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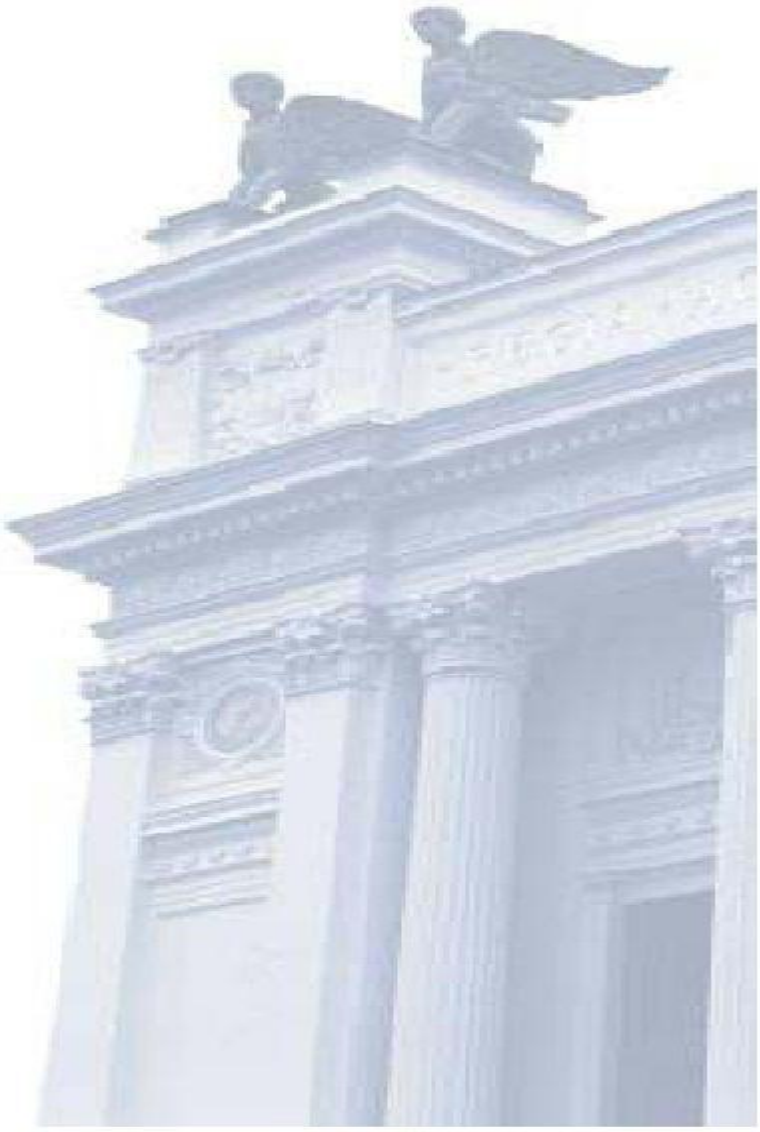
Beyond the Typical Twin Crises

- An Examination of Banking and Sovereign Debt Crises



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Abstract

This paper examines potential determinants of banking and sovereign debt crises for the period 1970-2008 using a multivariate logit model. In addition, the paper analyzes links between these types of crises through conditional and unconditional probabilities. The empirical results for banking crises suggest that higher inflation and real interest rates increase the likelihood of a banking crisis, whereas domestic credit growth and real GDP growth appear insignificant. It is also found that a high ratio of long-term external debt to GDP typically precedes debt crises, but real GDP growth and inflation appear insignificantly related to the probability of a debt crisis. Concerning the links, the results indicate that a banking crisis increases the likelihood of a debt crisis. However, for banking crises, little valuable information is gained when the occurrence of a debt crisis is used as the conditioning piece of information. The fact that quite few twin crises are found suggests that this phenomenon is relatively uncommon.

Keywords: Banking crises, debt crises, twin crises, multivariate logit model

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1 Introduction

This section provides a background to the twin crisis phenomenon for banking and sovereign debt crises, followed by the purpose of the paper and the research questions. Finally, the limitations and the outline of the paper are presented.

1.1 Background

On 15 September 2008, the US investment bank Lehman Brothers went into bankruptcy, making the notion that all banks were too big to fail no longer hold true. Up to that point, it had been assumed that governments would always bail out banks in serious trouble. When Lehman Brothers went down, the result was that every bank was considered to be risky. As share and housing prices plummeted, many large investment and commercial banks in the United States and Europe suffered large losses. The threat of a domino effect through the global financial system resulted in massive public financial assistance to prevent banks from collapsing (McKibbin & Stoeckel, 2009; Elliot, 2011).

Although several banks were rescued, the global economy went into a deep recession as banks became unwilling to lend both to each other and to the private sector, at the same time as consumer and business confidence fell considerably. Governments and central banks responded with unprecedented fiscal stimulus and monetary policy expansion. At the G20 summit in London on 2 April 2009, world leaders committed themselves to a $5 trillion fiscal expansion to boost jobs and restore growth (McKibbin & Stoeckel, 2009; Elliot, 2011).

As the global economy came to a turning point, concerns remained about a possible transformation of the crisis into another type of turmoil. For example, in September 2009, Harvard professor Kenneth Rogoff argued that there was a risk that the financial crisis was slowly morphing into a government debt crisis (Rogoff, 2009).

Indeed, from late 2009, fears of a sovereign debt crisis started to develop among investors regarding some European states, as budget deficits deteriorated and caused an overall increase in sovereign debt levels across the world. Concerns intensified in the beginning of 2010, and the issue was no longer the solvency of banks but the solvency of governments. On 9 May 2010, Europe's finance ministers approved a €750bn rescue package aimed at ensuring

financial stability in Europe through the establishment of the European Financial Stability Facility (EFSF) – a temporary credit-enhanced special purpose vehicle (Olivares-Caminal, 2011).

In October 2011, Eurozone leaders reached a three-pronged agreement to prevent the crisis from spreading to larger Eurozone economies, such as Italy and Spain. The deal included a voluntary write-down of 50 percent of Greek sovereign bonds held by private banks, boosting the EFSF to €1tn, and requiring banks to recapitalize by €106bn (BBC News, 2011). On 21 February 2012, Eurozone finance ministers agreed on a €130bn Greek bailout deal to avoid a so-called disorderly default of Greece. The bailout deal involved a 53.5 percent voluntary write-down of Greek sovereign bonds held by banks and other financial institutions, and lower rates of interest on Eurozone loans to Athens (Chaffin & Hope, 2012).

These events give rise to many interesting questions about banking and sovereign debt crises in general. Do they have common determinants? Does the occurrence of one of the crises increase the probability that a country will experience the other?

There have been many financial crises over the past 40 years affecting banks and governments. This has spawned a large volume of empirical literature that has attempted to find determinants and to predict these kinds of crises. For example, Demirgüç-Kunt and Detragiache (1998) and Laeven (2011) study the determinants of banking crises. In their studies, the identified determinants are combinations of macroeconomic factors, such as unstable macroeconomic policies, and bank-specific factors, for example changes in the real interest rate and the ratio of domestic credit to the private sector to GDP.

Regarding sovereign debt crises, most empirical studies have found that measures of solvency, such as the debt-to-GDP ratio, and measures of liquidity, such as short-term debt to reserves, are significant explanatory variables, along with some macroeconomic control variables, for example real GDP growth, inflation and the fiscal balance (Manasse et al., 2003).

There is also a large volume of empirical studies on the so-called twin crises, which typically refer to the concomitant occurrence of banking crises and currency crises, for example Kaminsky and Reinhart (1999) and Goldstein (2005). However, there are relatively few empirical studies that focus on banking and sovereign debt as twin crises, with two exceptions

being Reinhart and Rogoff (2011) and Borensztein and Panizza (2008). The current financial turbulence in Europe highlights the importance of gaining more insights into this phenomenon, which hopefully our paper will make a contribution to.

1.2 Purpose

The purpose of this paper is to examine potential determinants of banking and sovereign debt crises and analyze links between them.

1.3 Research Questions

Which factors are associated with the emergence of banking crises and sovereign debt crises? Do the two types of crises have common determinants? Does the occurrence of one of the crises increase the probability that a country will experience the other?

1.4 Limitations

In this paper, we focus on banking and sovereign debt crises, rather than other kinds of crises, such as currency and balance-of-payments crises. Our dataset is limited to the period 1970-2008. The study is based on a sample of all countries included in the IMF's International Financial Statistics (IFS) and the World Bank's Global Development Finance (GDF) databases. However, some countries could not be included because of data availability.

1.5 Outline

This paper is structured as follows. The second section provides the theoretical framework that forms the basis of the paper, including a review of empirical literature. The third section presents the empirical methodology concerning the identification of banking and sovereign debt crises, as well as the econometric model and the included explanatory variables. In the final part of section three, the methodology regarding links between the crises is presented. The data description is provided in the fourth section. Empirical results are put forward in section five and discussed in section six. The paper is concluded in the seventh section, which also includes suggestions for future research.

2 Theoretical Framework

This section contains a presentation of the theoretical framework and empirical review of the literature on banking and sovereign debt crises, as well as links between these kinds of crises.

2.1 Banking Crises

2.1.1 Theoretical Review

Every banking crisis has its own origin, which makes it difficult to predict upcoming crises. However, as Laeven (2011) discusses, there are patterns to be found in all banking crises. Macroeconomic variables, such as the growth rate of GDP and inflation, and more bank-specific variables, for example bank runs, are commonly discussed in the literature as determinants of banking crises (Laeven, 2011).

In general, macroeconomic factors involve actions taken by the government to prevent a banking crisis from occurring and the consequences of these actions. Demirgüç-Kunt and Detragiache (1998) discuss the effect of political responses on banking crises. Examples of interventions that they mention are loose monetary policies and using public funds for bail-outs of insolvent financial institutions. According to Laeven (2011), extensive expansionary fiscal and monetary policies can lead to a deterioration of the asset quality of banks through lending booms and market overinvestments. This is further strengthened by Ergungor and Thomson (2005) who argue that expansions of fiscal and monetary policies, generally including financial liberalization[1] of some sort, have a tendency to precede banking crises.

Today, many countries' monetary policy is focused on a low and stable inflation rate rather than keeping the exchange rate fixed or within a fluctuation range. Demirgüç-Kunt and Detragiache (1998) argue that this change in policy could cause problems in the banking sector. According to English (1996), higher inflation increases the size of the financial sector. The reason for this is that households make more transactions as they attempt to shift the cost of holding currency onto others. Thus, as countries attempt to keep inflation at a low target, the revenues gained from higher inflation are reduced, and this could lead to problems in the banking sector (Demirgüç-Kunt & Detragiache, 1998).

[1] Financial liberalization refers to the liberalization of the capital account and the deregulation of the domestic financial sector (Kaminsky & Schmukler, 2003).

Banks that are operating in the global market also face exchange rate risk. Borrowing in foreign currency while lending in domestic currency can cause an interest rate misalignment that can become expensive for banks. In many countries, regulations limit banks' trade with foreign currencies. However, there are ways to circumvent these regulations. For example, denominating domestic loans in foreign currencies provides banks that raise capital abroad an alternative way to go round these regulations. Also, by issuing loans in foreign currencies, the currency risk is transferred from banks to borrowers (Demirgüç-Kunt & Detragiache, 1998).

