Bank failures in the USA are significantly related to debt to GDP over time. Countries with most significant deviations in debt to GDP need to be analyzed. Current banking and sovereign crises in these countries are exposed in their context.

KEYWORDS:

Banking crisis, financial crisis, sovereign debt crisis, nationalizations, crisis resolution, sovereign guarantees, debt to GDP

TABLE OF CONTENTS

| | |
|---|-----|
| PREFACE AND ACKNOWLEDGEMENTS | ii |
| ABSTRACT | iii |
| KEYWORDS: | iii |
| TABLE OF CONTENTS | iv |
| LIST OF FIGURES | vi |
| CHAPTER 1 Introduction | 1 |
| 1.1 Effects of regulation on banking crises | 2 |
| 1.2 Systemic risk and stress testing | 4 |
| 1.3 Ratings and financial engineering | 6 |
| 1.4 Interest rates and market intervention | 7 |
| 1.5 Government risk | 9 |
| CHAPTER 2 Methodology | 12 |
| 2.1 Banks | 12 |
| 2.2 Public debt | 12 |
| 2.3 State insurance and implicit or explicit guarantees | 16 |
| 2.4 Nationalizations | 17 |
| CHAPTER 3 Empirical Analyses | 20 |
| CHAPTER 4 Conclusion and further developments | 41 |
| REFERENCES | 42 |

LIST OF TABLES

| | | |
|----------|---|----|
| Table 1A | Banking Crises History | 46 |
| Table 1B | Banking Crises Sample | 53 |
| Table 2A | Frequency of events in sample (n=41) | 54 |
| Table 2B | Factors contributing to sovereign debt crisis (n=41) | 54 |
| Table 2C | Likelihood of sovereign debt crises in case of... (n=41) | 54 |
| Table 2D | Sub-sample 35 countries, 6 variables | 54 |
| Table 2E | Sub-sample 36 countries, 4 variables | 55 |
| Table 2F | Sub-sample 39 countries, 3 variables | 55 |
| Table 3A | Assets to Deposit Ratio for Sample of US Commercial Banks | 56 |
| Table 3B | Assets to Deposit Ratio for Sample of US Regional Banks | 56 |
| Table 4 | Bank failures determining USA debt to GDP change. | 58 |
| Table 5 | Countries with banking crisis and significant debt to GDP trend deviation | 59 |
| Table 6 | Countries with significant debt to GDP trend deviation during 2007-2010 | 60 |

LIST OF FIGURES

| | | |
|----------|---|----|
| Figure 1 | Asset-size weighted Asset to Deposit Ratio for US banks. | 21 |
| Figure 2 | Median Asset to Deposit Ratio for US banks. | 22 |
| Figure 3 | Number of Problem Banks and Failures versus Banks over time. | 23 |
| Figure 4 | Problem banks decomposed in Savings Institutions and Commercial Banks. | 24 |
| Figure 5 | Bank Failure Rates over time decomposed in S&L and Commercial banks | 24 |
| Figure 6 | Percentage deposits insured versus Balance Deposit Insurance Fund in bln. \$. | 24 |
| Figure 7 | Median Asset Size of Failures in mln. \$. | 24 |
| Figure 8 | Debt to GDP in OECD countries from the start of the 1990s | 24 |
| Figure 9 | Debt to GDP in Euro Area countries from the start of the 1990s | 25 |

CHAPTER 1 Introduction

Varying prices for goods and services are intrinsic to the capitalist system. An economic downturn or bear market happens when prices start to decline due to oversupply or demand shortage. Often many factors contribute to economic downturns while not being counterbalanced by others leading to a flourishing economy. Steady rising prices are preferred to bubbles and busts. It is difficult for institutes like central banks to distinguish asset bubbles from productivity increases.

Instable, less regulated and developed countries caused many shocks to developed countries in the past, but nowadays deregulation in developed countries also leads to shocks in both developed and emerging countries. In the literature a distinction is made between currency crises and banking crises. Joint crises are also possible. Currency crises tend to happen more often in smaller and hence less stable economies. The effects of banking crises can be considered more accurately when the currency crises are eliminated.

Banking crises consist of bank runs, collapses of financial firms, massive government intervention, as well as less damaging but extensive unsoundness of institutions. The number of banking crisis measured depends on the period and countries observed as well as the definition thereof. Lindgren, Garcia and Saal (1996) considered banking crises in 130 out of more than 180 IMF member countries for the period 1980-1995. According to a World Economic Outlook report (IMF, 1998a p.79) 54 banking crises and 32 joint crises happened in 53 industrial and developing countries during the 1975-1997 period. Kaminsky and Reinhart (1996) considered only 20 countries and counted 25 banking crises from 1970-1995. Reinhart and Rogoff (2008) updated their earlier research, now including 173 instead of 139 financial crises by adding one decade of data (1970s-2007). Approximately 20% of those were in Western countries, down from 30% measured earlier. Based on these samples, the likelihood that a country did not experience a banking crisis during the past decades is rather small.

The more frequent banking (or currency) crises happen, the shorter the sorting out and liquidity problem periods and any overshooting last as market participants become both better prepared and informed (Kaminsky and Schmukler, 1999). The sorting out of countries appears to have occurred faster after the Brazil crisis of January 1999 than the Russian Crises of August 1998, which, in turn, was faster than after the East Asia crisis of June 1997 and the Mexican crisis of yearend 1994.

In this thesis we examine the influence of factors determining the frequency and extent of banking crises. We will derive the impact of banking crises on sovereign balances and see that despite the large effect on single government balances it is not possible to predict sovereign debt crises in the aggregate. At least up to now many governments were capable of dealing with large debt increases without causing such a crisis.

While supranational and intergovernmental institutions aim less fragility in the banking sector, many international and cross border banks exposed themselves to extreme risks arising from other sources. We will start with an exposition of the influence of institutions by means of regulation on banking crises. Irrespective of regulation, a minimum amount of systemic risk is always present. Systemic risk and the necessity of stress tests will be explained in the subsequent section. Rating agencies have their own methods to estimate the amount of risk involved. There is a lot of scrutiny going on with regard to their ratings. These rating are applied to individual banks, insurers and governments. Governments have power to intervene in the markets by adjusting the interest rates or money supply. A sovereign debt crisis may be originated if none of the previous mentioned instruments is available or suitable. Overleveraged banks and banking institutions a couple times larger than their home countries GDP also got my attention, because of the possible transfer of risk between these banks and the governments.

1.1 Effects of regulation on banking crises

Financial institutions and markets tend to be more important in more developed economies (Demirguc-Kunt and Levine, 1999). Compared to their counterparts in less developed economies companies and individuals even more rely on their existence. Banks are typically involved in intermediation, maturity transformation, facilitating payment flows, credit allocation, and maintaining financial discipline among borrowers (Lindgren, Garcia and Saal, 1996). Banking crises appear to happen in a late stage after the economy is hit by a broad crisis. The various types of regulation can be seen as the result of trial-and-error learning from governments and other authorities. Some argue that government policies limiting diversification and encouraging risk taking contribute to an increasing number of failures like the Savings & Loan crises (Clair, Robert T. and Gerald P. O'Driscoll, 1991). To the contrary, others emphasize the increase in both the frequency and seriousness of banking crises as a result of liberalization and deregulation (Flannery, 1995). Kaminsky and Reinhart (1996) report that some 70 percent of banking crises were preceded by deregulation and that financial liberalization was statistically significant in explaining banking crises. A study of 53 countries from 1980 to 1995 by Demirguc-Kunt and Detragiache (1998) finds that financial liberalization increases the likelihood of banking crises, but that the stronger are the preconditions for liberalization and market discipline in terms of contract enforcement, lack of corruption and bureaucratic interference, and respect for the rule of law. Moreover, the more repressed is the financial sector at the time liberalization is introduced, the more do gains from liberalization outweigh the costs of any banking crises.

After the crash of 1920s legislators issued laws forbidding banks to speculate on stock and money markets (Glass Steagel Act, 1933). It separated commercial and investment banking, and outlawed the payment of interest on demand deposits. Commercial banks however, while not involved in direct equity investing still owned and managed substantial amounts of commercial real estate acquired through loan foreclosures (James Freund et al., 1997). The same Act also permitted US Government securities to serve

as backing for Federal Reserve notes. The Thomas Amendment to the Agricultural Adjustment Act of 1933 permitted the Federal Reserve to adjust commercial bank reserve requirements.

In 1934 president Franklin D. Roosevelt signed the Federal Credit Union Act into law to “promote thrift and thwart usury”. Because of their non-profit, cooperative structures, credit unions are exempted from most state and federal taxes. Banks have convinced themselves this is an unfair advantage and have spent a lot of effort, plus a fortune in lobbying fees, trying to legislate credit unions out of existence, or at least limit who can join.

When Margaret Thatcher became prime minister in the United Kingdom in 1979 and Ronald Reagan president of the United States in the United States in 1981, the economies started an uptrend for about 25 years. Both leaders reduced the influence of the government and set an example for the western world. Privatisation and deregulation started and went on until the 21st century. Restrictions were reduced in order to achieve markets that operate freely. Third world countries were forced to open their borders. President Clinton changed the strict banking regulation in 1992. The previous regulation dated from the days of Roosevelt. Banks got permission to buy higher risk loans. Large banks were not allowed to invest directly into one another and should have separated investment and commercial trading departments prior to 1999.

In both periods from the late 1920s to late 1930s and from the mid 1990s until the sample end in 2006 wages in the financial sector were excessively high because of increased deregulation, privatising and free market thinking (Philippon and Reshef, 2007). Both periods of neo-liberalism ideology ended with a financial-economic near collapse. The Savings & Loan Crises in the 1980s also emerged after extensive deregulation. The stock market crash of 1929 was followed by a huge number of failing banks in 1934 and two years after the crash of 1987 the number of bank failures was also at an extreme.

The last couple of decades were based on the “Washington-consensus” initially coined by John Williamson (1989). This system was based on deregulation, privatisation and reorganization of government spending. Corporations got more power and self-regulation gained over supervision by authorities. In absence of proper rules financial markets will be dictated by the law of the jungle. Greed has to be tempered first by fear of losses. The fear of bankruptcy is reduced if a bailout or any other form of government assistance is guaranteed. As a result, the magnitude, although possibly not the frequency of banking insolvency’s may be greater than before the introduction of guarantees Calomiris (1999a). The costs of government policies to restrict systemic risk frequently have exceeded the benefits, although all the costs may not become widely visible until long after any benefits like reduced runs and supported assets values are enjoyed. Guarantees offered by the governments appear to be a classic example of the time inconsistency problem in economics. The benefits of the guarantees are observed today and the costs

only tomorrow given that the public as well as policy makers generally apply high discount rates to evaluating the present value of future outcomes of policy actions. Kindleberger (1978) appears to be correct when he argues that “today wins over tomorrow”. Next to fear of failure, prudential regulation and supervision should avoid certain excesses. Otherwise, the authorities should be aware of the effects of too many emergency measures and unpredictable government intervention.

In the end sovereign risk may increase if the same institution that has the power to prevent excesses by making legislation starts to deregulate. Deregulation leads to higher intertwinedness in an economy and possibly higher systemic risk in economic downturns. Banks may acquire several types of business exposing them directly to threats in the economy instead of earning a risk adjusted return on net capital supplied. In this way insurance and asset management are not part of the bank’s core business. Deregulation in general leads to less specialized and certified institutions. In the current economic environment there are several industries that need to be regulated simultaneously or as Krugman (2009) stated: “We have to in effect extend conventional bank regulations to a very much wider range of institutions. And that will help.” Credit institutions, insurance companies, mortgage suppliers and hedge funds have similar inputs and outputs as the banks as far as the savings pool, investment allocation and compensation package are concerned.

1.2 Systemic risk and stress testing

The failure of an individual bank may have various causes (O’Conner, 1938; Graham and Horner, 1988). Failure is distinct from insolvency. Insolvency is determined by events in the banking market; a bank either is insolvent or not. Failure in most cases hinges upon a supervisory decision, which may or may not be taken, and may be taken before or after insolvency. Failure depends on the same variables as insolvency, but is also subject to misincentives, forbearance and political interference. Theoretically sequential servicing, where the first in line is served first, gives other creditors an incentive to run when confidence is lost, but history provides little evidence these liquidity problems drove economically solvent banks into insolvency (O’Conner, 1938; Benston and Kaufman, 1995; Calomiris and Gorton, 1991; Carr, Mathewson, and Quigley, 1995). For the most part, except in periods of severe crisis when the financial condition of nearly all banks were suspect, runs, particularly by larger depositors, involved fund transfers from perceived financially sick to perceived financially healthy banks. What matters in general is not the banks’ absolute fragility, but their relative fragility.

The consequences of shocks in the economy may either be stand-alone or widespread. Systemic refers to an event having effects on the entire banking, financial, or economic system, rather than just one or a few institutions (Bartholomew and Whalen, 1995, p.4). Mishkin (1995, p.32) defines systemic risk as the likelihood of a sudden, usually unexpected event that disrupts information in financial markets, making

them unable to effectively channel funds to those parties with the most productive investment opportunities. Systemic risk is observed most frequently when it is defined as a broad big shock hitting many banks with the same risk-exposure (Contagious Common Shock). Transmitted insolvency at each and every party on the transmission chain leads to another form of systemic risk: Causation Contagious Systemic Risk.

In order to prevent Causation Contagious Systemic Risk it is necessary to resolve troubled institutions before their net worth declines below some low but positive critical level: Least Cost Resolution. With the closure-rule like the one used by the US Federal Deposit Insurance Corporation (FDIC) no losses should be suffered by depositors to the amount insured or by the deposit insurance agency in absence of large-scale fraud and unusually adverse changes in market values of diversified portfolios. Regulation is necessary to minimize the risk that banks run in trouble and to minimize the externalities if they fail. In practice the more recent losses at US banks shows the severity of losses suffered. In the past, banks were closed by the FDIC when losses were about 20% of total assets. Banks are capitalized at 7-10% of total assets. So when the equity of a bank is wiped out, the FDIC allows the bank some time to raise more capital before shutting it down. But more recent bank failures have loss ratios (the loss ratio is equal to the loss to the FDIC insurance fund with respect to a failed bank divided by the total assets of that failed bank) that have gone as high as 51% as was the case with the Community Bank of Nevada (FDIC, 2009). The loss at this bank was about 5 to 6 times the amount of capital. The losses at many troubled banks increased to a multiple of their capital and diminished the possibilities of raising additional capital. A new resolution regime for large financial institutions is necessary. Lawmakers in the US should create a new federal authority to help unwind large-scale institutions important to the financial system. This entity would be responsible for providing funding to an imploding institution so it could pay off its counterparties and creditors. The authority may be granted either to the FDIC, to the Federal Reserve or to a brand new entity. In other countries policymakers also have to deal with the banks “too big to manage” or “too big to fail” (TBTF) in a later stage. Some countries, like Germany are deliberating about the advantages of a so called bad bank, although there are numerous bad banks already. Asset to equity leverage of banks, usually limited by international standards reaches extreme levels after large amounts of equity are wiped out by common shocks, like large downturns in the housing market. A common shock represents correlation without direct causation (indirect causation). The going concern of many savings and loan institutions is currently endangered after earlier regulation obliged to have at least 65 percent of their lending in mortgages and other consumer loans.

If domestic or foreign banks are close to failure, governments may want to act on it to protect the savings from civilians. Authorities may execute Prompt Corrective Actions (PCA) introduced with the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA): Sanctions with regard to the distribution of capital if the bank fails to achieve certain capital adequacy ratios. The government may

oblige the banks to take additional core capital, pay additional money to a depository insurance fund while limiting bonuses and dividends. PCA requires closure of a bank with certain exceptions 90 days after its capital ratio falls below 2 percent (Oshinsky, 1999). The government acts in this regard risk avoiding, but they are opposed by investors willing to act more risk taking. It is imaginable that after many losses they want to make some money back. Shareholders may refuse risk averse government bailouts and opt for risk loving higher price bailouts while simultaneously risking bankruptcy. In case of banks and credit institutions this conflict of interest creates a large gap between shareholders and savers which are backed by the government defending national interest. Banks willing to repay government loans are also obliged to have a minimum amount of debt at their disposal, which is not backed by the guarantee system. This can be achieved by placing covered bonds. One type of covered bonds is also called bankruptcy remote special purpose vehicles due to the separate legal entity.

Banks and credit institutions can hardly reorganize without provoking a bank run and starting fire sales by filing for bankruptcy protection. More than other companies banks need a bridge bank or government guarantee to maintain a certain level of trust.

Stress testing reveals some systemic risk. In this process certain variables are estimated in worst case scenarios and the consequences are observed. In practice it is unlikely that extremely negative results will be published. Besides the conflicts of interest we have to take into account the three fallacies executive director at the Bank of England Haldane (2009) mentioned with regard to stress tests for banks: Blindness to catastrophes, blindness to domino-effects in the financial system and bankers' unwillingness to cope with risk analysis. Whether something deviates from normal depends on the amount of historical data. Historical simulation and back testing may cause blindness to catastrophes if the time span is too short. Inputs for many complex models were limited to a mere 25 years of history, but often less data was available or applied. The next fallacy is based on the fact that banks took too little into account that one or more domino-effects exist. According to central banker Haldane it is not impossible to calculate these risks but specialists simply devoted too little attention to it. Even if they were aware of the risks, they may have neglected the results.

1.3 Ratings and financial engineering

During the current crises there have been many debates on the added value of rating agencies. To a large extent investors put their faith in the hands of rating agencies. Many investors confuse estimated risk as measured by those agencies with the actual risks they face. This risk perception is based on the erroneous assumption that large scale rating shifts will not happen. In a large portfolio the effect of a rating shift of a single investment is limited, but a rating shift for whole portfolios may have devastating consequences. Before the 1990s, Standard & Poor's rated only a dozen sovereigns, almost all of them in the top (AAA)

rating category. Similarly, Moody's had rated only 11 countries up to 1980, and all of them were in the investment grade range. This means that the experience with the evolution of sovereign ratings is limited compared to the century-long corporate ratings (Moody's, 2003).

Financial engineering created lots of products with difficult to assess risk. The boom in the derivatives market as well as the limited track record with regard to default frequencies led to underestimation of risk and overconfident investors. The previous bull market both in housing and equity might have been amplified by credit agencies. Bondholders can insure themselves with Credit Default Swaps (CDS) against bankruptcy. After insuring against this type of risk the principal is guaranteed and the risk is limited to bond price-movements until maturity. The insurance company gets payments in advance. The insurer suffers heavy losses and the insured faces counterparty risk if too many companies go broke simultaneously. In a systemic risk environment like the banking sector the risks for the insurer might be even higher than in the auto manufacturer sector due to a common shock, like rising oil prices.

Banks amongst other companies tried to maintain a high credit rating or use high ratings of monoline insurers guaranteeing their debt to limit their cost of funding. This ultimately caused a deterioration of the lenders' financial position. If the lender goes broke, both the bank and monoliner have to find a lender of last resort, usually the government. By then the bank and monoliner use the rating and creditworthiness of the government. For this reason companies rarely get a higher rating than the government. The government may end up in the same situation as the monoliners if the lending terms are too soft apart from the possibility to print money at the central bank.

Negative feedback loops caused by rating agencies can trigger severe crises. For instance, rating agencies may react to the information that the value of government guarantees has increased by downgrading its sovereign bonds. The downgrade will raise the cost of servicing the public debt and lower the present discounted value of future budget surpluses. This will lower the value of the government's assets precisely when the value of its liabilities has increased. This may add up to the scrutiny of the United States government and the European Parliament, introducing tight regulation for rating agencies.