As Demirgüç-Kunt and Detragiache (1998) discuss, bank assets consist of a combination of short- and long-term loans to consumers and businesses, while their liabilities typically consist of short-term deposits. Adverse changes in the interest rate could lead to bank insolvency as the rate of return on bank assets falls below the rate needed to be paid on their liabilities. This shortfall could either be caused by a decline in borrowers' willingness or ability to service the debt they hold, or by a higher interest rate which banks are forced to pay to their depositors. High real interest rates can weaken the balance sheets of banks through an increase in non-performing loans or an inability to adjust the rate of return on bank assets quickly enough (Demirgüç-Kunt & Detragiache, 1998).

Higher interest rates are not the only factor that might destabilize the balance sheets of banks. Laeven (2011) argues that the procyclical movement of the financial system is a reason to its exposure to crises. As the economy grows, so does people's optimism about the future, which could lead to more lax lending standards. When the growth of the economy slows down, there is often a flight for quality and a subsequent credit collapse. In addition, according to Caprio and Klingebiel (1996), output and price volatility makes it more difficult for banks to find good borrowers. Thus, business cycle output might well be a determinant of banking crises (Laeven, 2011; Caprio & Klingebiel, 1996).

Bank runs are commonly mentioned in the literature as another reason to the occurrence of banking crises. A bank run occurs when customers rush to withdraw their deposits since they expect a bank to fail (Diamond & Dybvig, 2000). A deteriorating asset quality of banks' portfolios or an expected downturn in the economy are possible causes of unwarranted withdrawals by depositors, which further strains the liquidity position of banks. Bank assets are generally illiquid, which means that unwarranted withdrawals by depositors will increase the risk of bank insolvency. Another important aspect is self-fulfilling bank runs. Usually, deposit

withdrawals from one bank do not cause a banking crisis per se, although the market might perceive these withdrawals as a liquidity issue that other banks also risk facing. One way to reduce the risk of a bank run is to insure bank deposits. Deposit insurance schemes are therefore sometimes included as an explanatory variable of banking crises (Laeven, 2011; Demirgüç-Kunt & Detragiache, 1998).

2.1.2 Review of Empirical Research

Many empirical studies, among others von Hagen and Ho (2006) and Demirgüç-Kunt and Detragiache (1998), have found that macroeconomic variables, such as a declining growth rate of GDP and a high inflation rate, as well as bank-specific variables, such as interest rate shocks, increase the likelihood of banking crises. These variables are to a large extent the same that are discussed in the theoretical literature.

Demirgüç-Kunt and Detragiache (1998) estimate a multivariate logit model using a dataset of a combination of developed and developing countries from 1980 to 1994. They find that weak macroeconomic environments are closely related to the emergence of banking crises, especially low GDP growth rates. The study further shows that the banking system is sensitive to shocks in both nominal and real interest rates (Demirgüç-Kunt & Detragiache, 1998).

von Hagen and Ho (2006) examine determinants of banking crises using a panel dataset consisting of 47 countries from 1980 to 2001. By means of conditional logit models, the authors identify variables that have a tendency to precede banking crises. The results show that financial market variables, for example financial deregulation, and macroeconomic variables, such as high inflation and declining GDP growth rate, are the factors that best predict banking crises. Another finding of the paper is that exchange rate depreciations have insignificant effects on the emergence of banking crises (von Hagen & Ho, 2006).

In his study, Laeven (2011) finds similar patterns in banking crises even though the origins of them are different. He argues that market failures, the intervention of the government in the capital allocation, regulatory distortions, and macroeconomic policies that are unsustainable, are the main causes of banking crises. In addition, Laeven (2011) argues that banks increase their leverage during upswings in the economy, while shrinking the balance sheets as capital

becomes more expensive and harder to get. This will in turn have an effect on the society as a whole since it will become more difficult to borrow capital (Laeven, 2011).

Kaminsky and Reinhart (1999) examine the relationship between banking and currency crises. Using a dataset of 20 countries from 1970 to 1995 consisting of 102 crises, out of which 26 were banking crises, an examination of the connections between the two crises is conducted. The study shows that banking crises often occur after financial liberalization, after a period of capital inflows, and around the same time as the economy is moving into recession. In addition, currency crises are shown to worsen the situation for the banking sector, and a combination of the two crises makes them more severe than if they occur separately (Kaminsky and Reinhart, 1999).

Goldstein and Turner (1996) discuss the origins of banking crises in emerging economies. Their study supports the findings of Kaminsky and Reinhart (1999) in the sense that heavy capital inflows precede banking crises. According to Goldstein and Turner (1996), banks lend out too much capital during economic booms, which increases the foreign currency debt of banks. This in turn leads to greater exposure to changes in exchange rates and foreign interest rates (Goldstein & Turner, 1996).

Klomp (2010) examines potential heterogeneity among causes of banking crises by using a random coefficient logit model with a sample of 110 countries from 1970 to 2007. The results show that on average, the three most important determinants of banking crises are high real interest rates, high credit growth and negative GDP growth. However, no variable has a significant effect in more than 60 percent of the crises (Klomp, 2010).

2.2 Sovereign Debt Crises

2.2.1 Theoretical Review

The theoretical literature highlights several factors to be associated with a sovereign debt crisis. According to Manasse and Roubini (2009), there are two main approaches to identify the determinants of a debt crisis: the so-called ability-to-pay and the willingness-to-pay approaches.

On the one hand, the ability-to-pay approach holds that countries may be unable to repay their debt because they are either insolvent or illiquid (Manasse & Roubini, 2009). If a country is insolvent it is unable to fulfill its long-term obligations, whereas illiquidity means that a country is unable to meet its short-term obligations (Downes & Goodman, 2010).

On the other hand, the willingness-to-pay approach suggests that countries may be unwilling to repay their debt, based on a utility-maximizing cost-benefit calculation. Thus, according to this approach, governments compare the perceived costs and benefits associated with repayment. If the perceived costs exceed the benefits, the country defaults on its external debt. However, private creditors can take a number of retaliatory actions to penalize defaulting debtors, such as the exclusion from future borrowing. Usually, the government chooses to repay, because it knows that at some time in the future, it may face a shock during which it would be desirable to borrow again (Eaton & Gersovitz, 1981; Lee, 1991).

Regarding the ability to pay, whether a country is insolvent or not depends on its stock of debt relative to its ability to pay, for example measured by GDP, exports or government revenues. A sovereign is solvent if the discounted value of future trade balances is greater or equal to the current stock of net external debt. However, persistent fiscal deficits, or trade and current account imbalances, lead to an accumulation of debt. In order to avoid insolvency, fiscal and trade surpluses are therefore necessary at some point. Apart from flow imbalances, GDP growth and terms of trade also affect the ability to pay (Manasse & Roubini, 2009).

A debt crisis can also occur if a country is illiquid rather than insolvent. The link between liquidity and crises, primarily debt and financial crises, has been modeled as so-called self-fulfilling creditor runs. In these models, if creditors roll over maturing debt, the debtor is better off repaying the debt. On the other hand, if creditors refuse to roll over the maturing debt, the debtor defaults. There may even be an equilibrium in which no creditor rolls over, especially when creditors are small and have problems coordinating. This kind of self-fulfilling creditor runs is more likely the larger the amount of debt that needs to be rolled over. Thus, countries with excessive short-term external liabilities should be more vulnerable to crises (Detragiache & Spilimbergo, 2004; Cole & Kehoe, 2000).

Liquidity measures such as short-term debt over reserves, or M2 over reserves[2], are therefore included in many models of financial crises that emphasize the risk of a liquidity run. Other suggested proxies for liquidity needs include the external financing gap or the interest burden of servicing the debt (Manasse & Roubini, 2009).

2.2.2 Review of Empirical Research

Empirical studies of the determinants of debt crises usually resemble early-warning signal models, which aim at predicting sovereign debt crises. Explanatory factors that influence the probability of a debt crisis occurring are identified using so-called probit/logit regressions or signals models. Supporting the theoretical literature, most empirical studies have found that measures of solvency, such as the debt-to-GDP ratio, and measures of liquidity, such as short-term debt to reserves, are significant explanatory variables, along with some macroeconomic control variables, for example real GDP growth, inflation and the fiscal balance (Manasse et al., 2003).

Manasse et al. (2003) develop an early-warning model of sovereign debt crises using a panel dataset for 47 countries from 1970 to 2002. Through logit and binary recursive tree analysis[3], the authors identify macroeconomic variables reflecting solvency and liquidity factors that can predict a debt crisis a year in advance. Manasse et al. (2003) also find that sovereign debt crises last long and are persistent; once a country is in a crisis, it is difficult to get out of it.

A number of papers have attempted to empirically test the models of self-fulfilling creditor runs. This is normally done by regressing an indicator of crisis occurrence on the share of short-term debt to total debt and some control variables. A positive and significant coefficient for short-term debt would be interpreted as evidence in favor of self-fulfilling creditor runs. The empirical evidence so far is, however, mixed (Detragiache & Spilimbergo, 2004).

For example, Sachs et al. (1996) find weak evidence that countries affected by the Mexican Tequila crisis in 1994 had a higher share of short-term debt to total capital flows than other

[2] M2 is one of the definitions of money. It represents the monetary base and close substitutes for money, such as small-denomination time deposits. M2 can vary slightly between different countries (Howells and Bain, 2008).
[3] Tree analysis is a statistical technique to identify possible interactions between potential variables that can improve the predictability of being in crisis (Manasse et al., 2003).

countries. On the other hand, Rodrik and Velasco (1999) find that the ratio of short-term debt to reserves is a robust predictor of financial crises.

Another study analyzing debt crises in light of the theoretical models of self-fulfilling creditor runs is that of Detragiache and Spilimbergo (2001). Using a sample of 69 countries for the period 1970-1998 containing 55 crisis episodes, the authors investigate how the probability of a debt crisis depends on external liquidity after controlling for the structure of external debt and for macroeconomic variables. The liquidity variables considered are the share of short-term debt, debt coming due, and foreign exchange reserves. Detragiache and Spilimbergo (2001) find that these liquidity variables tend to be positively correlated with debt crises, concluding that monitoring all three components of external liquidity can be useful in order to predict debt crises. As for the macroeconomic variables, openness (measured as the sum of exports and imports divided by GDP) and the overvaluation of the real exchange rate are found to be weakly significant (Detragiache & Spilimbergo, 2001).

Manasse and Roubini (2009) investigate the economic and political conditions that are associated with the occurrence of sovereign debt crises, using a dataset for 47 emerging market economies from 1970 to 2002. By employing the so-called Classification and Regression Tree (CART)[4] methodology, the authors derive a set of "rules of thumb" that help characterizing countries facing default. Based on ten predictor variables, most debt crises can be classified into three types: episodes of insolvency (high debt and inflation), illiquidity (high short-term liabilities relative to foreign reserves) and macro-exchange rate risks (large overvaluation and negative growth shocks). Manasse and Roubini (2009) also conclude that unconditional thresholds, such as the debt-to-GDP ratio, are not useful per se for assessing the probability of default – it is rather the mix of different variables that can lead to a sovereign debt crisis.