1.4 Interest rates and market intervention

The interest rates determined by the various central banks are during a run-up in debt not only important for individual banks besides the consumers, but also for the interest payments of governments. A steady pace in rising government debt leads to high interest expenditures and lower residual annual budgets. In the literature, starting with Sharpe (1964) and Lintner (1965) the assumption is made that there is borrowing and lending at a risk-free rate, which is the same for all investors and does not depend on the amount borrowed or lent. This assumption of widely used Capital Asset Pricing Models (CAPM) implies

that governments with massive amounts of debt never go bankrupt. In reality there are quite some rating migrations for government debt from the highest class to lower ones. These shifts should be taken into account ex ante. Many countries accumulate more debt than GDP over time, pointing towards more downward adjustments in ratings. In the absence of a free lunch, the compensation on “risk-less” government bonds should be more or less equal to the inflation rate.

Although in the Euro zone the countries share the same currency, differences exist in the amount of government debt. The European Central Bank might be inclined to sacrifice the inflation protection to resolve crises in individual countries by maintaining a low interest rate policy. This procedure is also called Taylor rule analysis. For some countries, like Japan it is almost impossible to raise interest rates without causing a budgetary crisis. Due to rising debt levels even more countries will experience the necessity of a Zero Interest Rate Policy (ZIRP), with a close to zero interest rate for the foreseeable future. A close to zero interest rate diminishes future possibilities to stimulate the economy and increases deflationary pressures. According to board member Axel Weber (2009) an interest rate below 1% might paralyse the interbank market. Up to now deflation is rarely seen, but if it occurs the losses in e.g. real estate markets are probably high. If (central) banks continue to lend to unprofitable firms or other banks (evergreen lending) to prevent losses from materializing, the damage might be even higher. Short term US bills are sold at zero yields. Prices of bills can only decrease if yields are zero. This phenomenon caused an increase in naked shorting, the practice of selling bonds without delivering them. The amount of failed trades in Treasury bonds, which are shorted, non-existing treasury bonds, has doubled since 2007. Some \$250 billion worth of U.S. Treasury bonds were sold and not delivered in a single week in 2009. (Taibi, 2009)

Whenever the interest policy measure is exhausted, central banks can only stimulate the markets by providing liquidity. In the United States the Federal Reserve introduced the Term Securities Lending facility in March 2008 by which primary dealers could access up to \$200 billion of treasury securities against over time less liquid collateral to prevent fire sales. Next to this type of central bank liquidity guarantee, various central banks made swap agreements to share the risks and bought large amounts of government bonds to control the interest rate in government bond markets. High monetary expansion and limited demand for government bonds creates a gap that can only be closed by money printing. In the European Union the purchase of government bonds is constrained by e.g. the Maastricht Treaty protecting the other individual countries.

The Austrian School of economics supports the view of creative destruction. If a bank with bad asset quality fails a new and stronger one will emerge. Hence if a bank with bad asset quality is supported, profits are privatized and losses shared with the taxpayers. Supporting banks may result in either quick economic recovery or long lasting depressions with high government interest payments and taxes. The

resulting risks are acceptable to the government if it has enough opportunities to attract additional funding. If a government fails to attract domestic money it may face penalties like higher interest rates, exclusion from trade-agreements, an external debt crisis or even worse an internal debt crisis. At a certain level the debt needs to be rescheduled and the ex-ante risk-free rate is not only a reward for time-endowment but also for failure.

1.5 Government risk

Risk can be described as an unintended or unanticipated accumulation of large risks often through the lack of understanding of risks by stakeholders and overseers of those entities. A country's exposure to risk results from the risk exposure of each sector in the economy and from the transmission of risk across sectors through financial guarantees. Distress in the corporate sector can be transmitted to the financial sector, e.g. following a change in commodity prices. Distress in the financial sector can be transmitted to the government, e.g. through the government guarantee of bank deposits. Sovereign distress or default can be transmitted to the private sector, e.g. through increase in spreads.

Guarantees, like options, are contingent liabilities for their issuers, with required future payoffs contingent on the values of other assets. The equivalence between a risk-free loan and the combination of a risky loan plus a guarantee suggests the analogy between a loan guarantee and a put option on that loan. The position of the holder of the debt is analogous to default-free debt combined with a short put option on corporate assets. The bank holds a government financial guarantee. The government has it as a liability on its economic balance sheet.

The ultimate risk is that the government of a country or an agency backed by the government will refuse to comply with the terms of a loan agreement. Although sovereign nations do not go broke, they can assert their independence in any manner they choose, but cannot be sued without their assent.

Guarantees, like options, are contingent liabilities for their issuers, with required future payoffs contingent on the values of other assets. The equivalence between a risk-free loan and the combination of a risky loan plus a guarantee suggests the analogy between a loan guarantee and a put option on that loan. The position of the holder of the debt is analogous to default-free debt combined with a short put option on corporate assets. The bank holds a government financial guarantee. The government has it as a liability on its economic balance sheet.

The government exposure to the financial system is only measurable if the assets of institutions are marked to market and the guarantees are on the balance sheet of the government. Understanding the effects of risk accumulation on balance sheets is important because it explains why, in times of crises, monetary and fiscal policies tend to become ineffective. Banks with weak balance sheets do not react to

an increase in central bank money by raising the supply of loans. “The right answer to crisis avoidance is controlling risk” (Dornbusch, 1998).

Consider the following identity (based on Merton and Bodie, 1992) which holds in both a functional and a valuation sense:

$$\text{Risky loan} + \text{Loan Guarantee} \equiv \text{Default-free loan}$$

This can be rewritten as:

$$\text{Risky loan} \equiv \text{Default-free loan} - \text{Loan guarantee}$$

This identity strictly only applies if the guarantee itself is default free and if it covers the entire loan. If the guarantor defaults on this obligation or is not able to fully make up for losses on the promised payments the loan is not default free any more.

Investors can protect their investments by buying Credit Default Swaps (CDS). The most widely-traded CDS are based on the five year company bonds. The spread or difference over treasury bonds shows the relative level of risk involved. CDS are based on a default probability of the underlying debt and also on a certain chance of default in the so called risk-free environment. The absolute insurance rate may change because of higher treasury yields. Investors need to be compensated for large amounts of debt offered by the governments. This explains why CDS on government paper are also available. Sturzenegger and Zettelmeyer (2005) show that sovereign defaults implied investor losses (haircuts) between 13 to 73 percent of outstanding bonded debt. Commercial banks and bondholders have been prevailed upon substantial debt forgiveness (20% of Net Present Value) to the smaller countries Belize and Dominica and 40 to 50% of debt in Dominica and Grenada. In 1982 Mexico defaulted on its extreme obligations and Uruguay restructured its debt without asking creditors to accept a reduction on the principal.

Whenever a systemic crisis emerges it is imaginable that the counterparty cannot meet its obligations and that the insurance premium is based on a way too low risk-free rate assumed that the insurer invests the proceeds in risk-free investments like government bonds. This insurance-collateral causation makes it hard to evaluate sovereign default probabilities with CDS spreads.

The price of insuring against default on often default-free assumed US treasuries based on Credit Default Swaps increased from below 5 basis points in 2007 to 90 basis points early 2009 before falling back to 30 basis points. Current stimulus packages may not be large enough to limit the consequences of the current crises. The size of the stimulus packages is limited by sound lending practices of the governments. It took

almost two decades to recover from excessive government expenditures in the seventies of the past century. Large budget deficits would not be so bad if the developed economies had not racked up large accumulated debt loads before the crises, did not have aging populations or had higher oil revenues.

From the previous sections we can unravel the following two questions:

From the bank perspective:

“Are the risks for banks reduced if the owners are willing to commit and/or does the system become inefficient?”

From the government perspective:

“Are the sovereign risks acceptable and/or will this be the end of a risk-free environment?”

Evidence and solutions of higher sovereign financial risk could be found in countries involved with the Brady Bonds. Brady bonds were the result of a new strategy announced by the US Secretary of the Treasury Nicholas Brady in March 1989 that provided official incentives, through IMF and World Bank loans, for agreements to restructure debts into bonds with significant write-downs of the claims. The objective was to bring debtor countries back into sustainable positions without causing destabilizing financial losses to creditor commercial banks. The following countries were involved in this deal: Argentina, Brazil, Bulgaria, Costa Rica, Dominican Republic, Ecuador, Mexico, Morocco, Nigeria, Philippines, Poland, Uruguay. More recently the IMF supported other countries on the verge of default: Hungary, Ukraine, Latvia, Belarus, Serbia, Iceland, and Pakistan. Currently the crises become more noticeable in European Countries like Ireland, Spain, Greece, Portugal, Estonia and Lithuania.

The deficit of the government becomes more important when the government is acting in the capacity of a private entity as a lender of last resort. We will estimate the impact of banking crises in an unconventional way. Many researchers calculate the shortfall in GDP instead of the relative increase in government deficits over GDP.

CHAPTER 2 Methodology

2.1 Banks

In the problem statement there are two perspectives. The first viewpoint contains the amount of risk banks are exposed to based on normal market and regulatory risk. Besides that, there is a trade-off between risk and efficiency. The market can be efficient if there is equilibrium between the amount of entrants and exits at the supply-side. Banks will increase their operations and hence their risk and new entrants will join if the market as a whole operates below its equilibrium. Contrary, banks may operate inefficient if the market is above its equilibrium and the number of banks is too large to sustain. This may be the result of government intervention. We may conclude that the optimum number of banks follows a parabolic pattern. Efficiency is not only determined by the number of banks, but also by their relative size. Small banks lack scale-effects. Currently governments have to choose between too big to fail and too small to survive. Governments need to introduce asymmetric regulation with regard to asset size if the number of banks is considered to be above its equilibrium to solve this issue. Plans are launched to force spin-offs at large commercial banks to reduce the too big to fail problem, although some of them were already forced to do so by capital requirements. They might as well consider forced mergers or minimum asset-sizes for smaller banks in order to reduce the skewness in asset sizes. In the empirical section we will rank the banks on asset size and analyze if the asset-to-deposit ratio as a proxy for leverage of US banks is higher for larger banks. We will analyze time-series to get better understanding of the soundness of the banking system as a whole and of both large and small bank categories. History provides data on the possible impact of problem banks resulting in bank failures. These relationships will be detected and estimated. The problem banks can be decomposed in regional banks and commercial banks. Different causes over time may influence one type more than the other because of different asset allocation. We have to adjust the number of problem banks for the number of banks in each category to compare their relative share. Finally we look at the insured amount of deposits and the balance of the FDIC fund through which the risks of banks are transferred to the government.

2.2 Public debt

Government agencies calculate the governmental and national debt in many different ways. Economists also make various distinctions with regard to debt. Debt of a country is often divided in external and domestic debt. In the External Debt Statistics: Guide for Compilers and Users jointly published by the Bank for International Settlements, Eurostat, IMF, OECD, Paris Club, UNCTAD and World Bank, external debt is defined as follows: “External debt, at any given time, is the outstanding amount of those actual current, and not contingent, liabilities that require payment(s) of principal and/or interest by the debtor at some point(s) in time in the future and that are owed to nonresidents by residents of an

economy.” In practice the difference between the two types of debt has narrowed considerably because international investors have access to the domestic market and residents are allowed to trade in foreign currency denominated domestic debt. For some countries the number of indirect bidders is published when the government notes are auctioneered. A distinction is made between direct bidders and indirect bidders including foreign central banks. The total amount of bids in general and the share of the indirect bidders show the willingness to finance the government debt in general and the interest of foreigners in particular. The government may have an incentive to manipulate the share of indirect bidders. Central banks possibly act as indirect bidder through special purpose entities.

An external debt crisis occurs when a country fails to meet a principal or interest payment on the due date or within the specified grace period. It is possible that part of the debt is ultimately extinguished during an external debt crisis. In case of a domestic debt crisis the definition given above for external debt crisis applies, but simultaneously bank deposits may be frozen or converted to other currencies. Almost by definition the number of external debt crises is larger than the number of internal debt crises. The way governments and nations are financed determines the level of sustainable debt. Japan with a debt to GDP ratio of 174 still operates due to the high savings rate of civilians, while smaller countries with much lower debt to GDP ratios like Hungary are confronted with a financial crisis and require a bailout by the IMF. For any country a high debt to GDP introduces severe interest rate risk.

In this thesis the focus will be on public debt. Public debt should not be confused with external debt, which reflects the foreign currency liabilities of both the private and public sector and must be financed out of foreign exchange earnings. With regard to external debt, the largest shocks to the debt to GDP ratio are caused by currency devaluations instead of banking crises. However, Kaminsky and Reinhart (1996) report that, while banking crises statistically predicted balance of payments crises in the countries they studied, balance of payments crises did not predict banking crises”. As part of the domestic debt is owed by banks, the spillover effect of bank failures on domestic debt might be interrelated. Hence public debt is preferred to both external and internal debt.

According to Campos et al. (2006) the main contributors to an increasing debt to GDP ratio are interest expenditures and stock-flow reconciliations including devaluations and banking crises. A stock-flow reconciliation measures the difference between deficits (flow variables) and debt (stock variable). Inflation and GDP growth are the main factors reducing the debt to GDP ratio. Periods of banking crises usually show higher standard deviations in GDP growth and much higher standard deviations in government expenditure to GDP, while the volatility of revenues to GDP increase only moderately.

Recent research in the field has stressed the fact that, while important, debt levels are not the ultimate determinant of sovereign debt risk. There is evidence that debt levels are not crucial determinants of the

perception of default risk, as measured, for example, by credit agencies (Jaimovich and Panizza, 2006). Research on early-warning prediction of debt crises also failed to identify any measure of public debt level as a significant indicator of a highly probable subsequent debt crisis (Manasse, 2003). Large risks remain if crises cannot be identified. The same risk exists in the field of exchange-rates where exchange-rates are unable to reveal weakness of the whole system, for instance when there is a crisis on global scale.

Although debt levels are not the main determinant of default risk, it still makes many countries with multiple deficits very dependent on foreign countries. Some of them have not only large deficits at the national level but also at the state and individual household level. In 1929 the total amount of debt to GDP of the US was 160% increasing to 260% in 1932. The crises starting 2007 begun with a debt ratio of 385% and increased rapidly to over 500%. In the US banks are vulnerable because of domestic write-offs while the exposure of European banks to emerging markets is five times higher when compared to US or Japanese Banks. European banks owe more than 74% of the \$ 4.9 trillion emerging debt market, with a higher number of short-term maturities which need to be repaid or rolled over any time soon.

So far we have concluded that the actual level of debt not necessarily results in higher likelihood of sovereign defaults and that stock-flow reconciliations, which can be expected as a result of banking crises, have a large effect on sovereign debt. According to Cantor and Packer (1996) six factors appear to play an important role in determining a country's rating: per capita income, GDP growth, inflation, external debt, level of economic development, and default history. A statistical test shows that a 35 percentage point increase in the debt to GDP ratio would be associated with, at most, a one-notch decrease in credit rating (Eichengreen, Hausman and Panizza, 2005). Moody's appears to place more weight on external debt and less weight on default history as negative factors than does Standard and Poor's. Other things being equal, a country that has defaulted on debt in the recent past is widely perceived as high credit risk. Both theoretical considerations of the role of reputation in sovereign debt (Eaton 1996) and related empirical evidence indicate that defaulting sovereigns suffer a severe decline in their standing with creditors (Ozler 1991). Besides banking crises the Inter-American Development Bank (1995 en 2005) distinguish three main factors contributing to actual and perceived sovereign credit risk: The country's economic quality, the political and institutional quality, and the government debt quality. Some factors cannot be controlled, but it is possible to avoid higher levels of political uncertainty. Yue (2004) analyzes the quantitative effects of sovereign debt renegotiation on country interest rate spreads without any political factor. Quantitative analysis shows that higher levels of political uncertainty significantly raise the default frequency and both the level and volatility of the spreads (Arellano, 2007; Cuadra & Sapriza, 2006). Calvo (1998) labelled certain events as "sudden stops" and more research is done on optimal reserve management as a cushion against external shocks and capital flow reversals.

In our first analysis we include the debt to GDP ratio for a total number of 41 countries. Annual relative changes for the debt to GDP ratio have been calculated for a maximum of 35 years in the 1979-2014 period, including historic data and estimates. We will see if the analysis of this variable confirms earlier research cited above. In particular we will pay attention to the possibility of an emergent sovereign debt crisis.

Governments suffer from incompleteness in markets. The possibilities to shift risk across individuals are limited. Markets are incomplete because governments buy and sell one period non contingent discount bonds and they cannot commit to repay their sovereign debt. In order to finance the excess of government expenditures and interest payments over revenues, governments need to issue treasury bills and bonds. Countries that issue large amounts of sovereign debt often can only do so by issuing financial instruments with a very short duration. The duration determines the earlier mentioned government debt quality. When the spreads such governments pay exceed a certain threshold level, the debt becomes unsustainable. We can think of this threshold level as the one beyond which the country can no longer continue to service its debt without default, restructuring, or “unrealistically large” fiscal adjustments or changes in the balance of payments.

Incompleteness in the markets gives large indebted countries more incentives to default. More developed countries may be less inclined to default on their foreign obligations because their economies are often substantially integrated with the world economy. As a result, developed economies are particularly vulnerable to the legal rights of creditors to disrupt trade or seize assets abroad. The possibility of recourse to direct sanctions is a necessary condition for sovereign lending (Bulow and Rogoff, 1989).

The debate over why countries repay may seem rather philosophical, but it is quite dangerous to think about grand plans to restructure the world financial system without having a concrete view (Rogoff, 1999). Studies (Obstfeld and Taylor, 2003; Ferguson and Schularick, 2006) showed that the penalty for full default is about 100 basis points and 50 basis points for partial default over the market’s benchmark bond yields.

Countries may have incentives to increase their debt beyond international trade agreements. Within a trade union this process may lead to destabilization. While some countries are successful in reducing debt to GDP to pre-crisis levels within three years, debt levels stabilized at relatively high levels for others (De Bolle, 2006). At the start of the European Union the maximum allowed debt to GDP ratio was 60% or else should show at least a downward slope. Many countries including Austria, Belgium, Germany, Italy and Greece failed to meet this criterion. If the contraction of the world economy continues many more countries will cross this line, causing high interest expenditures as part of annual government budgets. In order to prevent such circumstances surpassing debt levels should be sanctioned and repayment needs to be enforced. There are several ways to achieve debt enforcement: Diplomatic influence to facilitate debt

settlements, exercise military force to start paying interest on defaulted debts (United States Department of State, 1913) or contractual arrangements like internal tax collection in case of a default¹: El Salvador 1912, Panama 1918, Costa Rica 1926, Honduras 1926.

2.3 State insurance and implicit or explicit guarantees

During the current crises several governments lifted the maximum guarantee banks had to pay to depositors in case a bank went out of business. This self financing solution might be inadequate with large accumulated risk at various banks. A possible solution is additional insurance for banks instead of only deposits insurance. Banks have to pay premiums and the money has to be put in a separate fund to finance future claims. The shortcomings of this solution are the unwillingness of governments to act as an insurer, the lack of money to pay the premiums during bear markets and the superfluosity during bull markets.

Besides being the ultimate guarantor for savings at the banks when a deposit insurance arrangement exists, the government can also directly or indirectly, by the deposit insurance fund, guarantee credit of individual banks. For instance, the US government agreed with Bank of America on the rules for a pool of up to \$118 billion in financial instruments that B of A could choose to put under the guarantee program. The guarantee would be in place for 10 years on residential assets and 5 years on everything else. B of A would absorb all of the first \$10 billion in losses from the agreed upon initial valuation of the pool's assets. A combination of the FDIC and Treasury would take 90% of the next \$10 billion in losses, with B of A absorbing the other \$1 billion. These explicit government guarantees on financial institutions' liabilities and forbearance from prudential regulations tend to be fiscally costly and these particular policies do not necessarily accelerate the speed of economic recovery (Honohan and Klingebiel, 2003; Claessens, Klingebiel, and Laeven, 2005; and Laeven and Valencia, 2008). If the owners of a bank get a government proposal a precedent is created for banks coping with the same circumstances. This exposes the government to higher sovereign risk. The probability of default may also increase and the long time alleged risk-free rate may not exist anymore. A statement that the government will stand by its guarantee has less credibility. Shareholders need an explicit guarantee incentive to provide additional capital when a serious crisis erupts. Shareholders may be reluctant to conditions of the deal. This may cause a conflict of interest between shareholders and other stakeholders.

In case of a blanket guarantee the risks are unlimited because the lender is permitted to make loans without prior approval. A blanket guarantee is a policy tool that may buy some time for policymakers, about 53 months on average, to implement a credible policy package. Laeven and Valencia (2008)

¹ La Republica de Costa Rica and Central Union Trust Company of New York as Trustee, Trust Agreement, November 1, 1926.

examine the effectiveness of blanket guarantees in restoring depositors' confidence and find that they are often successful.

Governments of many countries identify failing corporations with a failing government. They do not like the “creative destruction” framework introduced by Schumpeter. Avoiding unemployment and social unrest is one of their main targets, even if it comes at a high price. After many years of consolidation several banks have more assets than the government can guarantee in case of an emergency. This number is still increasing. While banks are consolidating, politicians are talking about “too big to fail” and shutting down many small banks.

Guarantees only cost taxpayers money if the risks actually set in and the compensating assets got a lower value. It is highly likely that billions of promised guarantees have to be paid if future recovery is unlikely. The US car industry is one of the best examples: Overproduction in a high wage country led to losses for several years. In the banking landscape we might see so called zombie-banks which are kept alive by government money injections or evergreen lending with interest-only loans without repayment. Zombie banks may cause unfair competition and inefficient markets because they are supported by the governments. The European Union states that if a bank needs state support for more than six months, it has to be restructured substantially. Commerzbank for example is compelled to sell 45% of its assets. The number of activities has to be reduced and they have to show how to become viable again. A distinction is made between banks that would fail instantaneously otherwise and banks that are sound but have some toxic assets. The latter need less restructuring, unless they got support larger than 2% of their risk-weighted assets, the minimum amount of capital that is required within banks and other institutions, based on the riskiness of the various assets.

2.4 Nationalizations

Nationalization is a radical step to protect the bank and part of the stakeholders against other stakeholders. In the nineties of the previous century Sweden solved a credit crisis by temporary nationalizations. It might be of national interest to secure savings and stabilize the payment system. At the same time shareholders might be zeroed out. Who determines when this measure is justified? What are the criteria and who scrutinizes it?

According to Ken Rogoff and Joseph Stiglitz (2009) many large US banks are technically bankrupt and need to be temporarily nationalized. If individual major banks are substantially undercapitalized they need to be rescued with such large capital infusions that it would make sense to nationalize them instead. The good and the bad assets need to be separated and the banks should return to their basic functions. The so called bad bank model is also mentioned by Nouriel Roubini. One of the main objections against a bad bank model which might be introduced in Germany too is the size of the losses involved for the current

owners of the bank. It might be hard to find parties interested in buying toxic assets. In the US the FDIC has the authority to create a bridge bank. A division of a bank with a critical function for the economy might be taken over by a bridge bank and can be sold later on. Without a bridge bank it would be difficult to keep the banks operating during a default.

The federal US government may acquire large minority positions in the nation's largest banks, but has no plans to run the institutions. Nationalizing banks creates high legal uncertainties. According to Douglas Elliott (2009), scholar at the Brookings Institution, a liberal think-tank, full nationalization may be needed for one or two of the larger US banks. In Germany a law temporary authorizes the government to buy shares of suffering banks. In the United Kingdom, Austria and Ireland the government has already the possibility to nationalize listed financial institutions.

In the current economic environment many countries are confronted with sovereign risk. Part of the risk of the private sector is shifted to the government and consequently the probability increases that a government ultimately refuses to comply with the terms of its own loan agreements. Although sovereign nations do not go broke, they can assert their independence in any manner they choose and they cannot be sued without their assent. From the investors' perspective this means that fixed returns offered by the government can no longer be treated as risk-free.

After the analysis of the banking characteristics in the empirical section we will do a multiple regression of up to 6 factors possibly influencing the likelihood of a sovereign debt crisis. Each of the factors describes processes occurring in different stages and order preceding or during a crisis. These factors provide first clues whether or not governments should act or refrain from it:

- Long term trend in debt to GDP
- Sovereign guarantees including blanket guarantees.
- Deposit insurance
- The number of banks
- Institutions closed as percentage of bank assets
- Receivership or more specific nationalizations.

The research hypothesis that summarizes all the elements above is stated as follows:

H0: The long term trend in public debt, sovereign guarantees, deposit insurance, number of banks, closed institutions and receivership substantially increase sovereign financial risk.

The possibility of a sovereign debt crisis (SDC) may be stated as follows:

SDC = f(Long term trend debt to GDP, Blanket Guarantees, Explicit Deposit Insurance, Number of Banks, Institutions Closed as Percentage of Bank Assets, Nationalizations of banks)

The long term trend in debt to GDP and institutions closed as percentage of bank assets are expressed in percentages. The number of banks is an actual number, while the others including sovereign debt crisis are regarded as binary variables.

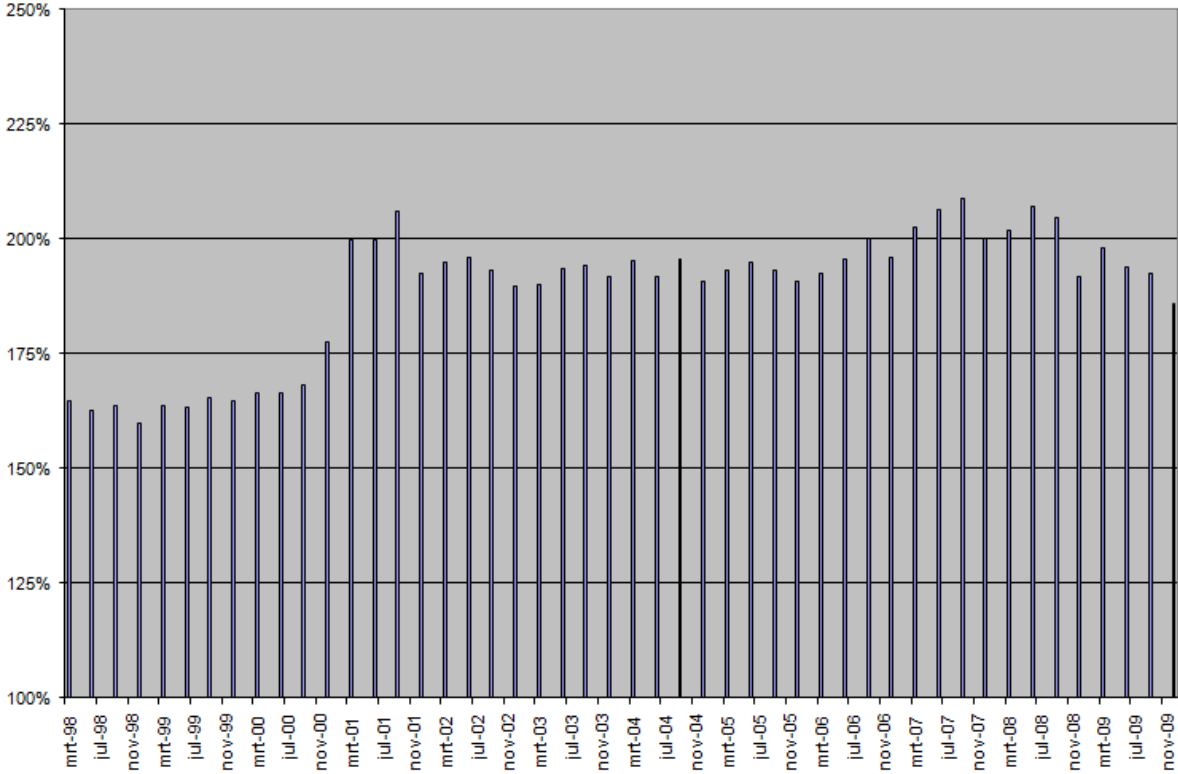
CHAPTER 3 Empirical Analyses

In the methodology section we have seen that the number of banks follows a parabolic pattern. This is also true for the optimum in the leverage of banks. During run-ups in asset prices regulators hardly worry about leverage at banks. The disadvantages of high leverage are often stressed because with high leverage even a minor shock may wipe out all equity. Only seldom are the low leverage comparative disadvantages accentuated. In a highly competitive environment low leverage also increases the possibility of a failure. For this research, we will focus mainly on low leveraged banks since it is also difficult to keep them profitable and operating during normal market circumstances. These banks face higher liquidity risk and have fewer opportunities to do firesales. Large banks can afford to do firesales but they may be faced with risky off-balance positions. Although the exact conditions for a shutdown are unknown, regulators pay attention to the assets to deposits rate too instead of just the equity of the bank. Equity can change dramatically over time and can be manipulated easier by public offerings and disguised government or central bank support.

Tables 3A en 3B sort asset to deposit ratios for a selection of US banks at the end of 2009. Besides deposits banks may attract additional capital. Other types of debt require higher returns and diminish the margins banks will earn. There are no banks with extreme leverage as far as these banks are concerned. In other countries banks have up to 5 times more assets than deposits. In fact it is not just the leverage but the riskiness of assets at each bank that matters. When the value of assets drops below the amount of deposits a bank fails. At the bottom of the list the distance to failure is only 20% of assets. Regulators often act before this point is reached. In the dataset we included both the largest commercial and regional banks. Since we did not include all banks, we can state that the largest commercial banks own up to 10% of all the risky assets owned by both commercial and regional banks. This is a reasonable number with regard to the too big to fail doctrine. After regressing Asset Size on Leverage we find highly significant results for the full sample. When splitting the data in regional and commercial banks, the higher leverage for larger banks remained only significant for commercial banks.

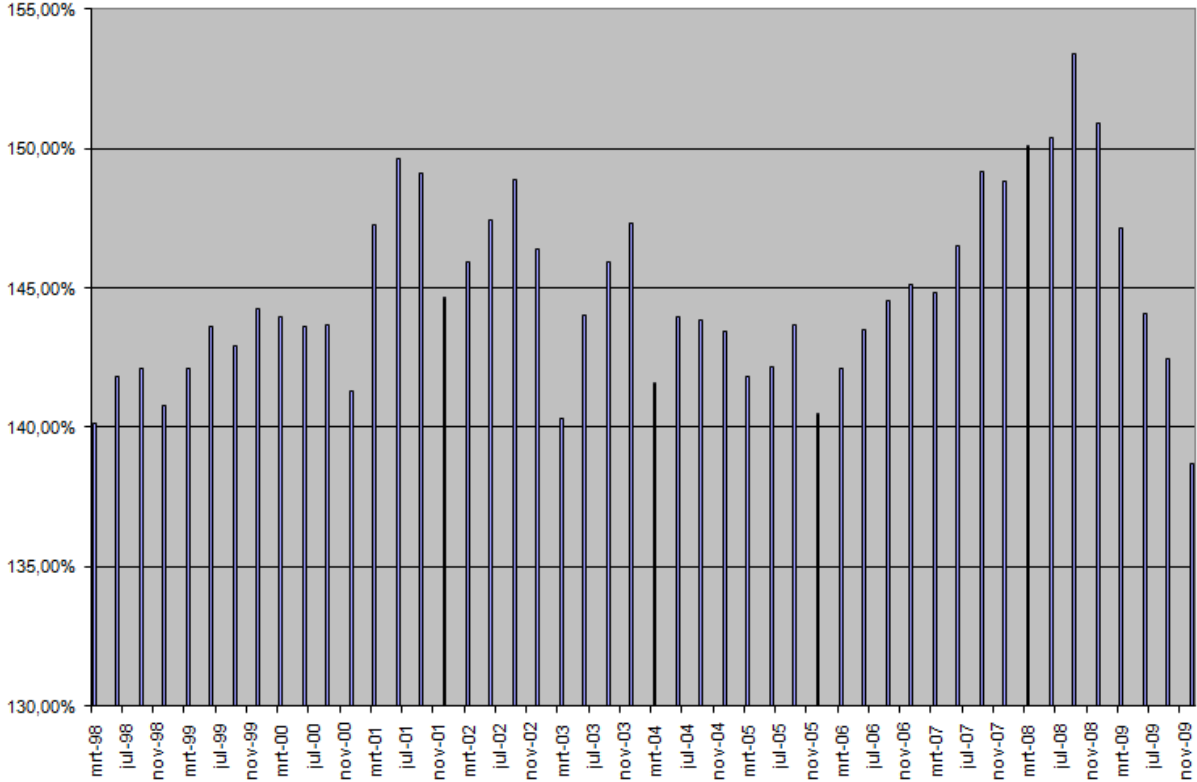
We need to aggregate the data and view it in a longitudinal way to check the soundness of the system. Current and historical analysis at the individual bank-level is also necessary for e.g. regulators to reveal trends and to take precautionary measures. The asset to deposit rates in the sample can be weighted by the respective asset sizes of the banks. We have to keep in mind that the interaction between banks, like interbank market or overlapping exposure, cannot fully be caught by asset weighting. After applying weights and multiplying by asset to deposits rates, we obtain the following chart:

Figure 1. Asset-size weighted Asset to Deposit Ratio for US banks.



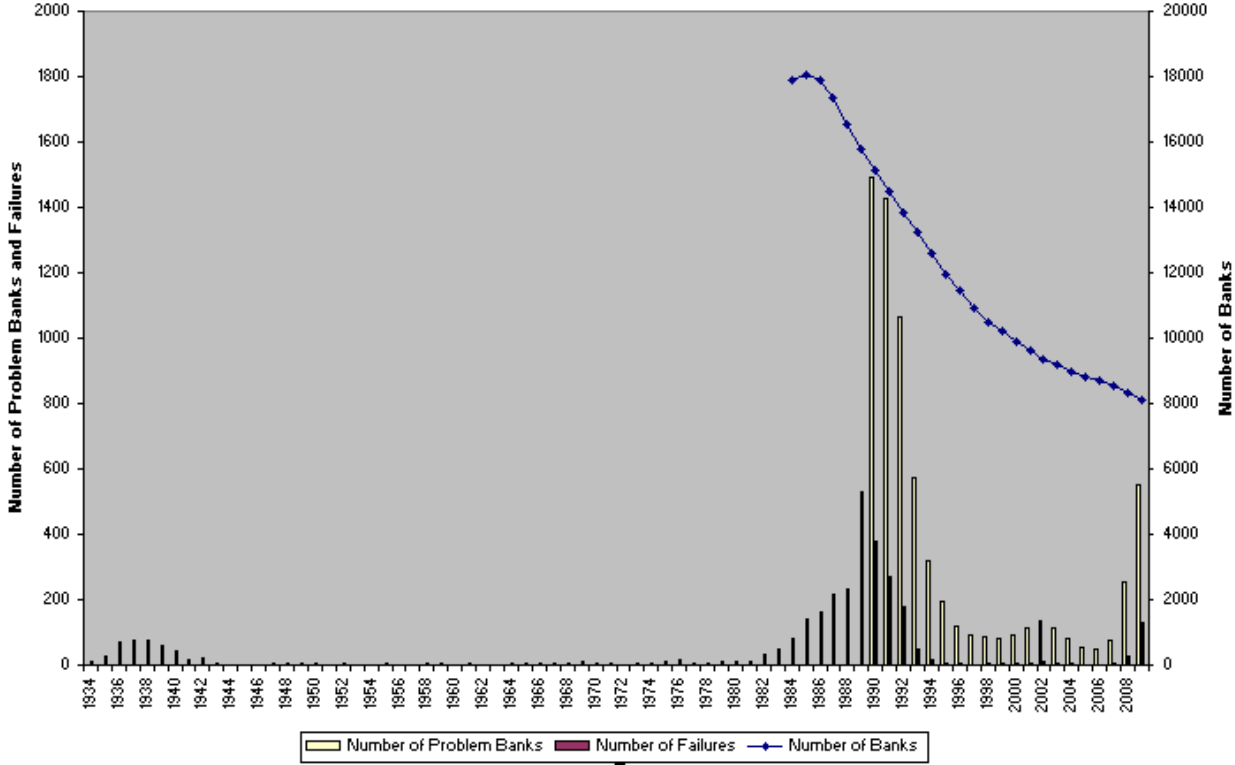
From the start of the new millennium the ratio remained quite stable at a higher level than before. However, there is a tendency towards lower leverage starting in 2008. This might be the result of both higher consumer savings rates leading to higher deposits and lower assets due to the housing crises. In spite of the stable trend, there may be a lot of harm caused by individual banks. An upward sloping trend for an individual bank may be counterbalanced by a decline for others in this aggregate. Hence we need to decompose this aggregate by removing weights and applying central tendency measures.

Figure 2. Median Asset to Deposit Ratio for US banks.



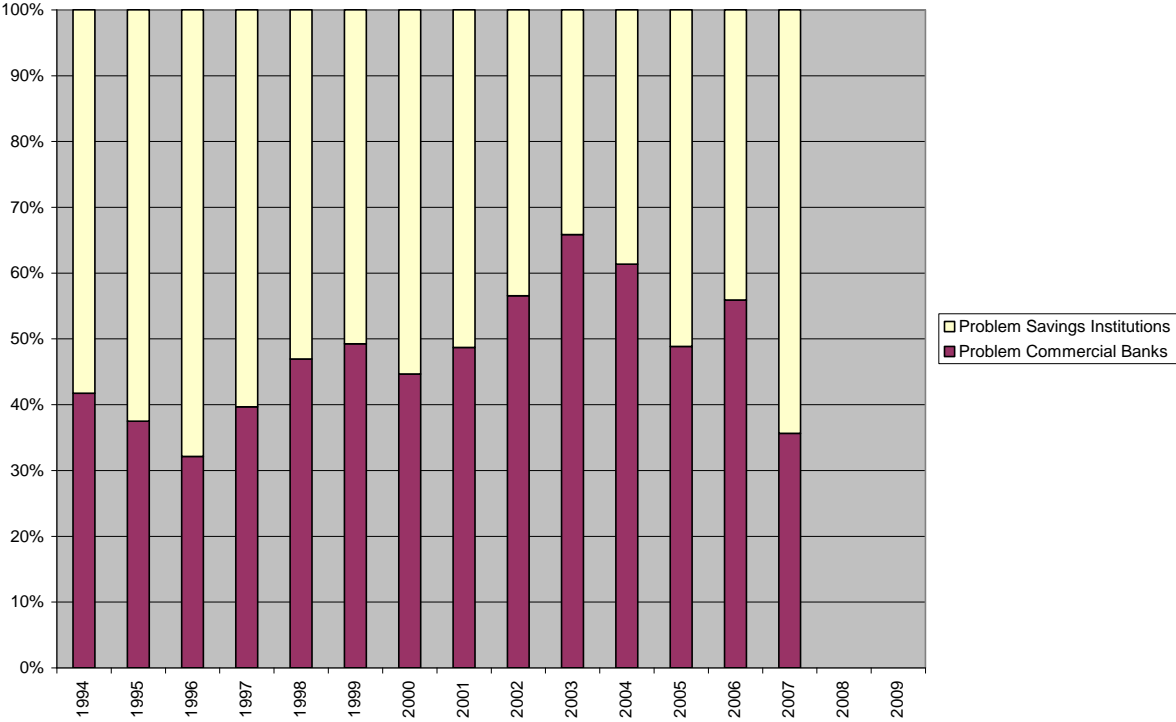
This time we select the median asset to deposit ratio and at first glance we see much lower values. From here we can conclude that there are many smaller banks with a limited amount of assets, less firesale opportunities and much closer to failure. The failure of many smaller or regional banks may have spill-over effects on larger commercial banks funding the many smaller banks.

Figure 3. Number of Problem Banks and Failures versus Banks over time.