Some studies analyze the interaction between currency crises and defaults. Reinhart (2002) finds that 84 percent of the emerging market defaults in her sample are associated with currency crises. This suggests that explanatory variables of currency crises should also have some explanatory power in models of sovereign default. Supporting this finding, Detragiache and Spilimbergo (2001) present evidence that many indicators that are useful for predicting currency crises are also useful for predicting debt crises.

[4] CART is a computer-intensive data mining technique for identifying "safe from crisis-prone" explanatory variables (Manasse and Roubini, 2009, p. 4).

Peter (2002) uses a panel logit model to estimate default probabilities of 78 emerging market countries for the period 1984-1997 as a function of economic and political variables. According to the empirical findings, the most important determinants of sovereign default appear to be a country's past repayment performance, political risks, exchange rate misalignments, the cost of international credit, and the volatility of output per capita (Peter, 2002).

There are also papers that examine the relationship between volatility and default risk. For example, Catão and Sutton (2002) present evidence that countries with historically higher macroeconomic volatility are more likely to default, in particular if this volatility is policy-induced. Their panel involves 25 emerging market countries over the period 1970-2001. A main implication of their findings is that less procyclical fiscal policies and less volatile monetary policies should improve a country's credit rating (Catão and Sutton, 2002).

2.3 Links Between Banking Crises and Sovereign Debt Crises

2.3.1 Theoretical Review

Although there are relatively few empirical papers addressing the links between banking and sovereign debt crises, there are more theoretical contributions on the topic. Reinhart (2009, p.1) describes potential transmission mechanisms from banking to debt crises as the five deadly D's: "Sharp economic *downturns* follow banking crises; with government revenues dragged down, fiscal *deficits* worsen; deficits lead to *debt*; as debt piles up, rating *downgrades* follow. For the most fortunate countries, it does not end in *default*."

According to Candelon and Palm (2010), there are three types of transmission mechanisms from banking to sovereign debt crises. First, in reaction to a banking crisis, governments set up safety plans which lead to an increase in public deficits. Second, fiscal costs are likely to be considerable if contingent liabilities materialize. Third, banking crises lead to shrinking government tax revenues and rising government spending (through social security). This deepens the budget deficit and drives up debt levels (Candelon & Palm, 2010). Similarly, Baldacci and Gupta (2009) argue that a banking crisis is likely to cause sovereign debt distress due to a combination of lower revenues and higher expenditures.

Concerning the transmission mechanisms from sovereign debt to banking crises, Borensztein and Panizza (2008) argue that a sovereign default would weaken the balance sheets of banks since banks hold substantial amounts of government bonds in their portfolios, especially banks in emerging economies. This could even create the threat of a bank run. In addition, banking crises are usually resolved through the injection of so-called government recapitalization bonds and central bank liquidity. However, these bonds are usually of questionable value in a debt crisis, and the public may lose confidence in the domestic currency, reinforcing the economic downturn (Borensztein & Panizza, 2008).

2.3.2 Review of Empirical Research

As mentioned, the empirical research on the links between banking and sovereign debt crises is relatively limited. Reinhart and Rogoff (2008a; b) even portray this lack of empirical studies as a "forgotten history", but two exceptions are Borensztein and Panizza (2008) and Reinhart and Rogoff (2011).

Borensztein and Panizza (2008) evaluate empirically four costs that might arise as a result of sovereign debt defaults: reputational costs, international trade exclusion costs, costs to the domestic economy through the financial system, and political costs to the authorities. The authors find that sovereign debt defaults result in considerable but short-lived economic costs. In addition, they find that the probability of a banking crisis conditional on a debt crisis is considerably higher than the unconditional probability of a banking crisis. However, the probability of a debt crisis conditional on a banking crisis is found to be only slightly higher than the unconditional probability. In other words, sovereign defaults seem to cause banking crises, but the relationship does not seem to be bidirectional (Borensztein & Panizza, 2008).

By using a rich panel dataset from 1800 to 2009, consisting of 290 banking crises and 209 sovereign debt crises, Reinhart and Rogoff (2011) test whether banking crises precede or accompany debt crises and vice versa. This is done by employing a causality test with a logit specification. The results show that the occurrence of systematic banking crises in financial centers increases the risk of domestic banking crises, which in turn is one of the factors that explain sovereign default. In addition, it is found that a rapidly increasing private indebtedness often precedes banking crises (Reinhart & Rogoff, 2011).

Reinhart and Rogoff (2008b) find that, on average, the central government debt increases by 86 percent three years after a financial crisis. It is not only the financial burden of bailouts that causes this increase, but large capital inflows and asset price bubbles also contribute to the increased government debt. The empirical results show that the frequency and duration of banking crises are similar for developed and middle-income countries. Reinhart and Rogoff (2008b) conclude that a high prevalence of banking crises has through history been associated with a high prevalence of sovereign defaults on external debt.

3 Methodology

This section contains a presentation of the empirical methodology used. It begins with a description of how banking and sovereign debt crises are identified. This is followed by a presentation of the econometric model and the associated explanatory variables. Finally, the methodology concerning the links between banking and debt crises is explained.

3.1 Identifying Banking Crises

Since the mid-1990's, a variety of classifications of banking crises have been used by researchers simply because there is no agreed-upon definition. A fairly broad definition is used by Laeven and Valencia (2008) who define a systemic banking crisis as a large number of defaults in a country's corporate and financial sectors, and when financial institutions and corporations face great difficulties repaying contracts on time.

In order to identify banking crises, many empirical studies use certain events as indicators, such as mergers, forced bank closures, and runs on financial institutions. For example, Demirgüç-Kunt and Detragiache (1998, p. 91) identify an episode as a banking crisis when at least one of the following four conditions holds:

1) "The ratio of non-performing assets to total assets in the banking system exceeded 10 percent.
2) The cost of the rescue operation was at least 2 percent of GDP.
3) Banking sector problems resulted in a large-scale nationalization of banks.
4) Extensive bank runs took place or emergency measures such as deposit freezes, prolonged bank holidays, or generalized deposit guarantees were enacted by the government in response to the crisis."

However, this so-called events method has several shortcomings. First, there is a tendency to identify banking crises too late. For instance, the costs associated with a bailout – the second criterion of Demirgüç-Kunt and Detragiache (1998) – can only be measured after a crisis and with a time lag. In addition, events such as bank holidays and the nationalization of banks are likely to take place only when the crisis is widespread in the economy. Second, the events method often involves subjective assessments, as in Laeven and Valencia (2008). Demirgüç-Kunt and Detragiache (1998, p. 90) even point out that their conditions for defining a banking crisis are established "somewhat arbitrarily". The subjectivity generally involves deciding whether a certain intervention is large enough to be considered a crisis. Third, the precise date of policy interventions is often uncertain or unclear. Fourth, the events method only identifies

crises when they are serious enough to trigger market events and it neglects crises that central banks and regulators fend off through prompt corrective policies. Focusing on crises that lead to policy interventions therefore gives rise to a selection bias in empirical work (von Hagen & Ho, 2006).

In light of these problems, von Hagen and Ho (2006) develop an alternative approach to classify banking crises. Starting from the conventional theory that the banking system's aggregate demand for central bank reserves depends negatively on the short-term interest rate, von Hagen and Ho (2006) define the beginning of a banking crisis as a period when there is excessive demand for liquidity in the money market. This could be because there is an increase in non-performing loans or a sharp worsening in the quality of bank loans. To compensate for this loss of liquidity, banks would increase their demand for central bank reserves. Another reason is sudden withdrawals of deposits by the public. Finally, a drying-up of interbank lending could force banks to turn to the central bank in order to refinance themselves (von Hagen & Ho, 2006).

The central bank can react to this increased demand for reserves in two main ways. If the operating target is the short-term interest rate, additional reserves need to be injected into the banking system through discount window lending or open market operations. On the other hand, if the central bank targets bank reserves, the supply of bank reserves is kept constant and the short-term interest rate will increase. A banking crisis is therefore characterized by a large increase in the volume of central bank reserves, a sharp rise in the short-term interest rate, or a combination of both (von Hagen & Ho, 2006).

Based on this logic, von Hagen and Ho (2006) identify crisis events with an index of money market pressure (IMP) that is a weighted average of changes in the ratio of reserves to bank deposits and changes in short-term real interest rates:

$$\mathrm{IMP}_t = \frac{\Delta\gamma_t}{\sigma_{\Delta\gamma}} + \frac{\Delta r_t}{\sigma_{\Delta r}}$$

where $\Delta\gamma_t$ is the change in the ratio of reserves to bank deposits, Δr_t is the change in the short-term real interest rate, and $\sigma_{\Delta\gamma}$ and $\sigma_{\Delta r}$ are the standard deviations of the two components, respectively. The ratio of reserves to bank deposits is defined as the ratio of borrowed reserves held by the banking system to total non-bank deposits in the banking sector. During

periods of high tension in the money market, this ratio rises either because the central bank injects additional reserves into the banking system or because depositors withdraw their funds (von Hagen & Ho, 2006).

von Hagen and Ho (2006) compute the IMP for a given country and define the start of a banking crisis as a period in which the index meets two criteria. First, it exceeds the 98.5 percentile of the sample distribution of the IMP for a certain country. Second, the change in the IMP from the previous period is positive and at least five percent. The authors also conduct a sensitivity analysis by changing the threshold level. It shows that increasing the threshold to the 99.5 percentile does not yield a significant change in the results, while decreasing it to the 95 percentile causes the regressions to lose explanatory power (von Hagen & Ho, 2006).

However, as with most methods for identifying banking crises, this approach is not flawless either. An objection is that it does not take into account asset-side crises, such as those caused by a collapse in the real estate market, but this objection is not relevant if the demand for reserves increases when the quality of bank assets deteriorates. Another objection is that the end of a banking crisis cannot be identified using the IMP approach. This is, however, a problem in the whole empirical crisis literature since there is no consensus on what kind of criteria that should be used to mark the end of a banking crisis. A common way is to disregard all observations in a fixed time window, beginning with the first observation when the index exceeds its threshold and then applying the index again to identify further crisis episodes (von Hagen & Ho, 2006).

In this paper, we will follow the methodology of von Hagen and Ho (2006) in order to identify a banking crisis, avoiding any subjective assessment that is inherent in the events method. We calculate the index of money market pressure from the equation above and define a banking crisis as a period in which the index exceeds the 95 percentile of the sample distribution of the IMP for a certain country. We do not use the second criteria of von Hagen and Ho (2006), as we consider the threshold of five percent somewhat arbitrary. The end of a banking crisis is defined as a crisis episode followed by two consecutive years of non-crisis episodes, i.e. when the index does not exceed the 95 percentile. Contrary to von Hagen and Ho (2006), our sensitivity analysis shows that raising the threshold to the 98.5 percentile causes the regressions to lose explanatory power. For a detailed description of the data used and the countries included, see section 4.1.

3.2 Identifying Sovereign Debt Crises

As with banking crises, it is not a trivial task to identify sovereign debt crises since there is no consensus among scholars how to define them. It could be narrowly defined as debt that has gone into arrears or include debt that has been restructured – and the word 'crisis' could be defined even more broadly (De Paoli et al., 2009).

A sovereign debt crisis could also be defined to occur when sovereign spreads over US Treasuries rise above 1,000 basis points, as in Sy (2004). Aylward and Thorne (1998) define a crisis when a country is in arrears to its creditors regardless of the amount. Yet another definition is employed by Rose (2002), who defines it as an event when the so-called Paris Club reaches agreement on a restructuring.

Detragiache and Spilimbergo (2001) analyze the relationship between debt crises and external liquidity, and define a debt crisis when either or both of the following conditions occur: (1) "there are arrears of principal or interest on external obligations towards commercial creditors (banks or bondholders) of more than 5 percent of total commercial debt outstanding; (2) there is a rescheduling or debt restructuring agreement with commercial creditors as listed in the GDF" (Detragiache & Spilimbergo, 2001, p. 6).

In a similar vein, De Paoli et al. (2009, p. 27) identify a crisis episode when either: (a) "the arrears of principal on external obligations towards private creditors reach at least 15 percent of total commercial debt outstanding; (b) the arrears of interest on external obligations towards private creditors reach at least 5 percent of total commercial debt outstanding; or (c) there is a rescheduling with private creditors as listed in the GDF". Unlike Detragiache and Spilimbergo (2001), these thresholds, for both arrears of principal and interest, are not arbitrarily selected, but rather based on the empirical distributions. More specifically, the chosen thresholds are between the 80th and 90th percentile of the empirical distribution of principal and interest arrears. In this way, thresholds that occur with low probability are identified (De Paoli et al., 2009).

Another approach, which is not uncommon, is to combine several datasets in order to identify debt crises. For example, Reinhart (2002) uses information on sovereign debt crises from Detragiache and Spilimbergo (2001), World Bank reports and two other secondary sources. Furceri and Zdzienicka (2012) even rely on five different datasets.

In our paper, we will use a slightly different definition of a sovereign debt crisis than De Paoli et al. (2009). We define the beginning of a debt crisis as two consecutive years when any of the following conditions occur:

1) The arrears of principal on external obligations towards private creditors reach at least 15 percent of short-term external debt.
2) The arrears of interest on external obligations towards private creditors reach at least 5 percent of short-term external debt.
3) The total amount of debt rescheduled reaches at least 10 percent of short-term external debt.

Similarly, the end of a debt crisis is defined as two consecutive years when none of these three conditions occur. The reason why short-term debt is used instead of total commercial debt is that the latter is not available in the GDF. Short-term external debt, defined as debt that has an original maturity of one year or less, is found to be the best proxy. Data availability is also the reason why the total amount of debt rescheduled is included as the third condition. Regarding the threshold of 10 percent, a sensitivity analysis yields similar results when the threshold is raised to 15 percent. For a detailed description of the data used and the countries included, see section 4.2.

3.3 Econometric Model

In order to examine potential determinants of banking and sovereign debt crises, we follow Demirgüç-Kunt and Detragiache (1998) and use a multivariate logit model. In statistics, logistic (or logit) regression is used for predicting the outcome of a binary dependent variable based on one or more explanatory variables. Like probabilities, the logistic function always takes on values between zero and one (Brooks, 2008). A logistic regression would be estimated by the following model:

$$P_i = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_{1i} + \ldots + \beta_k X_{ki} + u_i)}} \ , i = 1, \ldots, N$$

where P_i is the probability that $y_i = 1$, which means that country i experiences a banking or debt crisis; $X_{1i}, X_{2i}, \ldots, X_{ki}$ are a set of explanatory variables; $\beta_0, \beta_1, \ldots, \beta_k$ are coefficients; and u_i is an error term.

The logistic function is useful in the sense that it can take any input value from negative to positive infinity, while the output is bounded within the $(0,1)$ interval. Since this is not a linear model, it cannot be estimated using OLS. Instead, maximum likelihood is usually used (Brooks, 2008).

In this paper, the crisis dummy takes the value zero if there is no crisis and the value one if there is a crisis. The probability of a banking or debt crisis in country i at time t is denoted $P(i,t)$. It is hypothesized to be a function of n explanatory variables $X(i,t)$, with corresponding coefficients, β. For a discussion of the explanatory variables, see section 3.4. The log-likelihood function of the model is:

$$\ln L = \sum_{t=1}^{T} \sum_{i=1}^{n} P(i,t) \ln\left(F\left(\beta' X(i,t)\right)\right) + \left(1 - P(i,t)\right) \ln\left(1 - F\left(\beta' X(i,t)\right)\right)$$

where $F\left(\beta' X(i,t)\right)$ is the cumulative probability distribution function evaluated at $\beta' X(i,t)$.

When interpreting the estimated coefficients of logistic regressions, it is important to note that they do not indicate the increase in the probability of a crisis given a one-unit increase in the corresponding explanatory variable, as would have been the case of the linear probability model. Instead, the estimated coefficients indicate the effect of a one-unit change in an explanatory variable on $\ln(P(i,t)/(1 - P(i,t)))$. Even though the sign of the coefficient does indicate the direction of the change, the magnitude depends on the slope of the cumulative distribution function at $\beta' X(i,t)$ (Demirgüç-Kunt & Detragiache, 1998). However, since we in this paper are primarily interested in the direction of the change, the logistic regression would still be an appropriate specification.

The logistic regressions are estimated in EViews using Quadratic hill climbing as optimization algorithm and Huber/White robust covariances. The results of these regressions are provided in section 5 and Appendix 3 and 4.

3.4 Explanatory Variables

3.4.1 Banking Crises

The choice of explanatory variables is based on the existing theoretical and empirical literature, discussed in section 2.1, as well as data availability. Compared to other studies, such as Demirgüç-Kunt and Detragiache (1998) and von Hagen and Ho (2006), we have included fewer explanatory variables in order to limit problems with multicollinearity. In statistics, multicollinearity occurs when two or more explanatory variables are highly correlated, which could yield invalid results about any individual predictor (Brooks, 2008).

The five explanatory variables for banking crises used in our study capture financial liberalization, credit expansion, and adverse macroeconomic shocks (see table 1). In Appendix 2, further definitions and the sources of the explanatory variables are presented.

Table 1. List of Explanatory Variables for Banking Crises.

Measure of	**Variable**
Financial liberalization	Real interest rate
Financial liberalization	Ratio of domestic credit to the private sector to GDP
Credit expansion	Domestic credit growth
Macroeconomic situation	Real GDP growth
Macroeconomic situation	Inflation

The interest rate, used as a measure of financial liberalization, is expected to be positively related to the emergence of banking crises. According to Demirgüç-Kunt and Detragiache (1998), financial liberalization has a tendency to precede real interest increases, which in turn might cause serious banking sector problems. Another variable that captures the effects of financial liberalization is the ratio of domestic credit to the private sector to GDP. Demirgüç-Kunt and Detragiache (1998) refer to this variable as the best measure of financial liberalization. According to von Hagen and Ho (2006), it also captures the degree of development within the financial sector.

To measure the effect of credit expansion, we use domestic credit growth. According to Demirgüç-Kunt and Detragiache (1998), a strong increase in the domestic credit level is likely to increase the probability of a banking crisis. Therefore, our expectation is that the domestic credit growth variable is positively related to the emergence of banking crises.

In addition to the bank-specific variables, we include two macroeconomic variables, namely the growth rate of real GDP and inflation. As the economy enters a downturn, the overall ability to repay and service debt is likely to decline, which in turn increases the risk of entering a banking crisis (Demirgüç-Kunt & Detragiache, 1998). Hence, we expect GDP growth to be negatively related to the probability of banking crises. Concerning inflation, empirical research contradicts the theory of Demirgüç-Kunt & Detragiache (1998), by finding evidence that inflation is positively related to the emergence of banking crises rather than negatively related (von Hagen & Ho, 2006). In our study, the hypothesis on inflation is based on this body of empirical research. Thus, inflation is expected to be positively related to the probability of banking crises. Our hypotheses about the explanatory variables are summarized in table 2 below.

Table 2. Hypotheses About the Explanatory Variables for Banking Crises.

Variable	**Hypothesis**
Real interest rate	Positively significant
Ratio of domestic credit to the private sector to GDP	Positively significant
Domestic credit growth	Positively significant
Real GDP growth	Negatively significant
Inflation	Positively significant

Unlike other studies, such as Demirgüç-Kunt and Detragiache (1998), we decided not to include variables for bank liquidity or exchange rate changes in the logistic regressions. The reason for excluding liquidity variables, for instance liquid reserves (cash) to bank assets, is that they have distinct and well-known effects on the probability of banking crises. An example of a frequently studied exchange rate variable is the ratio of M2 to foreign exchange reserves. However, this measure is related to countries with an exchange rate peg. Using this variable would therefore considerably limit the number of countries included in our sample.

Finally, it should be noted that all explanatory variables have been lagged by one year, which is common practice in these kinds of models. According to von Hagen and Ho (2006), problems of simultaneity can be avoided by using a one-year lag on every explanatory variable.

3.4.2 Sovereign Debt Crises

Our choice of explanatory variables for sovereign debt crises reflects both the existing theoretical and empirical literature, as summarized in section 2.2, and data availability. While some studies use numerous explanatory variables, such as Manasse et al. (2003) who use 47, we

narrow them down to a set of five explanatory variables in order to limit problems with multicollinearity. The chosen variables are measures of liquidity, solvency and the overall macroeconomic environment, as listed in table 3 below. All the definitions of the explanatory variables and their sources are provided in Appendix 2.

Table 3. List of Explanatory Variables for Sovereign Debt Crises.

Measure of	**Variable**
Liquidity	Short-term external debt to GDP
Liquidity	M2 to total reserves
Solvency	Long-term external debt to GDP
Macroeconomic situation	Real GDP growth
Macroeconomic situation	Inflation

Short-term external debt to GDP is expected to be positively related to the probability of entering into a crisis, while M2 to total reserves is presumed to be negatively related, since this would indicate a worsening of a country's liquidity position. Concerning debt solvency, we chose to include only one measure: long-term external debt to GDP. As discussed by Detragiache and Spilimbergo (2001), measures of solvency, such as the share of debt owed to commercial banks and the share of debt at concessional terms, are highly correlated and multicollinearity could therefore lower the significance of each individual variable. Detragiache and Spilimbergo (2001) still keep them in the regressions, but they are not studying the impact of these variables on the crisis probability.

Long-term external debt was chosen instead of total external debt since the latter is the sum of short-term and long-term external debt. We therefore felt long-term external debt would be the most appropriate measure of solvency. The ratio of this variable to GDP is expected to be positively related to the probability of a crisis – just like short-term external debt. In other words, when the ratio of long-term external debt to GDP increases, a country's solvency position worsens.

On the theoretical side, the measures of liquidity and solvency are related to a country's ability to repay its debt. However, none of the explanatory variables reflect the willingness to repay debt since this is difficult to measure. Manasse et al. (2003) include political and institutional variables, such as political freedom, to capture a country's willingness to pay, but their results are mixed and depend on the time period.

We also use two macroeconomic variables – real GDP growth and inflation – to study the overall economic environment around debt crises. Here, we would suspect real GDP growth to decline and inflation to increase during periods of debt crises. Interestingly, previous research has come to different conclusions about the significance of these variables. For example, Manasse et al. (2003) find that low GDP growth and monetary mismanagement in the form of high inflation significantly matter for predicting debt crises. On the other hand, Detragiache and Spilimbergo (2001) find that several macroeconomic control variables, such as GDP growth and inflation, are insignificant in the regressions. Our hypotheses about the explanatory variables are summarized in table 4 below.