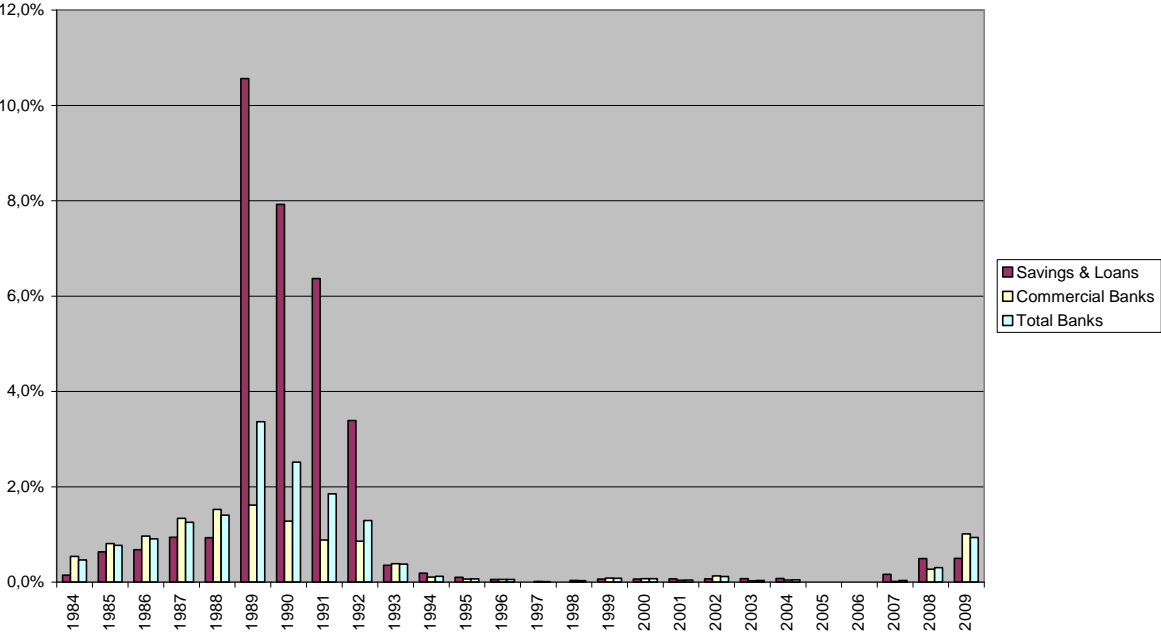
There are much more commercial banks than savings & loan institutions. A chart can be drawn of the relative share of savings & loan problem institutions versus commercial bank problem institutions. In figure 4 we see from mid 1990s the share of commercial bank problem institutions moving upward. This trend is mainly caused by international developments, like the Asia-crises and later on the dotcom-bubble where the larger banks are more exposed to. Contrastingly the total number of problem banks and failures was relatively low in this period when compared to the start of the 1990s as we saw in the previous figure. From 2003 we see a shift to more problems at the savings institutions. This possibly points to the consequences of a new real estate bubble. Almost 50% of outstanding loans of smaller banks are in commercial real estate. For the largest banks this is a mere 17% (IEX, 2009).

Figure 4. Problem banks decomposed in Savings Institutions and Commercial Banks.



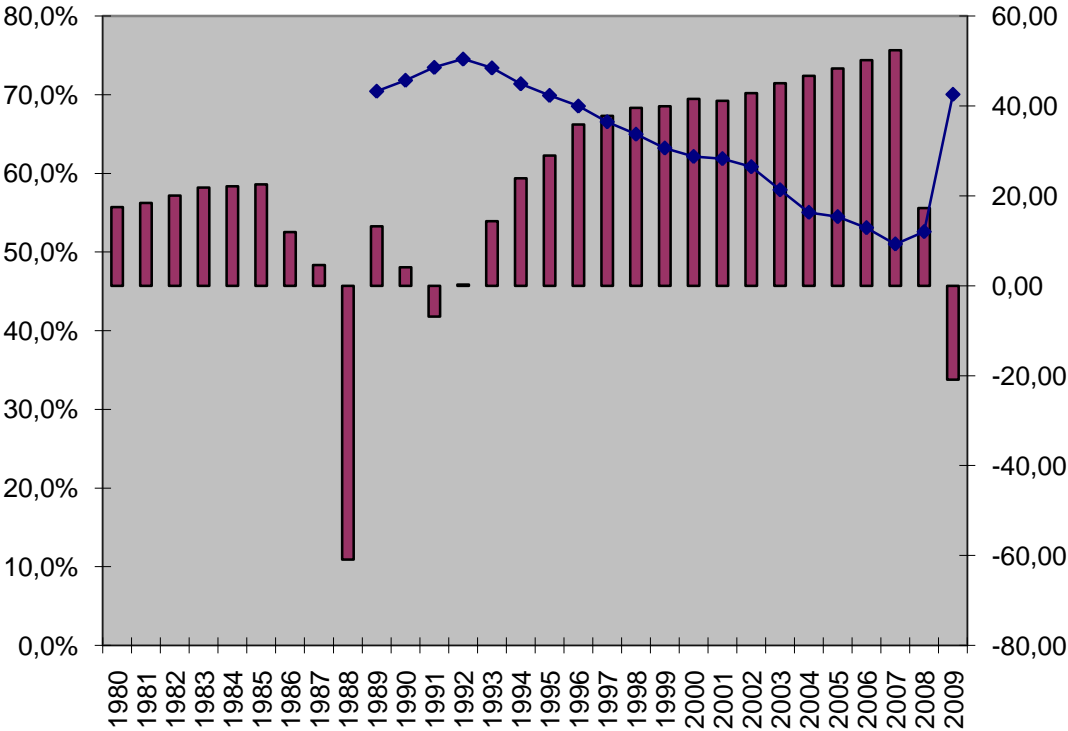
In the United States the number of bank failures is still low when compared to the Savings & Loan-crises at the end of the 1980s. In the 1980s Savings & Loan institutions should keep a minimum amount of real estate due to regulations and were closed during and after the real estate bubble. During the peak of the S&L crisis the number of problem institutions add up to a tenth of the total number of banks. More than a quarter of these problem institutions failed.

Figure 5. Bank Failure Rates over time decomposed in S&L and Commercial banks



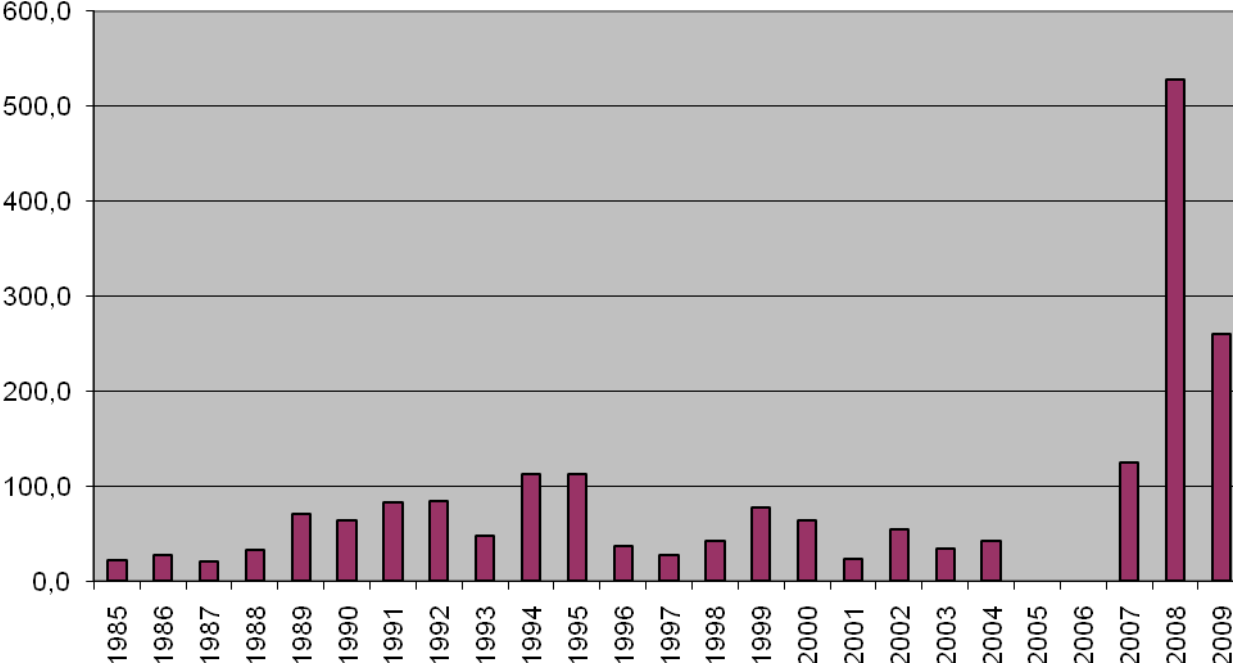
In the next figure the FDIC fund balance is compared to the deposit insurance rate. Unfortunately there is no data on the insurance rate available prior to 1988. A clear negative correlation is visible. Sudden depletions of the fund balance are accompanied with a sharp increase in the insurance rate, while gradual increases in the fund balance lead to lower insurance rates. The third explaining variable might be excess capital. Depositors are willing to take additional risk with regard to their savings if they have large amounts of capital. In times of crises they seek more protection. The fund itself has some contingent loss reserves based on estimated failure probabilities of problem banks. These data are not always reported and can hence not be analyzed. At the end of the 1980s the US government had to refund the FDIC balance. The trigger for systemic risk would be higher if there would be no refunding. Refunding leads to higher government expenditures. Countries have different debt levels they can absorb preventing sovereign debt crisis due to higher government expenditures. It is hard to prove the actual cause of sovereign debt crises as long as more factors determine their existence as we will see later on.

Figure 6. Percentage deposits insured versus Balance Deposit Insurance Fund in bln. \$.



In one of the previous figures we saw that the number of banks more than halved in the past two decades to 8099. While the bank assets and deposits rose to unseen levels, the median size of failures surged also to levels not even seen during the S&L crises of the 1980s. We still may wonder ourselves if a too high number of banks have become too big to fail.

Figure 7. Median Asset Size of Failures in mln. \$.



Before we move on to the more macroeconomic oriented data we will explain the sources where the various data can be obtained. At the microeconomic level the bank failure data is taken from the FDIC website (www.fdic.gov). The bank asset and deposit data are based on Thomson One Banker. Most of the data about countries involved in banking crisis is derived from Laeven and Valencia (2008), Reinhart and Rogoff (2008), Kaminsky and Reinhart (1999), Caprio Jr. And Klingebiel (1999), IMF World Economic Outlook (1998), Lindgren, Garcia and Saal (1996) and the Wall street Journal, October 22, 1998 and July 27, 1999. Many of these sources mention the starting dates and total cost in terms of output loss. Only a few report the exact durations of the crises. Pointing to the start of a crisis seems to be easier than marking the moment a crisis is resolved. Lindgren, Garcia and Saal (1996) following Sundararajan and Baliño (1991) make a somewhat arbitrary distinction between banking crisis and significant banking problems. They refer to cases with runs or other substantial portfolio shifts, collapses of financial firms, or massive government intervention, as crises. Extensive unsoundness short of a crisis they termed significant banking problems. For this thesis we suffice with any event called banking crisis.

Information varying from sovereign defaults to year of debt rescheduling is based on Sturzenegger and Zettelmeyer (2006), World Bank (2002), Beim and Calomiris (2001), and various IMF Staff reports. From the extended Laeven and Valencia (2008) database the following binary variables are drawn: Blanket Guarantees, Explicit Deposit Insurance, Nationalizations and Sovereign Debt Crises. The number of banks and the percentage of institutions closed are derived from the same source. Although to some extent the same data is used by Laeven and Valencia, their purpose is more directed towards explaining and describing variables rather than analyzing the influence on other variables like Sovereign Debt Crisis.

The number of sovereign debt crises is low compared to the number of banking crises. The wrong conclusion would be that there is a low correlation. Interestingly the number of post 2000 sovereign debt crises seems to be accelerating. We have to avoid the pitfalls some rating agencies made of estimating sovereign debt crises based on a too short track record. To some extent it would be possible to add a number of observed sovereign debt crises during the current global crises, but simultaneously it might be a bit arbitrary to do so since SDC is our outcome variable. There is also no agreement in literature which countries currently are involved in a SDC.

At the macroeconomic level the Public debt to GDP ratios used for estimating the trend in debt are based on data available at the website of The Economist (2009), the website of official government agencies like TreasuryDirect (2009), the OECD Factbook 2009 and its earlier versions. The OECD Factbook covers almost two decades of history on this variable and includes future expectations, while The Economist publishes only one decade, but more frequent updated data. The way debt and GDP are calculated for each specific country makes less difference if only the relative changes are considered and the definition of both remains the same over time for each specific country.

The blanket guarantee variable indicates whether or not authorities introduced a blanket guarantee on deposits (and possibly other liabilities). Sovereign guarantees are closely connected to the general trust in the banking system and hence have influence on the number of problem banks and the size of assets at failing banks. Problem banks are troubled institutions whose regulatory ratings have been downgraded due to issues related to liquidity, capital levels or asset quality. Bank failures can be evaluated for the system as a whole, but it might hide major shifts between bad and good banks. Bad banks may deplete insurance funds and if large enough cause systemic risk because of leverage and possible fire sales.

Data for the deposit insurance variable are based on Demirguc-Kunt, Kane, and Laeven (2008) and IMF Staff reports. This variable indicates whether or not an explicit deposit insurance scheme is in place at the start of the banking crisis. Introduction of deposit insurance should have ended and prevented bank runs in many countries, but it simultaneously caused a higher degree of risk taking behaviour. Deposit insurance arrangements originating after the first year of the crisis are ignored for this thesis. During a flourishing economy bad loan provisions and leverage to equity of banks are often underestimated. Contributions to deposit insurance programs may have been too low. Many crises like in Turkey 2000, Ecuador 1999 (Laeven, 2008), Argentina 2001 started with a common shock to series of smaller, less diversified banks. These countries possibly guaranteed bank deposits and loans and bailed out banks prior to their own default. In the 1930s about 10763 out of 24970 US banks went bankrupt. After many mergers and also quite some failures the number of banks in the USA is now reduced to 8099, whereof 6911 commercial banks and 1188 savings & loan institutions. Many of these banks are small regional banks. These banks have less or none international diversification. These banks absorb the first shocks in

their domestic country, before spreading to the larger banks. Larger banks may also expose themselves to common shocks. Austrian banks for example lent up to 70% of Austria's GDP to countries in Eastern Europe. Although the debt to GDP ratios for some countries are already exceptionally high, the guarantees provided by the governments are not even included. In October 2008 the government of Germany together with some German banks guaranteed already over 102 of credit for Hypo Real Estate. The same government also made a reservation of 80 billion euro's for direct capital infusions in troubled banks besides 400 billion of other credit. According to Roubini (2009) between guarantees, liquidity support, and capitalization, the US government has provided between \$7 trillion to \$9 trillion of help to the financial system.

The number of banks in year t is also collected, where t is the starting year of the crisis. A large number of banks may be a proxy for either the size of the country, the level of economic development and integration of banks or the degree of competition between banks.

A possibly more comparable variable is institutions closed from t to $t+3$. This variable indicates the share of bank assets (in percent) liquidated or closed during the years $[t, t+3]$, where t is the starting year of crisis. Closed institutions show a higher degree of unsoundness compared to banks facing liquidity issues, because it reveals that either the business model is not viable or that management is incompetent to keep the bank operating.

Despite all the processes with guarantees and bank failure prevention, bank failures still happen. If the regulator cannot find a receiver for the assets and deposits of the bank, the regulator often will act as a receiver. If banks are too large for a takeover the receiver may decide to nationalize the bank. Receivership is closely related to the failure rate because regulators prefer closing down failing banks gradually in order to prevent fire sales.

The last variable is sovereign debt crisis. This variable indicates whether or not a sovereign debt crisis occurred during the period $[t-1, t+1]$, where t denotes the starting year of the banking crisis.

We start the regression of the 41 banking crises dataset with 35 observations where all data are available. Only 5 out of 35 resulted in sovereign debt crises. The same analysis will be executed a couple of times for a different number of variables. While applying regression techniques we have to conclude that the small number of successes or events happening has a high impact on the significance of the covariates. Getting a more extended dataset requires quite some historical analysis of banks and countries at the expense of the possibility of getting an ex post facto hypothesis.

For the second regression the number of explaining variables is decreased to 4, while the sample size increased to 36 due to data availability. With a p-value of 0,17 the number of banks is the least insignificant variable in the unrestricted regression. The positive coefficient still might be the result of few observations and some extreme observations leading to sovereign debt crises. This variable is eliminated, because the sign of the coefficient is highly influenced by one observation: The number of banks in Russia. If the correlation is true, it still can be explained manifold.

The long term trend in debt to GDP variable is eliminated because it is highly insignificant. In our analysis we used this ratio as explaining variable to control for non-crises effects like interest rates and fiscal imbalances. Earlier cited research stated already that the amount of debt does not change the (perceived) likelihood of default. As sovereign debt crises are caused by more factors, it is not astonishing that we did not find a clear relationship between debt to GDP ratio and sovereign debt crises. Countries may also run highly into debt during a certain period causing increased sovereign risk without a sovereign crisis. As long as the trend in both long term public debt and GDP remain the same, a sovereign debt crisis seems quite unlikely. Whenever the trend in debt to GDP deviates from zero, it should be more likely that a sovereign debt crises emerges either due to the impossibility of attracting additional funding after an extreme rising trend in debt accumulation or after a sudden stop in debt reductions of a government. In the regression we used the means of the annual deviations for each country and the regression showed that this constant deviation from zero is insignificant for explaining sovereign debt crises. Hence regular budget deficits and interest rate effects do not determine the countries ultimately involved in sovereign debt crises. Later on we will show that extreme positive deviations from the mean are connected to banking crises at least for the United States and likely for other countries. Extreme deviations from the mean most definitely determine shifts in sovereign risk.

The third sub-sample eliminated the Number of Institutions closed as percentage of bank assets. This variable is one of the least insignificant variables and that is why we keep it in the second regression, but it is also less subject to ex ante regulation and ex post type of intervention by authorities. The exclusion of this variable gives 39 observations in the dataset. Each of the remaining variables may be considered as a policy instrument for resolving crises. Tables 2A-2C shows the results of the regressions.

In the following sections we will describe the influence of the analyzed factors. Tests of significance are used as a yardstick to estimate the statistical significance of associations between variables. They determine the associations that may not represent genuine relationships in the population under study. In the underlying multiple regressions many variables seemed to be insignificant. Significance can be measured by sampling error. Sampling error is an inverse function of sample size. A low correlation might be significant if discovered in a large sample, where the same correlation between the same variables would not be significant if found in a larger sample. Otherwise, a low number of observations

produce many insignificant correlations, which may become significant if tested with more data. As we stated earlier this may be the case for our Sovereign Debt Crises outcome variable. In order to avoid the sample size effect it may be preferable to break the data down in homogeneous strata and analyze the remaining associations as we did in the Tables 2D-2F. Variables sometimes are only slightly related to each other irrespective of sample size (Babbie, 2007). For this so called substantive significance are no objective tests available. The distinction between statistical and substantive significance is perhaps best illustrated in cases where absolute certainty exists that observed difference is not the result of sampling error. This would be the case when we observe an entire population. If there is no sampling than there is no sampling error.

The third regression contained 41 observations and 3 explaining variables. These variables may be regarded as policy instruments. From the dataset we can conclude how often they are applied when a banking crisis provoked. The dataset is split for each of these controlling variables and the relatedness with sovereign debt crises can be analyzed for each of these factors. The results are shown in Tables 2D-2F. The positive or negative outcome of these relationships is compared to the signs of the components in the regression analysis. We should be cautious with conclusions because of the limited number of sovereign debt crises.

In 30% of the sample blanket guarantees are given. If a blanket guarantee exists the likelihood of a sovereign debt crisis is reduced from 14% to 12%. Blanket guarantees seem to be an effective, unusual instrument for reducing chances of a SDC. Backing by the government should be applied more often! There is not as pressing a need to agree on a valuation as there is with a bad bank solution. Valuation of the assets does matter, but the existence of a cushion where the bank absorbs all losses makes it somewhat less critical that parties agree on current valuations.

In 51% of the cases explicit deposit insurance existed. Deposit insurance does not significantly impact the possibility of a sovereign debt crisis. The sign of the coefficient in the regressions switches easily from positive to negative and the p-values are also pointing to insignificance. Over time many countries became aware of the benefits of explicit deposit insurance and introduced it to increase the confidence in the banking system. As described in the theoretical sections, this encouraged risk-loving behaviour. In case of losses others are committed to contribute in the losses. Remarkably countries with no explicit deposit insurance experience less sovereign debt crises than countries with insurance. A guarantee system often forces peoples to spread their money over multiple accounts or banks. In absence of such a system they would be even more careful and thoughtful spreading their deposits. These systems are in the end backed up by the government. Hence it does not matter if an insurance system exists or not as long as the government functions as backup for the deposits at the banks. In many occasions the deposit insurance

limit for accounts increased over time. Governments assume that by upward adjusting higher potential liabilities are offset by lower bank failure rates based on higher depositors trust.

Nationalizations are the most frequent applied considered instrument. In 59% of the sample nationalizations were used to calm down banking crises. In all three regressions the coefficient was positive. The number of observations kept this variable from being significant. The p-value was as it strongest 0,20. It possibly gained some significance from the variable Percentage Institutions Closed, which was a strong factor in the unrestricted model, also positively related to SDC and omitted in the third regression. In table 2F we see that the application of nationalizations has the largest impact. This factor shows the highest difference in SDC likelihood due to (non)-existence of nationalizations. A Sovereign debt crisis was present in 17% of cases where nationalizations were applied versus only 6% if not. Remarkably, nationalizations seem to increase the likelihood of sovereign debt crises. It may also be possible that governments forced to do nationalizations, already carry high debt burdens or that common shocks delivered worst case scenarios to both banks and governments.

As promised we return to the extreme deviations in the debt to GDP trend. There is a clear correlation between the number of bank failures in the United States and this ratio. From table 4 we can conclude that it is significant at the 10% level (p-value = 0,0612). Unfortunately we do not have bank failure data of all 122 countries to test the significance for other countries. At least we can check if the earlier banking crises mentioned in table 1B coincided with extreme deviations in the short term debt to GDP trend. We take the mean of the short term annual changes and once again compare it to the long term mean. As these observations are already confirmed to be banking crises we can analyze the differences in means without significance tests. It becomes different when we do the process in reverse order and try to estimate the countries currently involved in banking crises based on the differences in means. Therefore we apply the 5% and 10% significance level to separate normal deviations from abnormal deviations during the 2007-2010 period. We have to seek for qualitative evidence of banking crises for each of these countries. It would take too much time to analyze new data for all countries, so we will do so for the 5% group only. Besides that, it is difficult to obtain an up to date banking and sovereign debt crises dataset where the majority of economists agreed upon existence and duration and it would be arbitrary to state these crises as such for this research.

Many industrialized countries currently experience the same common shocks in housing prices and hence in the banking sector and run into extreme deficits. Only a few countries have close to zero debt. These countries require more detailed analysis as a mediocre absolute short term increase in debt is extreme in percentages even if this increase is preceded by large long run debt reductions. The closer to zero the ratio is, the larger the change in terms of percentages.

Table 5 shows the differences between the debt to GDP trend during banking crises and their long run trend. The median annual trend of the 11 observations was +12,0% ranging from +3,0% in Hungary (1991-1995) to 53,8% in Uruguay (2002-2003). More interesting are the current evolutions. From the start of the new millennium we see an acceleration in debt to GDP in OECD countries which is absent in the Euro area. Outside Europe the crises seems to be more severe. The 2007-2010 annual deviation from the long run trend is close to the 10% significance level (p-value = 0,1161) for the OECD, while the Euro area currently does not deviate from the median trend.

Figure 8. Debt to GDP in OECD countries from the start of the 1990s.

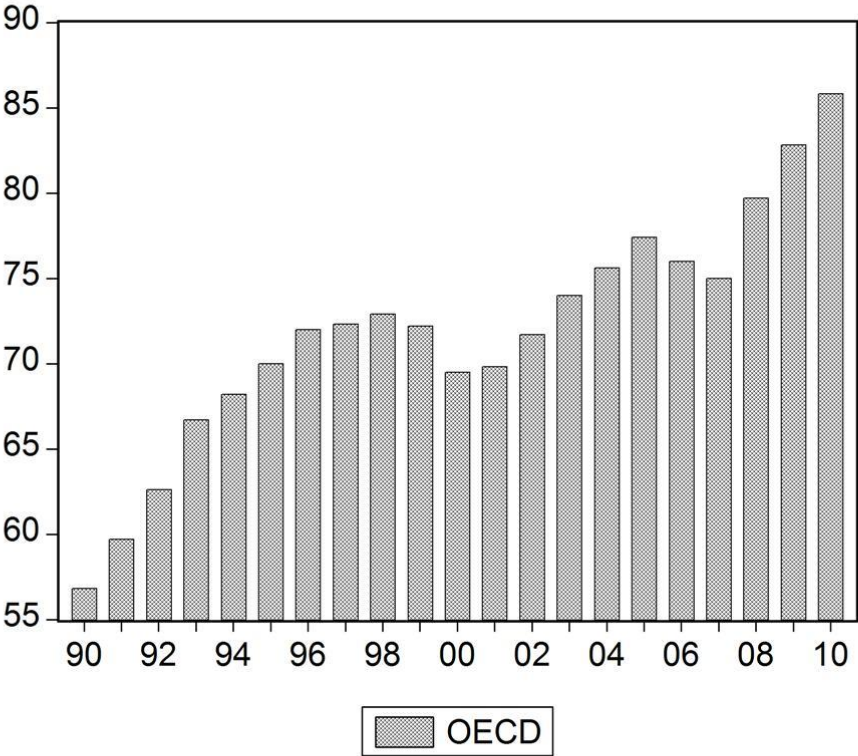
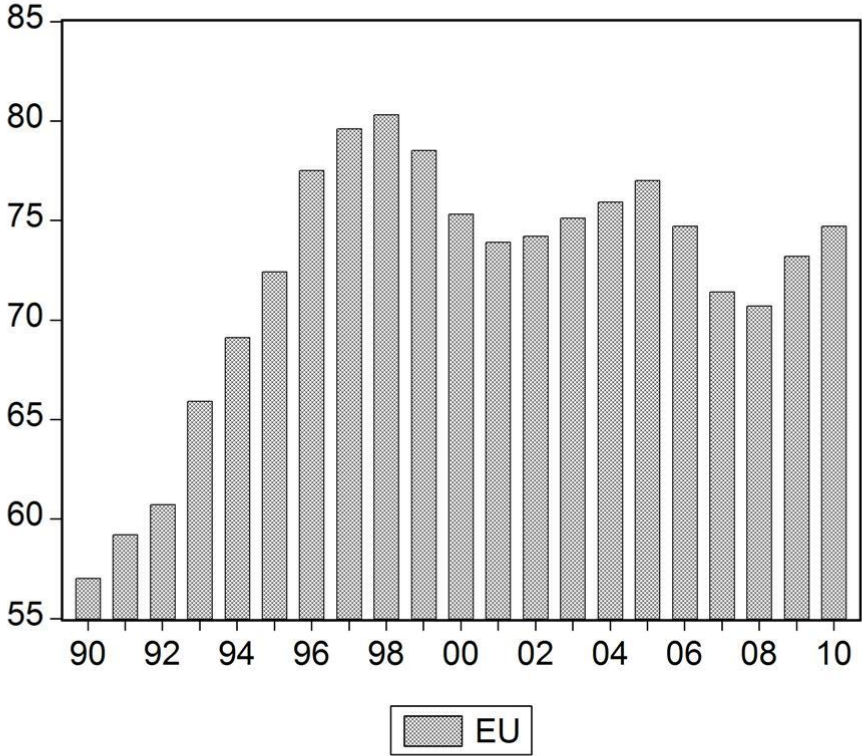


Figure 9. Debt to GDP in Euro area countries from the start of the 1990s.



The final question is if there is evidence to assume that the significant debt to GDP deviations are caused by financial rather than fiscal factors. We will describe the conditions for each specific country that had an increase in the ratio significant at the 5%-level during the 2007-2010 period. The included countries are reported in Table 6 and will be described below in alphabetic order.

Bahrain

The Island, or better the Kingdom consisting of 33 islands, has lived largely of fishing and pearl diving. Today, the country’s most attractive business is banking. Banking contributes 27 percent to the country’s GDP and some 14,000 employees are working in the financial sector. Bahrain was the first Gulf country setting up an independent financial regulatory body for the banking industry. In 1973, two years after the achieved independence from the UK ruling the Bahrain Monetary Agency (BMA) was formed. As of June 2009 there were about 150 banks. In contrast to other countries, Bahrain Banking was still achieving profits in 2008 thanks to good capitalization and capital liquidity. Losses occurred mostly at banks which were involved in the US subprime market, such as Arab Banking Corporation and Gulf International Bank. Both banks benefited from the support of their government shareholders, but have had to rethink their business models. Awal Bank defaulted in June 2009. The International Banking Corporation (TIBC) had to restructure and the BankMuscat International (BMI) also faced problems originating from stakes in Saudi Arabian institutions. The impact on the financial sector in Bahrain was limited because most of the failed banks were investment banks with loans from international banks. The Central Bank of Bahrain

protected the bank in early stage for larger shocks by capping the real estate exposure. The trend in debt to GDP deviated significantly from the longer trend. The ratio of debt to GDP was stable after many years of declines. The mediocre banking crises resulted in consolidating government balances not leading to increased sovereign risk.

Belgium

In the autumn of 2008, the financial crisis hit also Belgium severely. The National Bank of Belgium had to take emergency steps to supply additional liquidity to financial institutions facing severe pressure. The largest bank of Belgium at the time, Fortis, was partially nationalised on September 28, 2008, with Belgium, the Netherlands and Luxembourg investing a total of € 11.2 billion in the bank. The Dutch part was nationalized, while the Belgian part was sold to the French bank BNP Paribas. On September 30 the Belgian, French and Luxembourg governments stated that they would put in € 6.4 billion in Dexia, one of the other major Belgian banks, to keep the bank afloat. The problems at Dexia mainly stemmed from a multi-billion loan to the troubled German bank Depfa. In the same period the Belgian federal government injected 3.5 billion euro in KBC in order to strength its existing capital buffer. Later on the bank received another 2 billion euro of capital by the Flemish regional government and access to a 1.5 billion euro standby facility, which it can draw on to further support capital levels in the future. For Belgium the year 2008 clearly was the end of a 15 year period of steady debt to GDP reductions.

Bosnia and Herzegovina

In the post-war period 2004-2008 the average real credit growth was 19%. Prolonged rapid credit expansion raised concerns about possible uncontrolled accumulation of credit risk by banks. Economic activity has been on the decline since and the GDP contracted an estimated 3.5 percent in 2009. As economic activity dropped, fiscal imbalances that emerged already in 2008 were further aggravated. At the end of 2008, there were 20 banks with a banking license issued in the Federation Bosnia & Herzegovina and 10 banks in Republika Srpska. The only problematic banks are two insolvent banks (Privredna Bank and UNA Bank) which have no active participation in the market. Foreign-owned banks dominate the banking sector. Up to 95% of total assets is owned by foreign banks. Liquidity management and financing is mostly managed through connections between local subsidiaries and foreign parent companies. At the end of 2007 the central bank was prompted to tighten reserve requirements in order to slow down credit growth. The reserve requirement rate was hiked from 15% to 18%. Simultaneously, supervision authorities introduced additional prudential measures aimed at more reliance on domestic funding. As we have seen in Iceland the system is exposed to high exchange rate risk. The first wave of the ongoing crisis hit the banking sector when depositors started to withdraw deposits from the banks in October, when KM 814 million or 6.3% of total deposits were taken out of the banks. Although resident banks were stable and without any losses from the international financial crisis, households were alerted with events in other countries and market downgrades for large international banks. This episode did not

last too long and confidence in banks was restored after two weeks. The central bank of Bosnia and Herzegovina (CBBH) reacted promptly and reduced the reserve requirement rate from 18% to 14% in order to provide additional liquidity and compensate the withdrawn deposits. The CBBH continued with the relaxation of monetary instruments. Reserve requirements have been further lowered to 10% for long-term liabilities (and 14% for short-term liabilities) and new foreign borrowings were exempted from the reserve requirements. The government increased the deposit insurance limit. In federal Bosnia and Herzegovina it was raised from KM 7,500 to KM 20,000 in late 2008. In Republika Srpska it was raised from € 3,250 to € 10,000 in early 2009. The debt to GDP ratio over time was highly influenced by the rapid credit expansion. The decline in profitability led to large fiscal imbalances. Even if there were larger shocks in the banking system, most of them would have been absorbed by foreign banks.

Chile

The fact that Chile experienced earlier banking crises made them more prepared to the current crises. Anti-cyclical as well as proactive measures have been taken to limit the damage of a new crisis. Chile was hit by the collapse in world trade and commodity prices, notably the decline in copper prices by more than 50%. The Chilean banking sector is rather small. The global financial crisis forced Chilean banks to limit lending. In the second quarter of 2008 44% of banks reported tightened credit standards. Chile's banking sector profit fell 55.5 percent in December 2008 from November on lower loans and increased provisions to cover credit losses amid the global economic slowdown. Banco Central de Chile reacted vigorously in the first half of 2009 by reducing the interest rate from 8.25% to 0.5%. The government launched a fiscal stimulus plan worth \$ 4 billion and extended credit guarantees by state agencies by adjusting capital requirements. The government state owned BancoEstado, which is the fourth ranked bank in number of clients, was recapitalised. The increase in debt to GDP in terms of percentages was large in the 2007-2010 period, but the country had the equivalent of more than 30 percent of GDP available to shore up the banks and defend the peso if needed when compared to the pre 2000 era.

Hungary

Increased competition for Foreign Direct Investment reduced the growth rate in Hungary in the last couple of years. Banks amidst other companies faced lower profitability and lent only to corporations with better creditworthiness. The uncertainty of the crisis caused a decrease in investment. Low level household savings and high loan-to-deposit ratios led to increases in both non-performing loans and loan loss rates. The government tried to reduce the debt burdens of banks temporarily and provided credit guarantees mainly through Garantiqa Zrt. At the end of 2009 total loans extended with Garantiqa's guarantee exceeded HUF 630 billion, which is nearly 18 percent of total bank loans to Small and Medium Enterprises. The troubles not only originated from the banking sector. Many local authorities were also on the edge of bankruptcy, as are the Hungarian State Railways and the Budapest Public Transportation Company. The pre-tax profit of the banking sector amounted HUF 306 billion in 2009, up 5 percent on

2008, while financial enterprises recorded losses of HUF 11 billion in 2009. Large part of the debt is indebted in foreign currency. This makes the state and banking sector vulnerable to high rollover risk from external shocks. The European Central Bank made an unprecedented move in bailing out this non-euro state in October 2008 by providing € 5 billion because Austrian banks, which invested heavily in the region were at risk. In November 2008 Hungary received a \$ 25 billion cash injection from the IMF to save it from financial collapse. All in all, the global financial crisis of 2007-2010 aggravated the structural crises starting some more years ago in Hungary.

Iceland

Icelandic banks suffered heavily from the meltdown in the Icelandic króna during 2008 when the high inflation and local currency interest rates encouraged homeowners to take low interest rate foreign currency mortgages. In order to protect the banks against extended nonperforming mortgages and other failing assets the Icelandic government acquired 75% of Glitnir, effectively nationalizing the bank. Politicians were afraid that the banking crisis could end up in national bankruptcy. The parliament responded by approving a bill giving the government the ability to seize bank assets, force them to merge or compel them to sell off overseas subsidiaries. In October 2008 they seized control and nationalized the second largest bank, Landsbanki. The nation largest bank, Kaupthing, got a £ 400 million loan to strengthen the institutions balance sheet. Standard & Poor's lowered Iceland's banking industry country risk assessment, worrying that the cumulative amount of nonperforming and restructured loans could reach 35% to 50% of total outstanding loans. The rapid increase in sovereign debt from 30% of GDP to 111% in 2010 is one of the best examples of sovereign risk originating from a banking crisis.

Ireland

The Irish economy ended up in a deep recession late 2008 when the housing market collapsed. Unlike the British and other European governments who bought stakes in suffering banks, the Irish created a new facility for bad loans. At the end of March 2010 the National Asset Management Agency (NAMA) was created. The government could take over up to € 81 billion of the worst Commercial Real Estate loans from banks in exchange for government bonds and higher required capital ratios (tier 1). With these bonds banks were able to access credit lines from the European Central Bank. This plan was executed after earlier measures did not bring the desired results. Earlier on in January 2009 the third largest bank, Anglo Irish Bank was nationalized after double digit billion dollar losses. The largest two, Allied Irish Bank and Bank of Ireland were recapitalized and partially nationalized. The stake of the government in AIB run into 70% and 40% for the Bank of Ireland. Irish Nationwide Building Society also got aid from the government. The government exposure to the banking sector is large when we take into account that the size of the NAMA corresponds to 2/3 of the country's GDP and that the government guaranteed all deposits on 2 October 2008. About 73% of Irish sovereign debt is held by non-residents. For this and other reasons S&P downgraded the sovereign credit rating from AAA to AA.

Latvia

Despite their modern banking system, which started from scratch with the same technology as western countries, the Latvian economy remains vulnerable. In the 1990s some of the country's largest banks failed and opened the door to a serious bank run. Overspending and contraction once again took its toll in 2008 when the Latvian Privatisation Agency had to privatize the country's second largest bank, Parex Banka. Latvia turned to the European Commission and the IMF and got a € 7.5 billion loan to finance this bailout and fund the fiscal deficit. Unemployment rose to one of the highest measured percentages in Europe (23%). The cumulative default probability of the country rose to levels above 30%. Standard & Poor's downgraded the sovereign debt to BB, which is below investment grade.

Lithuania

The Lithuanian economy is characterized by relative low amounts of outstanding loans and sovereign debt. Foreign investors, mainly Scandinavian, control approximately 87% of the domestic banking sector. All banks were compliant with regard to the minimum requirements. When credit growth declined, the government reacted by adjusting the already low reserve requirements. The cautious banks fearing higher impairment losses despite refrained from increasing credit supplies to households and businesses. The only component increasing was the liability to other banks and financial institutions. The central bank advised the banks to reduce the amount of distributable earnings. The country still has a considerable default probability but has a lower risk profile and better credit rating than the other Baltic state Latvia.

Luxembourg

The size of the financial sector in Luxembourg is disproportionately large. Banking and insurance companies contribute to 40% of national wealth. Deposit taking is limited while interbank lending and money markets contribute the most to bank funding. Within two days Luxemburg carried out two rescue operations. The subsidiaries of Dexia and Fortis were the largest and third largest banks in Luxembourg. The authorities contributed 2.9 billion euro in capital to support them. In addition a one-year guarantee for over 4.5 billion euro was issued in support of Dexia's funding. Prior to this bailout any rescue effort in response to a systemic event would rely on parent banks and possibly their home countries. From now on the axiom that parent companies always support their troubled subsidiaries is called into question. Under an EU-wide initiative the limit on deposit insurance was raised fivefold. As of January 2009, deposits were protected up to € 100,000. At the same time the country has been affected by renewed efforts of large industrial countries to limit bank secrecy and tax evasion. The public debt stock more than doubled during the crises but is still low by international standards.