Table 4. Hypotheses About the Explanatory Variables for Sovereign Debt Crises.

Variable	**Hypothesis**
Short-term external debt to GDP	Positively significant
M2 to total reserves	Negatively significant
Long-term external debt to GDP	Positively significant
Real GDP growth	Negatively significant
Inflation	Positively significant

In the logistic regressions, the measures of liquidity and solvency are lagged by one year because they are end-of-period stocks. The macroeconomic variables are similarly lagged by one period to avoid problems of simultaneity. This approach is consistent with earlier research, for example Detragiache and Spilimbergo (2001).

3.5 Twin Crises

To examine links between banking and sovereign debt crises, we employ the methodology of Kaminsky and Reinhart (1999), who analyze the links between banking and currency crises. They calculate the conditional and unconditional probabilities of banking and currency crises in order to investigate whether a banking crisis increases the probability that a country will experience a currency crisis, or the other way around. For example, if the knowledge that there was a banking crisis during any of the past two years helps predict a currency crisis, then the probability of a currency crisis, conditioned on the information that a banking crisis has occurred, should be higher than the unconditional probability of a currency crisis (Kaminsky and Reinhart, 1999).

Mathematically, the conditional probability of an event A given event B is the probability of A if B is known to occur (Lange, 2010). This is commonly denoted $P(A|B)$ and is defined as:

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

In other words, the conditional probability of A given B is defined as the quotient of the unconditional joint probability of A and B, $P(A \cap B)$, and the unconditional probability of B, $P(B)$ (Lange, 2010). If A and B are statistically independent, the occurrence of A does not affect the probability of B, and vice versa, expressed as:

$$P(A|B) = P(A)$$
$$P(B|A) = P(B)$$

Following Kaminsky and Reinhart (1999), we begin by calculating the unconditional probability of banking and debt crises in our sample. For instance, the unconditional probability that a banking crisis will occur in the next year is simply one multiplied by the total number of banking crises in the sample divided by the total number of yearly observations in the sample.

In order to calculate the conditional probabilities, the crisis windows need to be defined. We define both the banking and debt crisis windows as the crisis episodes, including the year before and the year after a crisis. When these windows overlap, each pair of observations within the windows is identified as a twin crisis. For example, if a banking crisis occurs in a certain year and a debt crisis occurs in the same country the next year, two twin crises would be identified.

The probability of a debt crisis conditional on a banking crisis is calculated as the number of debt crises that occur within one year of a banking crisis divided by the total number of years in the banking crisis windows. Logically, the probability of a banking crisis conditional on a debt crisis is calculated correspondingly. The empirical results are provided in section 5.

4 Data

This section presents the data used for the analysis and the selection process for including a certain country in the study.

4.1 Banking Crisis Data

Because of data availability, the dataset for banking crises spans from 1970 to 2008. Since some of the independent variables are available only in annual frequency, the banking crisis dummy is also in annual frequency. In order to determine which countries to include, we started with all countries listed in the IMF's International Financial Statistics (IFS) CD-ROM (April 2012 version). Centrally planned economies and economies in transition were then eliminated since the relationship between the banking system and the rest of the economy is likely to be of a characteristic nature in these countries (Demirgüç-Kunt & Detragiache, 1998; United Nations Statistics Division, 2011). Countries that lacked macroeconomic or bank-specific data for half of the sample period were also excluded, as the number of observations would have been too few[5]. The final sample consists of 23 countries with a total of 108 banking crises. The countries are listed in Appendix 1 along with their banking crisis episodes.

The data used to calculate the index of money market pressure (IMP) and identify the banking crises is obtained from the IFS CD-ROM (April 2012 version) and the World Bank's Global Development Finance (GDF). The explanatory variables are also taken from these sources. A detailed description of the explanatory variables, the variables used to compute the IMP and their sources can be found in Appendix 2.

4.2 Sovereign Debt Crisis Data

The dataset for sovereign debt crises is limited to the period 1970-2008 because of data availability. As with banking crises, the data is in annual frequency. The process for determining which countries to include is similar to that of the banking crises, except we started with all the countries in the GDF database. Centrally planned economies and economies in transition were once again excluded. Countries that lacked macroeconomic or debt-related data for half of the sample period were also eliminated. Finally, we excluded the countries in which no sovereign debt crisis episode was identified. The final sample consists of 30 countries with a

[5] Not every variable is available for all countries for the full time period.

total of 386 debt crises (see Appendix 1). The data on all explanatory variables and the variables used to identify the sovereign debt crises are taken from the GDF database. A detailed description of these variables and their sources is provided in Appendix 2.

4.3 Twin Crisis Data

The countries included in the calculations of the conditional and unconditional probabilities of banking and debt crises are those that were found to have at least one banking and debt crisis, not necessarily the same year, during the sample period 1970-2008. The countries that fulfill this condition are Argentina, Burkina Faso, Côte d'Ivoire, Mauritius, Niger, Senegal and Sri Lanka. In total, 16 twin crises are identified for these countries.

5 Empirical Results

In this section, the descriptive statistics and the results of the logistic regressions are presented for banking and sovereign debt crises, respectively, as well as the conditional and unconditional probabilities for the twin crisis phenomenon.

5.1 Banking Crises

Table 5 presents the descriptive statistics of the explanatory variables for banking crises, aggregated together for all 23 countries. The table reports the respective mean of the explanatory variables in the whole sample, for periods of non-crisis, for years before entering a banking crisis, for crisis episodes, and for years before exiting a banking crisis.

Table 5. Mean of the Variables Used in the Regressions for Banking Crises.

Current year **Next year**	**All** **All**	**Non-crisis** **Non-crisis**	**Non-crisis** **Crisis**	**Crisis** **Crisis**	**Crisis** **Non-crisis**	**No. of** **Obs.**
Real interest rate	5.80	0.03	12.47	236.22	0.01	772
Ratio of domestic credit to the private sector to GDP	52.75	53.11	97.06	66.10	88.00	869
Domestic credit growth	1.50	1.50	1.49	1.89	2.23	854
Real GDP growth	3.57	3.51	3.05	0.80	2.30	880
Inflation	18.46	10.78	98.38	149.56	16.55	889

The results of the logistic regressions for all 23 countries combined are presented in table 6. The percentage figures reported in the table are the number of regressions in which a certain explanatory variable is significant relative to the total number of regressions, which is 23. For example, the real interest rate is positively significant at the 5 percent level in five of the 23 regressions, meaning 21.74 percent. Similarly, it is negatively significant at the 5 percent level in two of the 23 regressions (8.7 percent). The results are also reported for the 10 percent significance level in order to see if a higher significance level provides more insights. Every country regression is included in Appendix 3.

Table 6. Results of the Logistic Regressions for Banking Crises.

Variable	**Percent of regressions with positive significance**		**Percent of regressions with negative significance**	
	5 % level	**10 % level**	**5 % level**	**10 % level**
Real interest rate	21.74 %	30.43 %	8.70 %	8.70 %
Ratio of domestic credit to the private sector to GDP	17.39 %	21.74 %	13.04 %	17.39 %
Domestic credit growth	8.70 %	13.04 %	4.35 %	4.35 %
Real GDP growth	0 %	13.04 %	8.70 %	13.04 %
Inflation	21.74 %	26.09 %	8.70 %	8.70 %

5.2 Sovereign Debt Crises

Table 7 shows the descriptive statistics (means) of the explanatory variables for sovereign debt crises when all 30 countries in the debt crisis sample are aggregated. Table 8 presents the results of the logistic regressions for the 30 countries combined. It reports the number of regressions in which a certain variable is significant at the 5 or 10 percent level, relative to the total number of regressions. In addition, the results in table 8 are disaggregated according to the direction of the significance. The individual regressions for each country are provided in Appendix 4.

Table 7. Mean of the Variables Used in the Regressions for Sovereign Debt Crises.

Current year **Next year**	**All** **All**	**Non-crisis** **Non-crisis**	**Non-crisis** **Crisis**	**Crisis** **Crisis**	**Crisis** **Non-crisis**	**No. of** **Obs.**
Short-term external debt to GDP	0.06	0.05	0.06	0.07	0.04	1137
M2 to total reserves	7.97	5.89	12.16	11.90	6.35	1138
Long-term external debt to GDP	0.49	0.42	0.60	0.61	0.56	1137
Real GDP growth	3.69	3.75	3.37	3.52	3.35	1126
Inflation	43.14	13.20	14.62	111.22	13.21	1130

Table 8. Results of the Logistic Regressions for Sovereign Debt Crises**.**

Variable	**Percent of regressions with positive significance**		**Percent of regressions with negative significance**	
	5 % level	**10 % level**	**5 % level**	**10 % level**
Short-term external debt to GDP	13.33 %	20 %	16.67 %	26.67 %
M2 to total reserves	10 %	20 %	10 %	13.33 %
Long-term external debt to GDP	33.33 %	56.67 %	0 %	0 %
Real GDP growth	10 %	10 %	3.33 %	3.33 %
Inflation	16.67 %	16.67 %	16.67 %	16.67 %

5.3 Twin Crises

In table 9, the conditional and unconditional probabilities of banking and debt crises are presented for the seven countries that were found to have both types of crises.

Table 9. Conditional and Unconditional Probabilities of Banking and Sovereign Debt Crises.

Type	**Probability of banking crisis**	**Probability of sovereign debt crisis**
Unconditional	0.058	0.344
Conditional on sovereign debt crisis	0.045	
Conditional on banking crisis		0.407

6 Discussion

In this section, the empirical results are interpreted and analyzed. The section is divided into banking and sovereign debt crises, with subsections for analyses of the descriptive statistics and the logistic regressions.

6.1 Banking Crises

6.1.1 Analysis of the Descriptive Statistics

In table 5, the results of the descriptive statistics are presented. The means of the variables measuring financial liberalization suggest that the two variables move differently. The real interest rate is, on average, low during non-crisis years. However, as a banking crisis approaches, the real interest rate increases. During a year of banking crisis, the interest rate spikes but falls back to its original level towards the end of the crisis. The ratio of domestic credit to the private sector to GDP moves in an expected manner: going up right before a crisis is entered, declining during the crisis, and increasing as the crisis comes to an end. Thus, the descriptive statistics of the financial liberalization variables depict a worsening situation for the banking sector prior to a crisis.

The mean of the domestic credit growth declines slightly in the year before crisis entry, indicating that the variable might not be significantly related to the probability of a banking crisis. During crisis periods, domestic credit growth increases, which on the other hand indicates a positive relationship.

The movements of the two macroeconomic variables correspond to our expectations. Real GDP growth decreases as a crisis entry approaches, has its lowest point in the middle of a crisis and recovers towards the end of a banking crisis. Inflation, on the other hand, increases a year before crisis entry, peaking in the middle of a banking crisis. Overall, the descriptive statistics therefore indicate a worsening of the macroeconomic situation ahead of a banking crisis and an improvement in these variables in the year before exiting from a crisis.

However, the descriptive statistics are suggestive at best, and thus require econometric testing. The results of the logistic regressions, which are analyzed in the next section, are therefore important in order to shed more light on the determinants of banking crises.

6.1.2 Analysis of the Logistic Regressions

The results presented in table 6 are mixed and do not fully support our hypotheses in table 2. Table 6 shows that the real interest rate is positively significant in 21.7 and 30.4 percent of the regressions at the 5 and 10 percent level, respectively. This is an indication that the real interest rate is positively related to the emergence of banking crises – a result that is in accordance with the existing literature. In 8.7 percent of the regressions, negative significance is found, which weakens the finding somewhat. However, the overall results for the real interest rate seem to support the findings of Demirgüç-Kunt and Detragiache (1998).

Another variable that is used as a measure of financial liberalization is the ratio of domestic credit to the private sector to GDP. The number of positively and negatively significant regressions is almost equal for this variable, making the result inconclusive. This finding is consistent with Demirgüç-Kunt and Detragiache (1998) who find low significance for this variable. Furthermore, in the study by von Hagen and Ho (2006), no significance is found for the ratio of domestic credit to the private sector to GDP.

As described in section 3.4.1, we expected domestic credit growth to be positively related to the probability of banking crises. However, only a low number of regressions show positive significance of such a relation. Increasing the significance level from 5 to 10 percent does not seem to provide further insights. This result is in line with Demirgüç-Kunt and Detragiache (1998), who find inconsistently significant coefficients for the domestic credit growth.

The macroeconomic variables present a mixed result. GDP growth does not follow our expectation since only two of the regressions are negatively significant at the 5 percent level. When the significance threshold is raised to 10 percent, the number of regressions with positively or negatively significant GDP growth coefficients remains quite low. Taken together, this indicates that the variable is insignificant. Regarding inflation, it is positively significant in 21.7 and 26.1 percent of the regressions at the 5 and 10 percent levels, respectively. This suggests that inflation, as expected, is positively related to the probability of banking crises, which gives some support to the empirical findings of von Hagen and Ho (2006) rather than the theory of Demirgüç-Kunt and Detragiache (1998).

A measure of model performance for logistic regressions is the so-called pseudo-R^2, which is also known as McFadden's R^2. As the model fit improves, pseudo-R^2 increases. For the banking crisis regressions, McFadden's R^2 values are widely spread, although the majority of these values are between 20 and 50 percent. This indicates a fairly good fit of the models, considering that pseudo-R^2 values are often below 10 percent for logistic regressions (Brooks, 2008).

6.2 Sovereign Debt Crises

6.2.1 Analysis of the Descriptive Statistics

The descriptive statistics in table 7 provide a somewhat mixed picture of the determinants of sovereign debt crises. Both of the liquidity measures – short-term external debt to GDP and M2 to reserves – increase in the year before crisis entry, which in the case of M2 to reserves is not as expected. However, the ratio decreases during periods of crisis. Short-term external debt to GDP, on the other hand, rises even further within crisis, although the ratio falls in the year before a country exits from crisis.

The ratio of long-term external debt to GDP moves as expected and follows a similar pattern: it increases in the year before crisis entry and during crisis periods but slowly decreases in the year before crisis exit. Thus, the descriptive statistics depict a worsening of the debt situation ahead of a crisis and an improvement in short- and long-term external debt to GDP before exiting from a crisis.

Regarding the macroeconomic variables, inflation rises and real GDP growth falls in the run-up to a crisis, which is in accordance with the hypotheses in table 4. During periods of crisis, inflation spikes but later plunges and reaches the same level as non-crisis episodes in the year before crisis exit. Real GDP growth actually improves during crisis episodes, but falters before the end of a crisis. Overall, the descriptive statistics thus depict a worsening of the macroeconomic situation prior to a crisis and an improvement during either the early or late stage of a crisis. In general, the results in table 7 are consistent with the findings of Manasse et al. (2003). The descriptive statistics are only indicative, though, and therefore require econometric testing. In the next section, the results of the logistic regressions are analyzed.

6.2.2 Analysis of the Logistic Regressions

As with the descriptive statistics, the results of the logistic regressions are somewhat mixed. None of the explanatory variables is significant in more than half of the regressions at the 5 percent level. However, the ratio of long-term external debt to GDP is positively significant in more than 50 percent of the regressions at the 10 percent level. The ratio is still positively significant in a third of the regressions when the significance level is lowered to 5 percent. This finding suggests that the less solvent a country is, the more likely it is to default on its external debt, which is consistent with previous research, for example Manasse and Roubini (2009).

This is, however, not the case with the two liquidity variables. The ratio of short-term external debt to GDP is positively significant at the 5 percent level in 13.3 percent of the regressions but negatively significant in 16.7 percent of the cases. The second liquidity variable – M2 to reserves – also seems relatively insignificant at the 5 percent level. Raising the significance threshold to 10 percent does not seem to provide further insights. These findings provide little evidence in favor of the theoretical models of self-fulfilling creditor runs, such as Cole and Kehoe (2000). The results are surprising since measures of liquidity have been found to significantly matter for predicting debt crises. A reason for our findings could be that some countries lacked data for short-term external debt and M2 to reserves during the 1970's, making the number of observations relatively few in these countries. In addition, some countries were in a state of crisis during relatively long spells of the sample period.

Concerning the macroeconomic variables, real GDP growth is only positively significant in three of the regressions, implying that the variable is insignificant in most of the regressions. Inflation is found to be positively and negatively significant in four cases each at both significance levels. On the whole, this result indicates that inflation is also insignificantly related to the probability of a debt crisis. The empirical results on the macroeconomic variables therefore support the findings of Detragiache and Spilimbergo (2001) as opposed to Manasse et al. (2003).

Regarding the performance of the models, McFadden's R^2 values are between 30 and 60 percent for a broad majority of the regressions. Being logistic regressions, these values suggest that the fit of the model is fairly good.

6.3 Twin Crises

Table 9 shows that the unconditional probability of debt crises is 34.4 percent compared to 5.8 percent for banking crises. This difference reflects the relatively higher frequency of debt crises in the sample. The table also shows that the probability of a debt crisis conditional on a banking crisis is 40.7 percent, which is higher than the unconditional probability. This indicates that a banking crisis increases the probability that a country will experience a debt crisis – a result that is in line with the findings of Borensztein and Panizza (2008) but not those of Reinhart and Rogoff (2011). A plausible rationale of this result is that banking crises may cause sovereign debt distress through a combination of lower revenues and higher expenditures (Candelon & Palm, 2010).

As shown in table 9, the probability of a banking crisis conditional on a debt crisis is 4.5 percent. Since this is lower than the unconditional probability of a banking crisis, it indicates that little valuable information is gained when the occurrence of a debt crisis is used as the conditioning piece of information. Interestingly, this result is in line with the findings of Reinhart and Rogoff (2011) but not those of Borensztein and Panizza (2008).

A possible source of error is that the number of countries with both types of crises is relatively few – just seven. In addition, the number of twin crises is only 16. Because of the relatively low numbers of countries and twin crises in our study, the results in table 9 should be interpreted with some caution. However, the fact that so few twin crises are found, suggests that this phenomenon is relatively uncommon. This could be one of the reasons why not so many studies have focused on banking and sovereign debt as twin crises.

7 Conclusion

In this paper, we examine potential determinants of banking and sovereign debt crises and analyze links between them. To identify banking and debt crises, we use a methodology similar to von Hagen and Ho's (2006) and a definition close to De Paoli et al.'s (2009), respectively. The final sample for banking crises consists of 23 countries over the period 1970-2008 containing 108 crisis episodes. The same time period is used for debt crises and the final sample here consists of 30 countries, with a total of 386 crisis episodes. Thus, unlike banking crises, we find that debt crises last long and are persistent; once a country is in a debt crisis, it is difficult to get out of it.

In order to examine potential determinants of banking and debt crises, we use a multivariate logit model. The empirical results provide a somewhat mixed picture. For the regressions on banking crises, we find evidence that higher inflation and real interest rates increase the likelihood of a crisis. On the other hand, domestic credit growth and real GDP growth appear insignificant, and the results for the ratio of domestic credit to the private sector to GDP are inconclusive. These results are generally in line with existing research, for example the studies of Demirgüç-Kunt and Detragiache (1998) and von Hagen and Ho (2006).

Concerning debt crises, long-term external debt to GDP is positively significant in more than half of the regressions at the 10 percent level, indicating that measures of solvency matter for predicting debt crises. However, the measures of liquidity (short-term external debt to GDP and M2 to total reserves) yield inconclusive results. The macroeconomic variables (real GDP growth and inflation) appear to be insignificantly related to the probability of a debt crisis, supporting the findings of Detragiache and Spilimbergo (2001).

The final sample for analyzing links between banking and debt crises consists of seven countries for the period 1970-2008, with a total of 16 twin crisis episodes. The links are examined by calculating conditional and unconditional probabilities. We find indications that a banking crisis increases the probability that a country will experience a debt crisis, which supports the results of Borensztein and Panizza (2008). However, for banking crises, little valuable information is gained when the occurrence of a debt crisis is used as the conditioning piece of information. This is in accordance with the findings of Reinhart and Rogoff (2011). The fact

that quite few twin crises are found suggests that this phenomenon is relatively uncommon, which could be one of the reasons why not so many studies have focused on banking and sovereign debt as twin crises.

Although not an objective of this paper, it would be interesting to investigate if the nature of banking and debt crises exhibits any distinct regional patterns. Another suggestion for future research would be to study a time period that includes the current financial turbulence in Europe. This could give valuable insights regarding the determinants of banking and debt crises, as well as the twin crisis phenomenon. Finally, a relatively unexplored research area is the severity of these twin crises, which for example could be studied by calculating output losses for twin crisis episodes. We believe these suggestions are worthy of further analysis.

8 References

8.1 Books

Brooks, C., 2008. *Introductory Econometrics for Finance*. 2nd ed. Cambridge, U.K.: Cambridge University Press.

Downes, J. and Goodman, J.E., 2010. *Finance & Investment Handbook.* 8th ed. Hauppauge, NY: Barron's Educational Series, Inc.

Howells, P. and Bain, K., 2008. *The Economics of Money, Banking and Finance: A European Text*. 4th ed. Harlow, U.K.: Pearson Education Limited.

Lange, K., 2010. *Applied Probability*. 2nd ed. New York: Springer.

8.2 Newspaper Article

Chaffin, J. and Hope, K., 2012. Greeks Race to Unlock Bail-Out. *Financial Times*, 22 Feb. p.1b.

8.3 Journal Articles and Working Papers

Aylward, L. and Thorne, R. (1998) "An Econometric Analysis of Countries' Repayment Performance to the International Monetary Fund". *IMF Working Paper*, WP/98/32.

Baldacci, E. and Gupta, S. (2009) "Fiscal Expansions: What Works". *Finance & Development*, IMF, December 2009, Vol. 46, No. 4.

Borensztein, E. and Panizza, U. (2008) "The Costs of Sovereign Default". *IMF Working Paper*, No. WP/08/238.

Candelon, B. and Palm, F. (2010) "Banking and Debt Crises in Europe: The Dangerous Liaisons?" De *Economist*, Vol. 158, No. 1, pp. 81-99.

Caprio, G. and Klingebiel, D. (1996) "Bank Insolvency: Bad Luck, Bad Policy, or Bad Banking?" in Michael Bruno and Boris Pleskovic, ed., *Annual World Bank Conference on Development Economics*. Washington, DC: World Bank, pp. 79-104.