Netherlands

The Dutch government purchased the Dutch banking and insurance division of Fortis for € 16.8 billion, replacing earlier bailout plans. Fortis bank faced liquidity risk after participating in an expensive takeover

of ABN Amro. The authorities acted on the uncertainty with regard to the future of major financial institutions by raising the deposit guarantee to € 100,000 and guaranteeing € 200 billion interbank loans. This followed the set up of a € 20 billion fund aimed at recapitalizing banks and insurers. In the same roaring October 2008 ING was bailed out with a € 10 billion rescue plan. Half of this amount has been repaid in December 2009. Aegon got a € 3 billion loan and repaid the first billion. SNS Reaal received a € 750 million loan. From time to time the government still has to inject capital in the already nationalized ABN Amro and Fortis Bank Nederland. The total amount exceeds the € 30 billion already. From the taxpayers' perspective the loss on ING is much smaller than on ABN Amro and Fortis Bank Nederland combined. The exposure of the country is clearly influenced by the financial liabilities. Deposit insurance of Icelandic and DSB bank savings contribute to the worsening debt to GDP, which is rapidly increasing to the highs of the late 1990s.

New Zealand

The \$ 489 billion financial system in New Zealand can be divided in registered banks and non-registered banks. Registered banks account for 82% of the system. As a result of the collapse of a number of financial institutions, there was a flight to quality within the financial sector. Notwithstanding these failures the financial system remained reasonably resilient in the face of significant challenges from the global crisis. On 12 October 2008 New Zealand introduced the Crown Retail Deposit Guarantee Scheme levelling the playing field between banks and non-banks. The capital adequacy ratios for each of the five major New Zealand banks appear adequate when viewed against the minimum capital requirements. Four out of these five are Australian banks or subsidiaries thereof. New Zealand banks continued to lend to households and firms, although credit growth slowed. The proportion of loans to deposits is quite high, resulting in reliance on overseas wholesale funding markets. This vulnerability led to the inability of raising cash during several days of the year. The counterpart of large amounts lend is low proportion of investment assets to total assets. This prevented higher exposure to subprime related risk. Easing the monetary policy the Reserve Bank of New Zealand decreased the interest rate from 8.25% to 2.50%. The funding and liquidity risks diminished as conditions in short-term funding markets improved. The Reserve Bank started to remove some of the facilities like the term auction facility (TAF) where banks were able to borrow funds for three, six and twelve months using eligible collateral, like mortgage-backed securities, registered bank bills and government securities. Looking ahead banks will have to ensure they are provisioning for non-performing loans, in line with the high loan to deposit leverage.

Portugal

The Portuguese banking sector is mainly devoted to traditional retail banking. This limits the exposure to other asset markets. High indebtedness of consumers makes Portugal a net importer of capital and vulnerable to risk from wholesale banking. The banking system changed considerably in recent years, with many Spanish banks opening branches in the country. The government attempted to block the

acquisition of Champalimaud by the Spanish Banco Santander, on the ground that its size would be detrimental to the Portuguese financial stability. The European Commission regarded the case as an attempt to protect a national champion and deemed that there would be no negative impact on stability. In the end the merger was completed. More radical adjustments in the banking sector include the nationalisation of Banco Portugues de Negocios, the € 750 million liquidity support to Banco Privado Portugues, loan guarantees to the large banks BES and Millenium, a € 20 billion state-guaranteed debt facility, as well as many other support measures taken. The system is characterised by low capital adequacy ratios. Competition between state owned banks and private banks increased. The government's rating is a key element in determining the ability to support the banking system. The five largest banks account for 75% of the system. The smaller institutions may lose government support if they are unable to strengthen their credit profiles. Large part of sovereign debt (78%) is held by non-residents. Another risk factor is the energy price which constitute up to 50% of the government deficit. The country lost its triple A rating in 1997 and nowadays ranks A- only by Standard & Poors.

Spain

Spanish banks were involved in securitization, but were prohibited by the Bank of Spain to operate as buyer of these complex mortgage-backed securities in many cases. The savings rate of the country is 20% of GDP, which is relatively high, but the Spanish still managed to triple the average household debt level in less than a decade. The banks were able to capitalize on their strong position buying distressed banking assets, especially in the UK and USA. The greatest threat is the collapse of the immense domestic property market. The weakest institutions are found among the country's regional savings banks or cajas, which together comprise half of the banking system. They may be confronted with staggering amounts of bad loans, declines in profitability and solvency ratios. An estimated 800 offices are set to close in 2010, potentially affecting 75,000 out of 300,000 employees in the sector in Spain. New accounting rules may have been misused by the cajas to hide losses by discontinuing marking loans to market. Caja Castilla La Mancha was the first Spanish bailout after Banesto in 1993. Savers started to withdraw money from this large regional bank. A Deposit Guarantee Fund exists, but its € 7 billion is insufficient for any major bailout. Hence the government offered to guarantee € 100 billion of new bank debt and promised to buy up to € 50 billion in bank assets in order to boost liquidity. Like in other countries the state guarantee of bank deposits was raised to € 100,000. It is highly questionable whether these measures are sufficient to cover the damage of ultra high unemployment, expiring unemployment benefits amidst high indebtedness. Prior to the crisis the country had a modest debt to GDP, but it may have been doubled since.

United Kingdom

The large banking industry of the United Kingdom could not prevent damage caused by the credit crunch. The banks are dependent on wholesale funding or on government support in their absence. Between spring and the end of 2008 more than a trillion dollars have been withdrawn from UK banks. In 2007 Northern Rock, the fifth largest mortgage bank admitted financial difficulties and asked the Bank of England for assistance. After a while, this nationalization was followed by the merger of Halifax Bank of Scotland (HBOS) with UK bank Lloyds TSB in an emergency rescue plan. The government now holds a 43% stake in the enlarged group after a £ 17 bailout. Royal Bank of Scotland (RBS) announced the largest rights issue in British corporate history, aimed at raising £ 12 billion to offset write-downs from its ABN Amro purchase. The government injected £ 20 billion to cover mounting losses and received majority ownership of 58%. In return for the bailout, the bank agreed to cancel dividends until loans are repaid, have board members appointed by the Treasury and limit executive pay. Months later the government converted the preference shares to ordinary shares resulting in 70% ownership. The bank still in trouble had no option but to put £ 282 billion of toxic loans into the insurance scheme, taking the taxpayers' stake to 84% through a £ 25.5 billion capital increase with a further £ 8 billion kept in reserve. The stakes of the government are managed by the UK Financial Investments Limited (UKFI). Barclays also was forced to write down several billions and raised £ 18.5 billion, mainly through sovereign wealth funds. HSBC, by far the bank with the largest market capitalization, was able to cope with less government interference although it could access its share of the £ 200 billion Special Liquidity Scheme. During this period Bradford & Bingley was nationalized but Santander bought its deposits for \$ 38.2 billion. The problem for the UK economy is that banks don't want to lend because they know they have got a problem funding it. UK banks need to find approximately £ 440 billion by 2012 to replace maturing debt. This figure includes over £ 300 billion of funding provided by the Special Liquidity and Credit Guarantee Schemes. The Governor of the Bank of England made clear that these schemes will not be rolled over. In meantime the interest rate has been lowered to 0.5% and the limit on guaranteed deposits is raised to £ 50,000 from £ 35,000. Not surprisingly the UK has been put on the negative list by rating agencies and is one of the main candidates for losing its triple A status.

CHAPTER 4 Conclusion and further developments

Previously we examined the consequences of instruments governments can use both in times of normal market circumstances and times of crises. We analyzed the shortcomings and advantages in a theoretical framework of regulation, stress testing, prompt corrective action, rating agencies, interest rate adjustments and sovereign guarantees. Elaborating on these policy instruments we scrutinized the measures taken during banking crises. Nowadays the measures taken by a country are applied or copycat by several other countries. We are most interested in side-effects of banking crisis solutions. In the worst case scenario this might result in systemic risk at the sovereign level. The number of occasions with sovereign debt crises caused by banking crises is low, but rapidly increasing. This relationship needs to be analyzed further since sovereign debt crises may be the result of other items leading to fiscal imbalances. Some countries are able to substantially increase their debt possibly for resolving a banking crisis without provoking a sovereign debt crisis. We carefully concluded that blanket guarantees reduce the likelihood of sovereign debt crises, while nationalizations seem to make the matters worse. At first glance the latter is the most surprising, but it is confirmed by the fiscal difference in losses between nationalized banks and banks capital injections from the government in e.g. The Netherlands and the United Kingdom. It may also be possible that nationalizations happen in the hardest hit countries. The number of banks eventually was dropped of the regression as it was possibly biased by some extreme observations. The percentage institutions closed was removed in later stage too because it is less subject to ex ante regulation and ex post type of intervention by authorities. Earlier regressions showed that higher percentages institutions closed corresponded to higher likelihood of sovereign debt crises. We detected an inverse relationship between deposits and deposits insured and we estimate a relationship between number of problem banks and failures. The asset to deposit ratio described that many smaller banks in the United States are getting closer to bankruptcy. Bank failures in the United States significantly related to the debt to GDP ratio. Changes in debt to GDP during 2007-2010 significantly deviating from the earlier trend were detected in 17 out of 122 countries. Finally we have analyzed to what extent these deviations could be contributed to banking crises and the solutions applied to diminish its impact. Sovereign risk is on the rise, but the damage to the risk free environment is still limited. Shortly it will be good to prevent sovereign crises by applying conditional sovereign guarantees, limiting bank failures and receivership combined with prompt corrective action and maintaining an equilibrium between too big to fail and too small to survive.

REFERENCES

- Arellano, C., 2008, "Default Risk and Income Fluctuations in Emerging Economies". *American Economic Review*, American Economic Association, 98 (3), pp. 690-712, June
- Babbie, E, 2007, 11th Edition, "The Practice of Social Research". Belmont, CA: Wadsworth Publishing Co.
- Bartholomew, Philip F. and Gary W. Whalen, 1995, "Fundamentals of Systemic Risk" in George G. Kaufman, ed., *Research in Financial Services: Banking, Financial Markets, and Systemic Risk* (Vol. 7), Greenwich, CT: JAI Press, pp. 3-18.
- Benston, G., and Kaufman, G., 1995, "Is the Banking and Payments System Fragile?", *Journal of Financial Services Research* 9: 209-40.
- Bulow, Jeremy, and Kenneth Rogoff, 1989, "Sovereign Debt: Is to Forgive to Forget?" *American Economic Review* 79, no. 1: 43-50.
- Calomiris, Charles W., October 1999, *Victorian Perspectives on Financial Fragility in the 1980s and 1990s*, Working Paper, Columbia University.
- Calomiris, C., and Gorton, G., 1991, *The Origins of Banking Panics*. In R.G. Hubbard (ed.) *Financial Markets and Financial Crises*: 109-73. Chicago: University of Chicago Press.
- Calvo, Guillermo A., "Capital Flows and Capital-Market Crises: The Simple Economics of Sudden Stops." *Journal of Applied Economics*, November 1998, 1 (1), pp. 35-54.
- Campos, Camila F.S., Dany Jaimovich, and Ugo Panizza, 2006, *The Unexplained Part of Public Debt*. *Emerging Markets Review* 7 (3), September: 228-243.
- Cantor, R, and Packer, R., 1996, *Determinants and Impacts of Sovereign Credit Ratings*. Available at: <http://www.newyorkfed.org/research/epr/96v02n2/9610cant.pdf>
- Carr, J., Mathewson, F., and Quigley, N., 1995, *Stability in the Absence of Deposit Insurance: The Canadian Banking System, 1890-1966*. *Journal of Money, Credit and Banking* 27: 1137-58.
- Clair, Robert T. and Gerald P. O'Driscoll, "Learning from One Another: The U.S. and European Banking Experience," Research paper no. 9108, May 1991, Federal Reserve Bank of Dallas.
- Cuadra, Gabriel, and Horacio Sapriza, 2006, *Sovereign Default, Interest Rates and Political Uncertainty in Emerging Markets*. Working Paper 2006-02. Banco de Mexico.
- De Bolle, Monica, Björn Rother, and Ivetta Hakobyan, 2006, *The Level and Composition of Public Sector Debt in Emerging Market Crises*. IMF Working Paper no. 06/186. International Monetary Fund, Washington, DC. Available at: <http://www.imf.org/external/pubs/ft/wp/2006/wp06186.pdf>
- Demirguc-Kunt, Asli and Enrica Detragiache, "Financial Liberalisation and Financial Fragility." Working Paper 1917, Washington, D.C.: World Bank, May 1998.
- Dornbusch, Rudinger, 1998, *After Asia: New Directions for the International Financial System*. Conference Series 42. Beyond Shocks: What Causes Business Cycles.

Eaton, Jonathan, 1996, "Sovereign Debt, Repudiation, and Credit Terms." *International Journal of Finance and Economics* 1, no. 1 (January): 25-36.

Eichengreen, Barry, Ricardo Hausmann, and Ugo Panizza, 2005, *The Pain of Original Sin*. In Barry Eichengreen and Ricardo Hausmann, eds., *Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies*. Chicago: University of Chicago Press.

Elliott, Douglas J., 2009. *Bank Nationalization: What is it ? Should we do it?* Washington, DC: The Brookings Institution. Available at:
http://www.brookings.edu/~media/Files/rc/papers/2009/0225_bank_nationalization_elliott/0225_bank_nationalization_elliott.pdf

Evanoff, D.D., Kaufman, G.G. and LaBrosse, J.R. (eds), 2007, *International Financial Instability, Global Banking and National Regulation*, Singapore: World Scientific.

Federal Deposit Insurance Corporation. 2009. Press release. Available at:
<http://www.fdic.gov/news/news/press/2009/pr09146.html>

Flannery, M., 1995, "Prudential Regulation for Banks." In K. Sawamoto, Z. Nakajima, and H. Taguchi (eds.) *Financial Stability in a Changing Environment*: 281-318. New York: St. Martin's Press.

Graham, F. and Horner, J., 1988 "Bank Failure: An Evaluation of the Factors Contributing to the Failure of National Banks." *Proceedings of a Conference on Bank Structure and Competition*: 406-35. Chicago: Federal Reserve Bank of Chicago.

Haldane, A., 2009, 'Why Banks Failed the Stress Test'. Available at:
<http://www.bankofengland.co.uk/publications/speeches/2009/speech374.pdf>

IEX, 2009. Available at: http://www.iex.nl/columns/columns_artikel.asp?colid=48452

Inter-American Development Bank (IDB), 1995, *The Overhang Hangover*. Policy Research Working Paper no. 3673. World Bank, Washington, DC.

Inter-American Development Bank (IDB), 2005, *The politics of policies*. Economic and Social Progress in Latin America: 2006 Report. Washington, DC: IDB.

International Monetary Fund, *World Economic Outlook*, Washington, D.C.: World Bank, May 1998a.

Jaimovich, D., and Panizza, U., 2006, *Public Debt around the World: A New Dataset of Central Government Debt*. Research Department Working Paper no 561. Inter-American Development Bank, Washington DC.

James Freund et al., "Commercial Real Estate Crises of the 1980s and Early 1990s," in *History of the Eighties—Lessons for the Future* (Washington, DC: FDIC, 1997),
http://www.fdic.gov/bank/historical/history/137_165.pdf

Kaminsky, Graciela L. and Carmen M. Reinhart, "The Twin Crises: The Causes of Banking and Balance of Payments Problems," *International Finance Discussion Papers* (No. 554), Washington, D.C.: Board of Governors of the Federal Reserve System, March 1996.

Kaminsky, Graciela L. and Sergio L. Schmukler, "What Triggers Market Jitters: A Chronicle of the Asian Crisis," *International Finance Discussion Papers* No. 634, Washington, D.C.: Board of Governors of the Federal Reserve System, April 1999.

Kindleberger, Charles P., 1978, *Manias, Panics, and Crashes*, New York: Basic Books.

Krugman, P., 2009, Speech to an international finance forum in Seoul, 19-5-2009.

Krugman, P., 2010, *The Euro Trap*. Available at:
<http://www.nytimes.com/2010/04/30/opinion/30krugman.html>

Laeven, Luc, Fabian Valencia, 2008, *Systemic Banking Crises: A New Database*. IMF Working Paper no. 08/224. International Monetary Fund, Washington, DC. Available at:
<http://www.imf.org/external/pubs/ft/wp/2008/wp08224.pdf>

Lindgren, Carl-Johan, Gillian Garcia, and Matthew I. Saal, *Bank Soundness and Macroeconomic Policy*, Washington, D.C.: International Monetary Fund, 1996

Lintner, John, 1965, "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets." *Review of Economics and Statistics*. 47:1, pp. 13–37.

Manasse, Paolo, Nouriel Roubini, and Axel Schimmelpfennig, 2003, *Predicting Sovereign Debt Crises*. IMF Working Paper no. 03/221. International Monetary Fund, Washington, DC.

Merton, Robert C. and Zvi Bodie, 1992, "On the Management of Financial Guarantees", *Financial Management*, Winter, pp. 87-109.

Mishkin, Frederic S., "Comment on Systemic Risk," in George Kaufman, ed., *Research in Financial Services: Banking, Financial Markets, and Systemic Risk* (Vol. 7), Greenwich, CT: JAI Press 1995, pp. 31-45.

Moody's. 2003. *Moody's Special Comment: Sovereign Bond Defaults, Rating Transitions, and Recoveries (1985-2002)*. Moody's Investor Service, New York

O'Conner, J.F.T., 1938, *Banking Crisis and Recovery Under the Roosevelt Administration*. Chicago: Callaghan and Co.

Ozler, Sule, 1991, "Evolution of Credit Terms: An Empirical Examination of Commercial Bank Lending to Developing Countries." *JOURNAL OF DEVELOPMENT ECONOMICS* 38: 79-97.

Philippon, T., and A. Reshef (2007): "Skill Biased Financial Development: Education, Wages and Occupations in the U.S. Financial Sector," NBER Working Paper 13437.

Reinhart, Carmen M. and Rogoff, Kenneth S., *This Time is Different: A Panoramic View of Eight Centuries of Financial Crises* (April 2008). NBER Working Paper Series, Vol. w13882.

Robert Oshinsky, 1999, *Effects of Bank Consolidation on the Bank Insurance Fund*, Working Paper 99-3
<http://www.fdic.gov/bank/analytical/working/99-3.pdf>

Rogoff, K., 1999, "Institutions for Reducing Global Financial Instability," *Journal of Economic Perspectives* 13, 21-42.

Rogoff en Stiglitz, 2009, Speech at World Economic Forum, Davos (28 January - 1 February 2009)

Sharpe, William F., 1964, "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk." *Journal of Finance*. 19:3, pp. 425–42.

Sturzenegger, Frederico, and Jeromin Zettelmeyer, 2005, Haircuts: Estimating Investor Losses in Sovereign Debt Restructurings, 1998-2005. IMF Working Paper 05/137. International Monetary Fund, Washington, DC.

Sundararajan, V. and Tomás J.T. Baliño, 1991, Banking Crises: Cases and Issues, International Monetary Fund, Washington D.C., US.

Taibi, M., 2009, Available at:

http://www.rollingstone.com/politics/story/30481512/wall_streets_naked_swindle/8

United States Department of State. Papers relating to the foreign relations of the United States with the address of the president to Congress December 2, 1913. Washington, D.C.: U.S. Government Printing Office, 1913, p. 565. Available at: <http://digital.library.wisc.edu/1711.dl/FRUS.FRUS1913>

Weber, Axel. 2009. Available at:

[http://www.rtl.nl/\(/financien/rtlz/nieuws/\)/components/financien/rtlz/2009/weken_2009/16/0415_1330_fundamenteel_verschil_mening_ecb.xml](http://www.rtl.nl/(/financien/rtlz/nieuws/)/components/financien/rtlz/2009/weken_2009/16/0415_1330_fundamenteel_verschil_mening_ecb.xml)

Williamson, 1989. Available at: http://en.wikipedia.org/wiki/Washington_Consensus

Table 1A: Banking Crises History

| Country with Banking Crisis | Period | Crises Trend | Long Term Trend | Blanket Guarantee | Explicit Deposit Insurance Arrangement | Number of banks in t | Institutions closed from t to t+3 | Institutions closed % of bank assets | Nationalizations | Sovereign Debt Crisis (t-1, t+1) |
|-----------------------------|--------|--------------|-----------------|-------------------|--|----------------------|-----------------------------------|--------------------------------------|------------------|----------------------------------|
| France | 1802- | | | | | | | | | |
| France | 1805- | | | | | | | | | |
| UK | 1810- | | | | | | | | | |
| Denmark | 1813- | | | | | | | | | |
| UK | 1815- | | | | | | | | | |
| US | 1818- | | | | | | | | | |
| UK | 1825- | | | | | | | | | |
| US | 1825- | | | | | | | | | |
| US | 1836- | | | | | | | | | |
| Canada | 1837- | | | | | | | | | |
| UK | 1837- | | | | | | | | | |
| UK | 1847- | | | | | | | | | |
| Belgium | 1848- | | | | | | | | | |
| UK | 1857- | | | | | | | | | |
| US | 1857- | | | | | | | | | |
| India | 1863- | | | | | | | | | |
| Italy | 1866- | | | | | | | | | |
| UK | 1866- | | | | | | | | | |
| Austria | 1873- | | | | | | | | | |
| US | 1873- | | | | | | | | | |
| Peru | 1873- | | | | | | | | | |
| South Africa | 1877- | | | | | | | | | |
| Germany | 1880- | | | | | | | | | |
| France | 1882- | | | | | | | | | |
| Mexico | 1883- | | | | | | | | | |
| US | 1884- | | | | | | | | | |
| Denmark | 1885- | | | | | | | | | |
| Italy | 1887- | | | | | | | | | |
| France | 1889- | | | | | | | | | |
| Portugal | 1890- | | | | | | | | | |
| UK | 1890- | | | | | | | | | |
| US | 1890- | | | | | | | | | |
| Argentina | 1890- | | | | | | | | | |
| Brazil | 1890- | | | | | | | | | |
| Chile | 1890- | | | | | | | | | |
| South Africa | 1890- | | | | | | | | | |
| Germany | 1891- | | | | | | | | | |
| Italy | 1891- | | | | | | | | | |
| Portugal | 1891- | | | | | | | | | |
| Australia | 1893- | | | | | | | | | |
| Netherlands | 1897- | | | | | | | | | |
| Sweden | 1897- | | | | | | | | | |

| | | | | | | | | | | | |
|-------------|-------|--|--|--|--|--|--|--|--|--|--|
| Norway | 1898- | | | | | | | | | | |
| Chile | 1899- | | | | | | | | | | |
| Finland | 1900- | | | | | | | | | | |
| Brazil | 1900- | | | | | | | | | | |
| Germany | 1901- | | | | | | | | | | |
| Japan | 1901- | | | | | | | | | | |
| Denmark | 1907- | | | | | | | | | | |
| France | 1907- | | | | | | | | | | |
| Italy | 1907- | | | | | | | | | | |
| Japan | 1907- | | | | | | | | | | |
| Mexico | 1907- | | | | | | | | | | |
| Sweden | 1907- | | | | | | | | | | |
| US | 1907- | | | | | | | | | | |
| Chile | 1908- | | | | | | | | | | |
| India | 1913- | | | | | | | | | | |
| Mexico | 1913- | | | | | | | | | | |
| Argentina | 1914- | | | | | | | | | | |
| Belgium | 1914- | | | | | | | | | | |
| Brazil | 1914- | | | | | | | | | | |
| France | 1914- | | | | | | | | | | |
| Italy | 1914- | | | | | | | | | | |
| Japan | 1914- | | | | | | | | | | |
| Netherlands | 1914- | | | | | | | | | | |
| Norway | 1914- | | | | | | | | | | |
| UK | 1914- | | | | | | | | | | |
| US | 1914- | | | | | | | | | | |
| Chile | 1915- | | | | | | | | | | |
| Mexico | 1920- | | | | | | | | | | |
| Portugal | 1920- | | | | | | | | | | |
| Finland | 1921- | | | | | | | | | | |
| India | 1921- | | | | | | | | | | |
| Italy | 1921- | | | | | | | | | | |
| Netherlands | 1921- | | | | | | | | | | |
| Norway | 1921- | | | | | | | | | | |
| Canada | 1923- | | | | | | | | | | |
| China | 1923- | | | | | | | | | | |
| Japan | 1923- | | | | | | | | | | |
| Taiwan | 1923- | | | | | | | | | | |
| Austria | 1924- | | | | | | | | | | |
| Belgium | 1925- | | | | | | | | | | |
| Germany | 1925- | | | | | | | | | | |
| Brazil | 1926- | | | | | | | | | | |
| Chile | 1926- | | | | | | | | | | |
| Japan | 1927- | | | | | | | | | | |
| Taiwan | 1927- | | | | | | | | | | |
| Brazil | 1929- | | | | | | | | | | |
| India | 1929- | | | | | | | | | | |
| Mexico | 1929- | | | | | | | | | | |

| | | | | | | | | | | |
|--------------------------|-----------|--------|----|-----|-----|-----|-----|-----|-----|----|
| US | 1929- | | | | | | | | | |
| France | 1930- | | | | | | | | | |
| Italy | 1930- | | | | | | | | | |
| Argentina | 1931- | | | | | | | | | |
| Belgium | 1931- | | | | | | | | | |
| Brazil | 1931- | | | | | | | | | |
| China | 1931- | | | | | | | | | |
| Finland | 1931- | | | | | | | | | |
| Germany | 1931- | | | | | | | | | |
| Greece | 1931- | | | | | | | | | |
| Portugal | 1931- | | | | | | | | | |
| Spain | 1931- | | | | | | | | | |
| Sweden | 1931- | | | | | | | | | |
| Argentina | 1934- | | | | | | | | | |
| Belgium | 1934- | | | | | | | | | |
| China | 1934- | | | | | | | | | |
| Italy | 1935- | | | | | | | | | |
| Brazil | 1937- | | | | | | | | | |
| Belgium | 1939- | | | | | | | | | |
| Finland | 1939- | | | | | | | | | |
| India | 1947- | | | | | | | | | |
| Brazil | 1963- | | | | | | | | | |
| Uruguay | 1971- | | | | | | | | | |
| UK | 1974- | | | | | | | | | |
| Central African Republic | 1976- | | | | | | | | | |
| Chile | 1976- | | | | | | | | | |
| Germany | 1977- | | | | | | | | | |
| South Africa | 1977- | | | | | | | | | |
| Spain | 1977-1982 | 2,83% | | | | 110 | | | Yes | |
| Israel | 1977-1983 | | | | | | | | Yes | |
| Venezuela | 1978- | -0,54% | | | | | | | | |
| Chad | 1979-1983 | | | | | | | | | |
| Guinea | 1980-1985 | | | | | | | | | |
| Ecuador | 1980- | -8,62% | | | | | | | | |
| Egypt | 1980- | -2,46% | | | | | | | | |
| Morocco | 1980- | | | | | | | | | |
| Argentina | 1980-1982 | 10,59% | No | Yes | 214 | 21 | 16% | Yes | | No |
| Chile | 1981-1983 | 4,44% | No | No | 61 | 8 | 20% | No | | No |
| Uruguay | 1981-1984 | 6,20% | | | | | | | | |
| Mexico | 1981-1982 | 7,24% | | | | | | | | |
| Philippines | 1981-1987 | 1,26% | | | | | | | Yes | |
| Colombia | 1982- | 0,27% | No | No | - | - | - | Yes | | No |
| Ghana | 1982- | 2,30% | No | No | 11 | 0 | 0% | No | | No |
| HongKong | 1982- | | | | | | | | | |
| Kuwait | 1982- | | | | | | | | | |
| Singapore | 1982- | | | | | | | | | |
| Turkey | 1982-1985 | 3,39% | | | | | | | | |
| Canada | 1983-1985 | 1,01% | | | | | | | | |

| | | | | | | | | | | |
|--------------------------|--------------|---------|----|-----|-----|----|--------|----|-----|--|
| Congo Dem.Rep. of | 1983- | | | | | | | | | |
| Equatorial Guinea | 1983-1985 | -26,12% | | | | | | | | |
| Morocco | 1983- | | | | | | | | | |
| Niger | 1983 | | | | | | | | | |
| Peru | 1983-1990 | | | | | | | | Yes | |
| Senegal | 1983-1988 | | | | | 16 | | | | |
| South Korea | 1983- | 12,70% | | | | | | | | |
| Thailand | 1983-1987 | 10,10% | | | | | | | | |
| Mauritania | 1984- | | | | | | | | | |
| UK | 1984- | 3,02% | | | | | | | | |
| USA | 1984- | 3,55% | | | | | | | | |
| Argentina | 1985- | 10,59% | | | | | | | | |
| Brazil | 1985- | 4,17% | | | | | | | | |
| Kenya | 1985- | | | | | | | | | |
| Malaysia | 1985-1988 | 5,80% | | | | | | | | |
| South-Africa | 1985 | | | | | | | | | |
| Bolivia | 1986-1987 | -3,08% | | | | | | | | |
| Bangladesh | 1987- | -1,81% | | | | | | | | |
| Costa Rica | 1987- | -0,80% | | | | | | | | |
| Denmark | 1987-1992 | -1,55% | | | | | | | | |
| Mali | 1987-1989 | | | | | | | | | |
| Mozambique | 1987-1993 | | | | | | | | | |
| Nicaragua | 1987- | -0,15% | | | | | | | | |
| Norway | 1987-1989 | 4,41% | | | | | | | | |
| Tanzania | 1987- | | | | | | | | | |
| Benin | 1988 | | | | | 3 | 3 | | | |
| Burkina Faso | 1988-1994 | | | | | | | | | |
| Central African Republic | 1988-1992 | | | | | | | | | |
| Lebanon | 1988-1990 | | | | | | | | | |
| Madagascar | 1988 | | | | | | | | | |
| Nepal | 1988- | | | | | | | | | |
| Panama | 1988-1989 | | | | | | | | | |
| Côte d'Ivoire | 1988-1990 | -7,92% | No | No | 20 | 6 | Medium | No | No | |
| Argentina | 1989-1990 | 10,59% | No | Yes | 177 | 28 | 40% | | | |
| Australia | 1989-1992 | 1,41% | | | | | | | | |
| Cameroon | 1989-1993 | -14,69% | | | | | | | | |
| El Salvador | 1989 | 8,75% | | | | | | | | |
| Jordan | 1989-1990 | | | | | | | | | |
| New Zealand | 1989-1990 | | | | | | | | | |
| South Africa | 1989- | | | | | | | | | |
| Sri Lanka | 1989- | 3,15% | No | Yes | 23 | 0 | 0% | No | No | |
| Togo | 1989-1991 | | | | | 1 | 7% | | | |
| Algeria | 1990-1992 | -11,5% | | | | | | | | |
| Brazil | 1990- | 4,17% | No | No | 229 | 0 | 0 | No | No | |
| Burkina Faso | 1990- | | | | | | | | | |
| Bulgaria | 1990s ('96-) | -7,28% | | | | | | | | |
| Italy | 1990-1995 | 2,45% | | | | | | | | |
| Lebanon | 1990- | | | | | | | | | |

| | | | | | | | | | | |
|------------------------|-----------|--------|--------|-----|-----|-----|----|-------|-----|----|
| Nicaragua | 1990- | | -0,15% | | | | | | | |
| Romania | 1990- | | | | | | | | | |
| Sierra Leone | 1990- | | | | | | | | | |
| Congo, Dem. Rep. Of | 1991- | | | | | | | | | |
| Czech Republic | 1991- | | 9,37% | | | | | | | |
| Djibouti | 1991-1993 | | | | | | | | | |
| Egypt | 1991-1995 | | -2,46% | | | | | | | |
| Hungary | 1991-1995 | 3,01% | 0,07% | | | | | | | |
| Finland | 1991-1994 | 41,69% | 7,91% | Yes | Yes | 519 | 0 | 0% | Yes | No |
| Georgia | 1991- | | | | | | | | | |
| Greece | 1991-1995 | | 0,32% | | | | | | | |
| Liberia | 1991-1995 | | | | | 11 | | 60,0% | | |
| Nigeria | 1991-1995 | | | | | 115 | | | | |
| Norway | 1991- | | 4,41% | No | Yes | 164 | 2 | 1,0% | Yes | No |
| Poland | 1991- | | | | | | | | | |
| São Tomé and Príncipe | 1991- | | | | | | | | | |
| Slovak Republik | 1991-1995 | | | | | | | | | |
| Sweden | 1991-1995 | 12,63% | 1,10% | Yes | No | 118 | 0 | 0% | Yes | No |
| Tunisia | 1991-1995 | | -1,50% | | | | | | | |
| UK | 1991- | | 3,02% | | | | | | | |
| Albania | 1992- | | | | | | | | | |
| Bosnia and Herzegovina | 1992- | | 0,99% | | | | | | | |
| Chad | 1992- | | | | | | | | | |
| Congo, Rep. Of | 1992- | | | | | | | | | |
| Estonia | 1992-1995 | | 4,52% | No | No | 21 | 11 | 15,0% | Yes | No |
| Indonesia | 1992- | | 9,43% | | | | | | | |
| Japan | 1992-1994 | 7,31% | 4,76% | | | | | | | |
| Kenya | 1992- | | -1,42% | | | | | | | |
| Poland | 1992- | | 0,31% | | | | | | | |
| Slovenia | 1992-1994 | | 22,92% | | | | | | | |
| Cape Verde | 1993- | | | | | | | | | |
| Guinea | 1993- | | | | | | | | | |
| Guyana | 1993-1995 | | | | | | | | | |
| India | 1993- | | 2,02% | | | | | | | |
| Macedonia | 1993-1994 | | 1,12% | | | | | | | |
| Armenia | 1994- | | | | | | | | | |
| Bolivia | 1994- | | -3,08% | No | No | 17 | 2 | 11,0% | No | No |
| Bulgaria | 1994- | | -7,28% | | | | | | | |
| Brazil | 1994-1995 | 16,22% | 4,17% | No | No | 246 | 41 | Small | No | No |
| Burundi | 1994- | | | | | | | | | |
| Congo, Dem. Rep. of | 1994- | | | | | | | | | |
| Costa Rica | 1994- | | -0,80% | | | | | | | |
| Eritrea | 1994 | | | | | | | | | |
| France | 1994- | | 5,02% | | | | | | | |
| Haiti | 1994- | | | | | | | | | |
| Jamaica | 1994- | | 0,07% | | | | | | | |
| Latvia | 1994- | | 15,94% | No | No | 56 | 14 | 40,0% | No | No |
| Mexico | 1994-1998 | | 7,24% | Yes | Yes | 52 | 0 | 0% | Yes | No |

| | | | | | | | | | | |
|--------------------------|-----------|--------|---------|-----|-----|------|-----|-------|-----|-----|
| Turkey | 1994 | | 3,39% | | | | | | | |
| Uganda | 1994- | | -4,05% | | | | | | | |
| Venezuela | 1994-1995 | | -0,54% | No | Yes | 51 | 12 | 23,0% | Yes | No |
| Argentina | 1995 | | 10,59% | No | Yes | 205 | 5 | 0,62% | No | No |
| Azerbaijan | 1995- | | -8,66% | | | | | | | |
| Belarus | 1995- | | | | | | | | | |
| Brazil | 1995- | | 4,17% | | | | | | | |
| Cameroon | 1995- | | -14,69% | | | | 3 | | | |
| Central African Republic | 1995- | | | | | | | | | |
| Croatia | 1995 | | 2,43% | No | Yes | 60 | 11 | 7,1% | Yes | No |
| Guinea-Bissau | 1995- | | | | | | | | | |
| Kyrgyz Republic | 1995- | | | | | | | | | |
| Lithuania | 1995- | | 2,29% | No | No | 28 | 14 | 15,0% | Yes | No |
| Paraguay | 1995- | | -2,25% | No | No | 34 | 9 | 23,0% | No | No |
| Russia | 1995- | | -7,13% | | | | | | | |
| Swaziland | 1995 | | | | | | | | Yes | |
| Zambia | 1995- | | -6,67% | | | | | | | |
| Zimbabwe | 1995- | | 15,69% | | | | | | | |
| Bulgaria | 1996- | | -7,28% | No | Yes | 45 | 16 | 24,0% | Yes | No |
| Czech Republic | 1996- | | 9,37% | No | Yes | 55 | 4 | 1,5% | No | No |
| Ecuador | 1996- | | -8,62% | | | | | | | |
| Jamaica | 1996- | | 0,07% | Yes | No | 36 | 1 | 4,15% | Yes | No |
| Myanmar | 1996- | | | | | | | | | |
| Thailand | 1996-2002 | 33,33% | 10,10% | Yes | No | 41 | 1 | 2,0% | Yes | No |
| Yemen | 1996- | | -6,50% | | | | | | | |
| HongKong | 1997-2000 | | 8,87% | | | | | | | |
| Indonesia | 1997-2005 | 25,12% | 9,43% | Yes | No | 238 | 66 | 13,5% | Yes | No |
| Japan | 1997- | | 4,76% | Yes | Yes | | 0 | 0% | Yes | No |
| Malaysia | 1997-2002 | 10,46% | 5,80% | Yes | No | 47 | 0 | 0% | Yes | No |
| Mauritius | 1997- | | 1,1% | | | | | | | |
| Philippines | 1997-2000 | 6,53% | 1,26% | No | Yes | 1003 | 26 | 1,0% | | No |
| South-Korea | 1997-1999 | 40,00% | 12,70% | Yes | Yes | 59 | 22 | 9,0% | Yes | No |
| Taiwan | 1997- | | 26,96% | | | | | | | |
| Ukraine | 1997- | | -5,40% | No | Yes | 230 | 48 | 2,0% | No | No |
| Vietnam | 1997- | | 41,62% | No | No | 83 | 5 | 2,0% | No | No |
| China P.R. | 1998- | | -1,64% | | | | | | | |
| Colombia | 1998- | | 0,27% | No | Yes | 39 | 12 | 9,9% | Yes | No |
| Ecuador | 1998- | | -8,62% | Yes | Yes | 40 | 14 | 50,2% | Yes | Yes |
| El Salvador | 1998- | | 8,75% | | | | | | | |
| Russia | 1998- | | -7,13% | No | No | 1476 | 399 | 4,0% | Yes | Yes |
| Slovak Republic | 1998- | | -0,01% | | | | | | | |
| Bolivia | 1999- | | -3,08% | | | | | | | |
| Honduras | 1999- | | -1,54% | | | | | | | |
| Peru | 1999- | | -5,42% | | | | | | | |
| Nicaragua | 2000- | | -0,15% | Yes | No | 12 | 0 | 0% | No | No |
| Turkey | 2000- | | 3,39% | Yes | Yes | 80 | 12 | 8,0% | Yes | No |
| Argentina | 2001- | | 10,59% | No | Yes | 84 | 0 | 0 | Yes | Yes |

| | | | | | | | | | | |
|--------------------|-----------|--------|--------|----|-----|----|---|--------|-----|-----|
| Guatemala | 2001- | | 4,77% | | | | | | | |
| Paraguay | 2002- | | -2,25% | | | | | | | |
| Uruguay | 2002-2003 | 53,80% | 6,2% | No | Yes | 31 | 5 | 18,83% | Yes | Yes |
| Dominican Republic | 2003- | | 3,9% | No | No | 14 | 0 | 0 | No | Yes |
| Guatemala | 2006- | | 4,77% | | | | | | | |
| United Kingdom | 2007- | 13,1% | 3,02% | No | Yes | | | | Yes | No |
| USA | 2007- | 10,0% | 3,55% | No | Yes | | | | No | No |