Catão, L. and Sutton, B. (2002) "Sovereign Defaults: The Role of Volatility". *IMF Working Paper*, WP/02/149.

Cole, H.L. and Kehoe, T.J. (2000) "Self-fulfilling Debt Crises". *The Review of Economic Studies*, Vol. 67, No. 1, pp. 91-116.

Demirgüç-Kunt, A. and Detragiache, E. (1998) "The Determinants of Banking Crises in Developing and Developed Countries". *IMF Staff Papers*, Vol. 45, No. 1, pp. 81-109.

De Paoli, B., Hoggarth, G. and Saporta, V. (2009) "Output Costs of Sovereign Crises: Some Empirical Estimates". *Bank of England Working Paper*, No. 362.

Detragiache, E. and Spilimbergo, A. (2001) "Crises and Liquidity: Evidence and Interpretation". *IMF Working Paper*, WP/01/02.

Detragiache, E. and Spilimbergo, A. (2004) "Empirical Models of Short-term Debt and Crises: Do They Test the Creditor Run Hypothesis?" *European Economic Review*, Vol. 48, No. 2, pp. 379-389.

Diamond, D.W. and Dybvig, P.H. (2000) "Bank Runs, Deposit Insurance, and Liquidity". *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 24, No. 1, pp. 14-23.

Eaton, J. and Gersovitz, M. (1981) "Debt with Potential Repudiation: Theoretical and Empirical Analysis". *The Review of Economic Studies*, Vol. 48, No. 2, pp. 289-309.

English, W.B. (1996) "Inflation and Financial Sector Size". *Journal of Monetary Economics*, Vol. 44, No. 3, pp. 379-400.

Ergungor, O.E. and Thomson, J.B. (2005) "Systemic Banking Crises". *Federal Reserve Bank of Cleveland Policy Discussion Papers*, No. 9.

Furceri, D. and Zdzienicka, A. (2012) "How Costly are Debt Crises?" *IMF Working Paper*, WP/11/280.

Goldstein, I. (2005) "Strategic Complementarities and the Twin Crises". *The Economic Journal*, Vol. 115, No. 503, pp. 368-390.

Goldstein, M. and Turner, P. (1996) "Banking Crises in Emerging Economies: Origins and Policy Options". *BIS Economic Papers*, No. 46.

Kaminsky, G.L. and Reinhart, C.M. (1999) "The Twin Crises: The Causes of Banking and Balance-Of-Payments Problems". *The American Economic Review*, Vol. 89, No. 3, pp. 473-500.

Kaminsky, G.L. and Schmukler, S.L. (2003) "Short-run Pain, Long-run Gain: The Effects of Financial Liberalization". *IMF Working Paper*, WP/03/34.

Klomp, J. (2010) "Causes of Banking Crises Revisited". *North American Journal of Economics and Finance*, Volume 21, No. 1, pp. 72 – 87.

Laeven, L. (2011) "Banking Crises: A Review". *Annual Review of Financial Economics*, Vol. 3, pp. 17-40.

Laeven, L. and Valencia, F. (2008) "Systemic Banking Crises: A New Database". *IMF Working Paper*, WP/08/224.

Lee, S.H. (1991) "Ability and Willingness to Service Debt as Explanation for Commercial and Official Rescheduling Cases". *Journal of Banking and Finance*, Vol. 15, No. 1, pp. 5-27.

Manasse, P. and Roubini, N. (2009) "'Rules of Thumb' for Sovereign Debt Crises". *Journal of International Economics*, Vol. 78, No. 2, pp. 192-205.

Manasse, P., Roubini, N. and Schimmelpfennig, A. (2003) "Predicting Sovereign Debt Crises". *IMF Working Paper*, WP/03/221.

McKibbin, W.J. and Stoeckel, A. (2009) "The Global Financial Crisis: Causes and Consequences". *Asian Economic Papers*, 9(1), pp. 54-86.

Peter, M. (2002) "Estimating Default Probabilities of Emerging Market Sovereigns: A New Look at a Not-so-new Literature". *HEI Working Paper*, No. 06/2002.

Reinhart, C.M. (2002) "Default, Currency Crises and Sovereign Debt Crises". *NBER Working Paper*, No. 8738.

Reinhart, C.M. (2009) "The Economic and Fiscal Consequences of Financial Crises". MPRA Paper, No. 13025.

Reinhart, C.M. and Rogoff, K.S. (2008a) "The Forgotten History of Domestic Debt". *NBER Working Paper* 13946.

Reinhart, C.M. and Rogoff, K.S. (2008b) "Banking Crises: An Equal Opportunity Menace". *NBER Working Paper* 14587.

Reinhart, C.M. and Rogoff, K.S. (2011) "From Financial Crash to Debt Crisis". *American Economic Review*, Vol. 101, pp. 1676–1706.

Rodrik, D. and Velasco, A. (1999) "Short-term Capital Flows". *NBER Working Paper*, No. 7364.

Rose, A.K. (2002) "One Reason Countries Pay Their Debts: Renegotiation and International Trade". *NBER Working Paper*, No. 8853.

Sachs, J., Tornell, A. and Velasco, A. (1996) "Financial Crises in Emerging Markets: the Lessons From 1995". *NBER Working Paper*, No. 5576.

Sy, A. (2004) "Rating the Rating Agencies: Anticipating Currency Crises or Debt Crises". *IMF Working Paper*, WP/03/122.

von Hagen, J. and Ho, T. (2006) "Money Market Pressure and the Determinants of Banking Crises". *Journal of Money, Credit and Banking*, Vol. 39, No. 5, pp. 1037-1066.

8.4 Electronic Sources

BBC News, 2011. *Leaders Agree Eurozone Debt Deal After Late-Night Talks*. [online] 27 October. Available at: <http://www.bbc.co.uk/news/world-europe-15472547> [Accessed 18 April 2012].

Elliott, L., 2011. Global Financial Crisis: Five Key Stages 2007-2011. *The Guardian*, [online] 7 August. Available at: <http://www.guardian.co.uk/business/2011/aug/07/global-financial-crisis-key-stages> [Accessed 15 April 2012].

Olivares-Caminal, R., 2011. *The EU Architecture to Avert a Sovereign Debt Crisis*. [online] OECD Journal: Financial Market Trends. Vol. 2011, Issue 2. Available at: <http://www.oecd.org/dataoecd/11/36/49191980.pdf> [Accessed 18 April 2012].

Rogoff, K., 2009. The Next Financial Crisis. *The Guardian*, [online] 12 September. Available at: <http://www.guardian.co.uk/commentisfree/2009/sep/12/world-economy-financial-crisis-debt> [Accessed 14 April 2012].

United Nations Statistics Division, 2011. *Composition of Macro Geographical (Continental) Regions, Geographical Sub-Regions, and Selected Economic and Other Groupings*. [online] 20 September. Available at: http://unstats.un.org/unsd/methods/m49/m49regin.htm#transition> [Accessed 8 May 2012].

Appendix 1: List of Banking and Sovereign Debt Crises by Country

Table 10. List of Banking Crises by Country.

Country	Year
Argentina	1990-1991; 1994
Burkina Faso	1977-1978; 1994
Canada	1976; 1979; 1985-1986; 1991
Côte d'Ivoire	1977; 1981; 1990; 1994
Denmark	1975; 1982; 1993-1994
Finland	1983; 1987-1989; 1993
Indonesia	1982-1984; 1997-1999
Italy	1981; 1992; 1998-2001
Korea, Republic of	1980-1982; 1997-1998
Malaysia	1975; 1982; 1987; 1990; 1997-1998
Mauritius	1980-1981; 1988
Mexico	1983; 1989; 1994-1996; 1999
Netherlands	1978; 1984-1985; 2001; 2007
Niger	1978; 1984; 1994
Norway	1977; 1986; 1992-1993; 2003
Philippines	1981; 1984-1985; 1998
Portugal	1979-1985; 1991-1992
Senegal	1977-1978; 1981; 1994-1995
South Africa	1972; 1982-1985
Sri Lanka	1983-1984; 1991; 1996
Sweden	1979; 1985; 1992-1993; 2008
United States	1974; 1978; 1981; 1987; 2008
Vanuatu	1987; 2000

Table 11. List of Sovereign Debt Crises by Country.

Country	Year	Type of crisis
Argentina	1983-1994	Arrears + rescheduling
	2002-2008	Arrears
Bolivia	1982-1999	Arrears + rescheduling
Burkina Faso	1985-1993	Arrears + rescheduling
	1999-2004	Rescheduling
Burundi	2006-2008	Rescheduling
Cape Verde	1988-1993	Arrears
	1996-2005	Arrears + rescheduling
Côte d'Ivoire	1983-1984	Arrears
	1987-1998	Arrears + rescheduling
	2001-2008	Arrears + rescheduling
Dominican Republic	1971-1976	Arrears
	1984-1999	Arrears
	2004-2006	Rescheduling
Egypt	1989-1995	Arrears + rescheduling
El Salvador	1990-1991	Rescheduling
Ethiopia	1990-2008	Arrears
Gambia	1984-1986	Arrears
	2008	Rescheduling
Ghana	1971-1976	Arrears
	1992-1994	Arrears
	2001-2002	Rescheduling
Guatemala	1984-2005	Arrears
Jamaica	1973-1974	Arrears
	1987-1995	Arrears + rescheduling
	2001-2008	Arrears
Kenya	1991-1994	Arrears
	2000-2001	Rescheduling
	2004-2008	Rescheduling + arrears
Lesotho	1990-1994	Arrears
Madagascar	1981-1991	Arrears + rescheduling
	1997-2005	Rescheduling + arrears
Mauritius	1990-1991	Arrears
	1994-1995	Arrears
Nepal	1995-1997	Arrears
Niger	1975-1976	Arrears
	1989-2004	Rescheduling
Panama	1987-2001	Arrears
Peru	1984-1998	Arrears + rescheduling
Rwanda	2000-2001	Rescheduling
	2005-2006	Rescheduling
Senegal	1973-1975	Arrears
	1989-1999	Rescheduling
	2004-2006	Rescheduling
Seychelles	1991-1999	Arrears
Sri Lanka	1992-2002	Arrears
St Vincent and the	2002-2005	Arrears
Grenadines	2008	Arrears
Togo	1971-1984	Arrears
	1989-1998	Rescheduling
	2008	Rescheduling
Uganda	1984-2001	Arrears
Venezuela	1993-1996	Arrears

Appendix 2: Description of Variables

Table 12. Description and Sources of the Variables Used to Identify Banking Crises.

Variable	Definition	Source
Borrowed reserves	Loans from monetary authorities to financial institutions.	Borrowed reserves are from line 26g of IFS.
Total deposits	Sum of demand deposits, time and saving deposits, and foreign liabilities of deposit money banks.	Demand deposits are from line 24 of IFS. Time and saving deposits are from line 25. Foreign liabilities are from line 26c.
Real interest rate	Nominal interest rate minus the concurrent rate of inflation.	The money market rate is from line 60b of IFS. The inflation rate is from the GDF.

Table 13. Description and Sources of the Variables Used to Identify Sovereign Debt Crises.

Variable	Definition	Source
Principal arrears, private creditors	Principal repayment due towards private creditors but not paid, on a cumulative basis.	GDF.
Interest arrears, private creditors	Interest repayment due towards private creditors but not paid, on a cumulative basis.	GDF.
Total amount of debt rescheduled	Debt stock, principal, interest, and penalties rescheduled.	GDF.
Short-term external debt	Debt that has an original maturity of one year or less, in percent of GDP.	GDF.