Table 1B: Banking Crises Sample

| # | Country with Banking Crises | Period | Long Term Trend | Blanket Guarantee | Explicit Deposit Insurance Arrangement | Number of banks in $t^{2,3}$ | Institutions closed % of bank assets ³ | Nationalizations | Sovereign Debt Crises (t-1, t+1) |
|----|-----------------------------|-----------|-----------------|-------------------|--|------------------------------|---|------------------|----------------------------------|
| 1 | Argentina | 1980-1982 | 10,59% | No | Yes | 214 | 16% | Yes | No |
| 2 | Chile | 1981-1983 | 4,44% | No | No | 61 | 20% | No | No |
| 3 | Colombia | 1982-1985 | 0,27% | No | No | - | - | Yes | No |
| 4 | Ghana | 1982- | 2,30% | No | No | 11 | 0% | No | No |
| 5 | Côte d'Ivoire | 1988- | -7,92% | No | No | 20 | Medium | No | No |
| 6 | Sri Lanka ¹ | 1989- | 3,15% | No | Yes | 23 | 0% | No | No |
| 7 | Argentina | 1989-1990 | 10,59% | No | Yes | 177 | | | |
| 8 | Brazil | 1990- | 4,17% | No | No | 229 | 0% | No | No |
| 8 | Finland | 1991-1994 | 7,91% | Yes | Yes | 519 | 0% | Yes | No |
| 9 | Norway | 1991- | 4,41% | No | Yes | 164 | 1% | Yes | No |
| 10 | Sweden | 1991-1995 | 1,10% | Yes | No | 118 | 0% | Yes | No |
| 11 | Estonia | 1992-1995 | 4,52% | No | No | 21 | 15% | Yes | No |
| 12 | Bolivia | 1994- | -3,08% | No | No | 17 | 11% | No | No |
| 13 | Brazil ^{1,2} | 1994-1995 | 4,17% | No | No | 246 | Small | No | No |
| 14 | Latvia | 1994- | 15,94% | No | No | 56 | 40% | No | No |
| 15 | Mexico | 1994-1998 | 7,24% | Yes | Yes | 52 | 0% | Yes | No |
| 16 | Venezuela | 1994-1995 | -0,54% | No | Yes | 51 | 23% | Yes | No |
| 17 | Argentina | 1995- | 10,59% | No | Yes | 205 | 0,62% | No | No |
| 18 | Lithuania | 1995- | 2,29% | No | No | 28 | 15% | Yes | No |
| 19 | Paraguay | 1995- | -2,25% | No | No | 34 | 23% | No | No |
| 20 | Bulgaria | 1996- | -7,28% | No | Yes | 45 | 24% | Yes | No |
| 21 | Croatia | 1995 | 2,43% | No | Yes | 60 | 7,1% | Yes | No |
| 22 | Czech Republic | 1996- | 9,37% | No | Yes | 55 | 1,5% | No | No |
| 23 | Jamaica | 1996- | 0,07% | Yes | No | 36 | 4,15% | Yes | No |
| 24 | Thailand | 1996-2002 | 10,10% | Yes | No | 41 | 2% | Yes | No |
| 25 | Indonesia | 1997-2005 | 9,43% | Yes | No | 238 | 13,5% | Yes | No |
| 26 | Japan | 1997- | 4,76% | Yes | Yes | | 0% | Yes | No |
| 27 | Malaysia | 1997-2002 | 10,46% | Yes | No | 47 | 0% | Yes | No |
| 28 | Philippines | 1997-2000 | 1,26% | No | Yes | 1003 | 1% | No | No |
| 29 | South-Korea | 1997-1999 | 12,70% | Yes | Yes | 59 | 9% | Yes | No |
| 30 | Ukraine | 1997- | -5,40% | No | Yes | 230 | 2% | No | No |
| 31 | Vietnam | 1997- | 41,62% | No | No | 83 | 2% | No | No |
| 32 | Colombia | 1998- | 0,27% | No | Yes | 39 | 9,9% | Yes | No |
| 33 | Nicaragua | 2000- | -0,15% | Yes | No | 12 | 0% | No | No |
| 34 | Turkey | 2000- | 3,39% | Yes | Yes | 80 | 8% | Yes | No |
| 35 | Ecuador | 1998- | -8,62% | Yes | Yes | 40 | 50,2% | Yes | Yes |
| 36 | Russia | 1998- | -7,13% | No | No | 1476 | 4% | Yes | Yes |
| 37 | Argentina | 2001- | 10,59% | No | Yes | 84 | 0% | Yes | Yes |
| 38 | Uruguay | 2002- | 6,20% | No | Yes | 31 | 18,83% | Yes | Yes |
| 39 | Dominican Republic | 2003- | 9,41% | No | No | 14 | 0% | No | Yes |
| 40 | United Kingdom | 2007- | 3,2% | No | Yes | | | Yes | No |
| 41 | USA | 2007- | -0,6% | No | Yes | 8099 | 1,8% | No | No |

Table 2A: Sub-sample 35 countries, 6 variables

| Dependent Variable: SDC | | | | |
|--|-------------|-----------------------|-------------|--------|
| Method: Least Squares | | | | |
| Date: 04/26/10 Time: 15:34 | | | | |
| Sample(adjusted): 1 40 | | | | |
| Included observations: 35 | | | | |
| Excluded observations: 5 after adjusting endpoints | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | -0.004985 | 0.142627 | -0.034953 | 0.9724 |
| NATIONALIZATIONS | 0.136886 | 0.149982 | 0.912684 | 0.3692 |
| EXPLICITDEPOSINS | -0.003694 | 0.130076 | -0.028401 | 0.9775 |
| BLANKETGUARANTE | -0.106920 | 0.152916 | -0.699205 | 0.4902 |
| INSTCLOSEDPERC | 0.588748 | 0.557024 | 1.056954 | 0.2996 |
| LONGTERMTREND | -0.040604 | 0.757010 | -0.053637 | 0.9576 |
| NUMBERBANKS | 0.000313 | 0.000224 | 1.398924 | 0.1728 |
| R-squared | 0.147334 | Mean dependent var | 0.142857 | |
| Adjusted R-squared | -0.035380 | S.D. dependent var | 0.355036 | |
| S.E. of regression | 0.361262 | Akaike info criterion | 0.978428 | |
| Sum squared resid | 3.654281 | Schwarz criterion | 1.289498 | |
| Log likelihood | -10.12250 | F-statistic | 0.806366 | |
| Durbin-Watson stat | 0.756065 | Prob(F-statistic) | 0.573592 | |

Table 2B: Sub-sample 36 countries, 4 variables

| Dependent Variable: SDC | | | | |
|--|-------------|-----------------------|-------------|--------|
| Method: Least Squares | | | | |
| Date: 04/19/10 Time: 19:30 | | | | |
| Sample(adjusted): 1 40 | | | | |
| Included observations: 36 | | | | |
| Excluded observations: 4 after adjusting endpoints | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 0.054715 | 0.114424 | 0.478175 | 0.6359 |
| NATIONALIZATIONS | 0.164787 | 0.146231 | 1.126896 | 0.2684 |
| EXPLICITDEPINS | -0.010243 | 0.125984 | -0.081305 | 0.9357 |
| BLANKETGUARANTE | -0.148345 | 0.145348 | -1.020621 | 0.3153 |
| INSTCLOSEDPERC | 0.428753 | 0.516523 | 0.830075 | 0.4128 |
| R-squared | 0.086474 | Mean dependent var | 0.138889 | |
| Adjusted R-squared | -0.031400 | S.D. dependent var | 0.350736 | |
| S.E. of regression | 0.356200 | Akaike info criterion | 0.901599 | |
| Sum squared resid | 3.933236 | Schwarz criterion | 1.121532 | |
| Log likelihood | -11.22877 | F-statistic | 0.733613 | |
| Durbin-Watson stat | 0.768328 | Prob(F-statistic) | 0.576042 | |

Table 2C: Sub-sample 39 countries, 3 variables

| Dependent Variable: SDC | | | | |
|--|-------------|-----------------------|-------------|--------|
| Method: Least Squares | | | | |
| Date: 04/19/10 Time: 19:22 | | | | |
| Sample(adjusted): 1 40 | | | | |
| Included observations: 39 | | | | |
| Excluded observations: 1 after adjusting endpoints | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 0.067760 | 0.093655 | 0.723506 | 0.4742 |
| NATIONALIZATIONS | 0.167843 | 0.131003 | 1.281219 | 0.2085 |
| EXPLICITDEPINS | 0.012029 | 0.115588 | 0.104064 | 0.9177 |
| BLANKETGUARANTE | -0.144297 | 0.133572 | -1.080294 | 0.2874 |
| R-squared | 0.059861 | Mean dependent var | 0.128205 | |
| Adjusted R-squared | -0.020722 | S.D. dependent var | 0.338688 | |
| S.E. of regression | 0.342180 | Akaike info criterion | 0.789952 | |
| Sum squared resid | 4.098040 | Schwarz criterion | 0.960574 | |
| Log likelihood | -11.40407 | F-statistic | 0.742851 | |
| Durbin-Watson stat | 0.746000 | Prob(F-statistic) | 0.533759 | |

Table 2D: Frequency of events in sample (n=41)

| | | | |
|---------------------------|-----------------------|--|----------------------|
| Sovereign Debt Crisis 13% | Blanket Guarantee 30% | Explicit Deposit Insurance Guarantee 51% | Nationalizations 59% |
|---------------------------|-----------------------|--|----------------------|

Table 2E: Factors contributing to Sovereign Debt Crisis (n=41)

| Sovereign Debt Crisis? | Blanket Guarantees (nr. of sample) | Explicit Deposit Insurance Guarantee (nr. of sample) | Nationalizations (nr. of sample) |
|------------------------|------------------------------------|--|----------------------------------|
| No | 25 No – 11 Yes | 18 No – 18 Yes | 16 No – 20 Yes |
| Yes | 4 No – 1 Yes | 2 No – 3 Yes | 1 No – 4 Yes |
| | Blanket Guarantees (percentages) | Explicit Deposit Insurance Guarantee (percentages) | Nationalizations (percentages) |
| No | 69% No – 31% Yes | 50% No – 50% Yes | 44% No – 56% Yes |
| Yes | 80% No – 20% Yes | 40% No – 60% Yes | 20% No – 80% Yes |

Table 2F: Likelihood of Sovereign Debt Crises in case of... (n=41)

| | | |
|----------------------------|---|---------------------------|
| No blanket Guarantee 14% | No Explicit Deposit Insurance Guarantee 10% | No Nationalizations 6% |
| Only Blanket Guarantee 8% | Only Explicit Deposit Insurance Guarantee 14% | Only Nationalizations 17% |
| With Blanket Guarantee 12% | With Explicit Deposit Insurance Guarantee 12% | With Nationalizations 12% |

Table 3A: Assets to Deposit Ratio for Sample of US Commercial Banks

| Bank | Leverage | Assets (mln. \$) | Rel. Asset Share of sample |
|------|----------|------------------|----------------------------|
| BAC | 224% | 2223299 | 10,2% |
| C | 222% | 1856646 | 8,6% |
| JPM | 217% | 2031989 | 9,7% |
| BK | 157% | 212224 | 1,4% |
| TCB | 155% | 17885 | 0,1% |
| WFC | 151% | 1240434 | 8,5% |
| PNC | 144% | 269863 | 1,9% |

Table 3B: Assets to Deposit Ratio for Sample of US Regional Banks

| Bank | Leverage | Assets (mln. \$) | Rel. Asset Share of sample |
|-------|----------|------------------|----------------------------|
| FHN | 175% | 26069 | 0,2% |
| STT | 171% | 153973 | 0,9% |
| IBOC | 164% | 11763 | 0,1% |
| USB | 153% | 281176 | 1,9% |
| CATY | 153% | 11495 | 0,1% |
| BOKF | 152% | 23517 | 0,2% |
| VLV | 150% | 14284 | 0,1% |
| CMA | 149% | 59249 | 0,4% |
| MTB | 145% | 68880 | 0,5% |
| RF | 144% | 142318 | 1,0% |
| BBT | 144% | 165195 | 1,2% |
| STI | 143% | 174165 | 1,3% |
| KEY | 141% | 92710 | 0,7% |
| NTRS | 141% | 82142 | 0,6% |
| FMER | 140% | 10540 | 0,1% |
| ASBC | 137% | 22874 | 0,2% |
| FULT | 137% | 16522 | 0,1% |
| EWBC | 137% | 20559 | 0,2% |
| UMBF | 137% | 11663 | 0,1% |
| CBIN | 135% | 834 | 0,0% |
| MI | 135% | 56154 | 0,4% |
| FITB | 134% | 113354 | 0,9% |
| BOH | 132% | 12415 | 0,1% |
| WL | 130% | 10903 | 0,1% |
| WTNY | 129% | 11806 | 0,1% |
| BXS | 129% | 13168 | 0,1% |
| CBSH | 128% | 18120 | 0,2% |
| HBAN | 127% | 51555 | 0,4% |
| PVTB | 126% | 11951 | 0,1% |
| SIVB | 124% | 12788 | 0,1% |
| WTFC | 123% | 12216 | 0,1% |
| CFR | 122% | 16288 | 0,1% |
| ZION | 121% | 50625 | 0,4% |
| SNV | 120% | 32820 | 0,3% |
| CYN | 120% | 20915 | 0,2% |
| FCNCA | 120% | 18466 | 0,2% |
| CHCO | 120% | 2593 | 0,0% |

Table 3C: Leverage determined by Asset Size Full Sample

| Dependent Variable: LEVERAGE | | | | |
|---|-------------|-----------------------|-------------|--------|
| Method: Least Squares | | | | |
| Date: 04/20/10 Time: 14:44 | | | | |
| Sample(adjusted): 1 44 | | | | |
| Included observations: 44 after adjusting endpoints | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 131.1231 | 3.309403 | 39.62138 | 0.0000 |
| ASSETSIZE | 3.28E-05 | 4.90E-06 | 6.679646 | 0.0000 |
| R-squared | 0.515110 | Mean dependent var | 144.0230 | |
| Adjusted R-squared | 0.503565 | S.D. dependent var | 25.30115 | |
| S.E. of regression | 17.82671 | Akaike info criterion | 8.643662 | |
| Sum squared resid | 13347.25 | Schwarz criterion | 8.724762 | |
| Log likelihood | -188.1606 | F-statistic | 44.61767 | |
| Durbin-Watson stat | 1.798203 | Prob(F-statistic) | 0.000000 | |

Table 3D: Leverage determined by Asset Size Commercial Banks

| Dependent Variable: LEVERAGE | | | | |
|------------------------------|-------------|-----------------------|-------------|--------|
| Method: Least Squares | | | | |
| Date: 04/20/10 Time: 15:15 | | | | |
| Sample: 1 7 | | | | |
| Included observations: 7 | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 137.5141 | 11.38042 | 12.08340 | 0.0001 |
| ASSETSIZE | 3.77E-05 | 7.97E-06 | 4.724249 | 0.0052 |
| R-squared | 0.816974 | Mean dependent var | 181.1943 | |
| Adjusted R-squared | 0.780369 | S.D. dependent var | 37.45921 | |
| S.E. of regression | 17.55519 | Akaike info criterion | 8.803533 | |
| Sum squared resid | 1540.924 | Schwarz criterion | 8.788079 | |
| Log likelihood | -28.81237 | F-statistic | 22.31853 | |
| Durbin-Watson stat | 2.288421 | Prob(F-statistic) | 0.005223 | |

Table 3E: Leverage determined by Asset Size Regional Banks

| Dependent Variable: LEVERAGE | | | | |
|---|-------------|-----------------------|-------------|--------|
| Method: Least Squares | | | | |
| Date: 04/20/10 Time: 15:19 | | | | |
| Sample(adjusted): 8 44 | | | | |
| Included observations: 37 after adjusting endpoints | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 136.0310 | 3.108756 | 43.75736 | 0.0000 |
| ASSETSIZE | 3.85E-06 | 7.86E-06 | 0.490227 | 0.6270 |
| R-squared | 0.006820 | Mean dependent var | 136.9905 | |
| Adjusted R-squared | -0.021557 | S.D. dependent var | 14.53486 | |
| S.E. of regression | 14.69069 | Akaike info criterion | 8.264843 | |
| Sum squared resid | 7553.571 | Schwarz criterion | 8.351920 | |
| Log likelihood | -150.8996 | F-statistic | 0.240322 | |
| Durbin-Watson stat | 1.627020 | Prob(F-statistic) | 0.627033 | |

Table 4: Bank failures determining USA debt to GDP change.

| Dependent Variable: USARELCHANGE | | | | |
|---|-------------|-----------------------|-------------|-----------|
| Method: Least Squares | | | | |
| Date: 04/20/10 Time: 16:59 | | | | |
| Sample(adjusted): 1980 2009 | | | | |
| Included observations: 30 after adjusting endpoints | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 0.021265 | 0.011846 | 1.795142 | 0.0834 |
| BANKFAILURES | 0.000150 | 7.69E-05 | 1.950438 | 0.0612 |
| R-squared | 0.119613 | Mean dependent var | | 0.034181 |
| Adjusted R-squared | 0.088171 | S.D. dependent var | | 0.056335 |
| S.E. of regression | 0.053794 | Akaike info criterion | | -2.942951 |
| Sum squared resid | 0.081028 | Schwarz criterion | | -2.849538 |
| Log likelihood | 46.14427 | F-statistic | | 3.804207 |
| Durbin-Watson stat | 0.926091 | Prob(F-statistic) | | 0.061199 |

Table 5: Countries with banking crisis and significant debt to GDP trend deviation.

| Country | Period | Long Term Trend | Short Term Trend |
|----------------|---------------|------------------------|-------------------------|
| Brazil | 1994-1995 | 4,17% | 16,22% |
| Finland | 1991-1995 | 7,91% | 33,77% |
| Hungary | 1991-1995 | 0,07% | 3,01% |
| Indonesia | 1997-2005 | 9,43% | 25,12% |
| Japan | 1992-1994 | 4,76% | 7,31% |
| South-Korea | 1997-1999 | 12,70% | 40,04% |
| Malaysia | 1997-2002 | 5,80% | 10,46% |
| Philippines | 1997-2000 | 1,26% | 6,53% |
| Sweden | 1991-1995 | 1,10% | 12,63% |
| Thailand | 1996-2002 | 10,10% | 33,33% |
| Uruguay | 2002-2003 | 6,20% | 53,80% |

Table 6: Countries with significant debt to GDP trend deviation during 2007-2010**At 5% significance level:**

| Country | Long Term Trend | Short Term Trend | p-value |
|------------------------|------------------------|-------------------------|----------------|
| Bahrein | -4,56% | 1,35% | 0,0474 |
| Belgium | -0,77% | 2,46% | 0,0041 |
| Bosnia and Herzegovina | 0,99% | 13,97% | 0,0088 |
| Chile | 4,44% | 30,04% | 0,0188 |
| Hungary | 0,07% | 4,56% | 0,0136 |
| Iceland | 8,00% | 48,18% | 0,0021 |
| Ireland | 1,15% | 25,91% | 0,0027 |
| Latvia | 15,94% | 39,15% | 0,0354 |
| Lithuania | 2,29% | 15,54% | 0,0360 |
| Luxembourg | 8,39% | 31,14% | 0,0060 |
| Netherlands | -0,69% | 7,45% | 0,0004 |
| New Zealand | -2,24% | 8,56% | 0,0007 |
| Portugal | 2,12% | 7,32% | 0,0239 |
| Spain | 2,83% | 11,75% | 0,0069 |
| United Kingdom | 3,02% | 14,47% | 0,0000 |
| United States | 3,55% | 9,49% | 0,0000 |
| Yemen | -6,50% | 7,96% | 0,0157 |

Between 5% and 10% significance level:

| Country | Long Term Trend | Short Term Trend | p-value |
|----------------|------------------------|-------------------------|----------------|
| Botswana | 16,14% | 42,98% | 0,0680 |
| Denmark | -1,55% | 3,01% | 0,0622 |
| Ecuador | -8,62% | -2,08% | 0,0750 |
| Estonia | 4,52% | 17,12% | 0,0547 |
| Kazakhstan | -2,31% | 11,73% | 0,0575 |
| Kuwait | -13,82% | -7,76% | 0,0984 |
| Russia | -7,13% | 16,74% | 0,0639 |
| Sudan | -5,69% | -0,16% | 0,0543 |
| Ukraine | -5,40% | 8,95% | 0,0952 |