Table 14. Description and Sources of the Explanatory Variables for Banking Crises.

Variable	Definition	Source
Real interest rate	Nominal interest rate minus the concurrent rate of inflation.	The money market rate is from line 60b of IFS. The inflation rate is from the GDF.
Ratio of domestic credit to the private sector to GDP	Ratio of domestic credit to the private sector to GDP.	Domestic credit to the private sector is from line 32d of IFS. GDP is from the GDF.
Domestic credit growth	Growth rate of real domestic credit.	Domestic credit to the private sector is from line 32d of IFS. This is then divided by the inflation rate from the GDF.
Real GDP growth	Annual percentage growth rate of real GDP at market prices.	GDF.
Inflation	Annual percentage change in consumer prices.	GDF.

Table 15. Description and Sources of the Explanatory Variables for Sovereign Debt Crises.

Variable	Definition	Source
Short-term external debt to GDP	Debt that has an original maturity of one year or less, in percent of GDP.	GDF.
M2 to total reserves	Ratio of money and quasi money (M2) to total reserves.	GDF.
Long-term external debt to GDP	Debt that has an original or extended maturity of more than one year, in percent of GDP.	GDF.
Real GDP growth	Annual percentage growth rate of real GDP at market prices.	GDF.
Inflation	Annual percentage change in consumer prices.	GDF.

Appendix 3: Regressions for Banking Crises by Country

Argenina

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1981 2008
Convergence achieved after 10 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.793806	1.967914	-2.435984	0.0149
INTEREST_RATE(-1)	0.150472	0.036036	4.175634	0.0000
CREDIT_PRIV_SECT_TO_GDP(-1)	8.707695	8.583901	1.014422	0.3104
DOMESTIC_CREDIT_GROWTH(-1)	-0.050181	0.049247	-1.018983	0.3082
GDP_GROWTH(-1)	0.148484	0.084085	1.765875	0.0774
INFLATION(-1)	-0.017499	0.005312	-3.294520	0.0010

McFadden R-squared	0.609284	Mean dependent var	0.107143
S.D. dependent var	0.314970	S.E. of regression	0.207455
Akaike info criterion	0.694649	Sum squared resid	0.946824
Schwarz criterion	0.980121	Log likelihood	-3.725085
Hannan-Quinn criter.	0.781921	Deviance	7.450170
Restr. deviance	19.06799	Restr. log likelihood	-9.533994
LR statistic	11.61782	Avg. log likelihood	-0.133039
Prob(LR statistic)	0.040417		

Obs with Dep=0	25	Total obs	28
Obs with Dep=1	3		

Burkina Faso

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1977 2008
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.954840	4.429426	-0.667093	0.5047
INTEREST_RATE(-1)	8.050457	17.14897	0.469443	0.6388
CREDIT_PRIV_SECT_TO_GDP(-1)	-5.327737	21.74885	-0.244966	0.8065
DOMESTIC_CREDIT_GROWTH(-1)	-0.225337	0.089906	-2.506364	0.0122
GDP_GROWTH(-1)	0.025400	0.162186	0.156613	0.8756
INFLATION(-1)	0.139577	0.167282	0.834381	0.4041

McFadden R-squared	0.097667	Mean dependent var	0.093750
S.D. dependent var	0.296145	S.E. of regression	0.314960
Akaike info criterion	0.936484	Sum squared resid	2.579197
Schwarz criterion	1.211310	Log likelihood	-8.983747
Hannan-Quinn criter.	1.027581	Deviance	17.96749
Restr. deviance	19.91227	Restr. log likelihood	-9.956133
LR statistic	1.944773	Avg. log likelihood	-0.280742
Prob(LR statistic)	0.856733		

Obs with Dep=0	29	Total obs	32
Obs with Dep=1	3		

Canada

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1976 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	9.750842	7.514751	1.297560	0.1944
INTEREST_RATE(-1)	34.72340	36.37297	0.954648	0.3398
CREDIT_PRIV_SECT_TO_GDP(-1)	-16648.52	10009.47	-1.663276	0.0963
DOMESTIC_CREDIT_GROWTH(-1)	-0.500755	0.578160	-0.866118	0.3864
GDP_GROWTH(-1)	-0.102399	0.367403	-0.278710	0.7805
INFLATION(-1)	-0.097358	0.203994	-0.477259	0.6332

McFadden R-squared	0.257049	Mean dependent var	0.151515
S.D. dependent var	0.364110	S.E. of regression	0.363886
Akaike info criterion	0.995633	Sum squared resid	3.575145
Schwarz criterion	1.267725	Log likelihood	-10.42794
Hannan-Quinn criter.	1.087183	Deviance	20.85588
Restr. deviance	28.07167	Restr. log likelihood	-14.03583
LR statistic	7.215790	Avg. log likelihood	-0.315998
Prob(LR statistic)	0.205080		

Obs with Dep=0	28	Total obs	33
Obs with Dep=1	5		

Côte d'Ivoire

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1977 2008
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-10.57334	3.879084	-2.725730	0.0064
INTEREST_RATE(-1)	-137.7980	54.31540	-2.536997	0.0112
CREDIT_PRIV_SECT_TO_GDP(-1)	15.49246	5.342799	2.899689	0.0037
DOMESTIC_CREDIT_GROWTH(-1)	0.841192	0.556448	1.511718	0.1306
GDP_GROWTH(-1)	0.009166	0.193323	0.047410	0.9622
INFLATION(-1)	-1.321632	0.531950	-2.484503	0.0130

McFadden R-squared	0.479048	Mean dependent var	0.125000
S.D. dependent var	0.336011	S.E. of regression	0.275545
Akaike info criterion	0.767558	Sum squared resid	1.974046
Schwarz criterion	1.042383	Log likelihood	-6.280928
Hannan-Quinn criter.	0.858655	Deviance	12.56186
Restr. deviance	24.11329	Restr. log likelihood	-12.05665
LR statistic	11.55143	Avg. log likelihood	-0.196279
Prob(LR statistic)	0.041479		

Obs with Dep=0	28	Total obs	32
Obs with Dep=1	4		

Denmark

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1973 2008
Convergence achieved after 8 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	6.953064	3.749591	1.854353	0.0637
INTEREST_RATE(-1)	34.36958	33.20441	1.035091	0.3006
CREDIT_PRIV_SECT_TO_GDP(-1)	-19.45745	9.109386	-2.135979	0.0327
DOMESTIC_CREDIT_GROWTH(-1)	-1.187367	1.728797	-0.686816	0.4922
GDP_GROWTH(-1)	-1.287503	0.365299	-3.524521	0.0004
INFLATION(-1)	0.104376	0.199636	0.522833	0.6011

McFadden R-squared	0.545769	Mean dependent var	0.111111
S.D. dependent var	0.318728	S.E. of regression	0.251307
Akaike info criterion	0.650234	Sum squared resid	1.894654
Schwarz criterion	0.914154	Log likelihood	-5.704218
Hannan-Quinn criter.	0.742349	Deviance	11.40844
Restr. deviance	25.11591	Restr. log likelihood	-12.55796
LR statistic	13.70747	Avg. log likelihood	-0.158451
Prob(LR statistic)	0.017578		

Obs with Dep=0	32	Total obs	36
Obs with Dep=1	4		

Finland

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1979 2008
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-9.595509	4.710028	-2.037251	0.0416
INTEREST_RATE(-1)	18.46218	29.56974	0.624361	0.5324
CREDIT_PRIV_SECT_TO_GDP(-1)	1201.390	838.1017	1.433466	0.1517
DOMESTIC_CREDIT_GROWTH(-1)	0.998950	0.900939	1.108788	0.2675
GDP_GROWTH(-1)	0.242921	0.237978	1.020769	0.3074
INFLATION(-1)	0.134391	0.238499	0.563485	0.5731

McFadden R-squared	0.248703	Mean dependent var	0.166667
S.D. dependent var	0.379049	S.E. of regression	0.372933
Akaike info criterion	1.077011	Sum squared resid	3.337903
Schwarz criterion	1.357250	Log likelihood	-10.15516
Hannan-Quinn criter.	1.166662	Deviance	20.31032
Restr. deviance	27.03367	Restr. log likelihood	-13.51684
LR statistic	6.723357	Avg. log likelihood	-0.338505
Prob(LR statistic)	0.242041		

Obs with Dep=0	25	Total obs	30
Obs with Dep=1	5		

Indonesia

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1982 2008
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-6.048839	3.601366	-1.679595	0.0930
INTEREST_RATE(-1)	39.09821	15.22457	2.568099	0.0102
CREDIT_PRIV_SECT_TO_GDP(-1)	-4.014126	6.241148	-0.643171	0.5201
DOMESTIC_CREDIT_GROWTH(-1)	0.024972	0.319793	0.078087	0.9378
GDP_GROWTH(-1)	0.252561	0.319057	0.791585	0.4286
INFLATION(-1)	0.250477	0.141816	1.766210	0.0774

McFadden R-squared	0.339144	Mean dependent var	0.222222
S.D. dependent var	0.423659	S.E. of regression	0.380955
Akaike info criterion	1.144563	Sum squared resid	3.047657
Schwarz criterion	1.432527	Log likelihood	-9.451601
Hannan-Quinn criter.	1.230190	Deviance	18.90320
Restr. deviance	28.60413	Restr. log likelihood	-14.30207
LR statistic	9.700932	Avg. log likelihood	-0.350059
Prob(LR statistic)	0.084166		

Obs with Dep=0	21	Total obs	27
Obs with Dep=1	6		

Italy

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1972 2008
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	2.187576	4.087581	0.535176	0.5925
INTEREST_RATE(-1)	-4.205029	14.76745	-0.284750	0.7758
CREDIT_PRIV_SECT_TO_GDP(-1)	-0.003133	0.003011	-1.040720	0.2980
DOMESTIC_CREDIT_GROWTH(-1)	-0.376624	2.934650	-0.128337	0.8979
GDP_GROWTH(-1)	0.076049	0.245937	0.309220	0.7572
INFLATION(-1)	-0.037204	0.133094	-0.279531	0.7798

McFadden R-squared	0.069269	Mean dependent var	0.162162
S.D. dependent var	0.373684	S.E. of regression	0.386466
Akaike info criterion	1.149395	Sum squared resid	4.630044
Schwarz criterion	1.410625	Log likelihood	-15.26381
Hannan-Quinn criter.	1.241491	Deviance	30.52761
Restr. deviance	32.79961	Restr. log likelihood	-16.39980
LR statistic	2.271994	Avg. log likelihood	-0.412535
Prob(LR statistic)	0.810371		

Obs with Dep=0	31	Total obs	37
Obs with Dep=1	6		

Korea, Republic of

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1978 2008
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-11.45885	8.072303	-1.419527	0.1557
INTEREST_RATE(-1)	35.15160	34.47133	1.019734	0.3079
CREDIT_PRIV_SECT_TO_GDP(-1)	6.904745	7.065862	0.977198	0.3285
DOMESTIC_CREDIT_GROWTH(-1)	-0.060916	0.369201	-0.164996	0.8689
GDP_GROWTH(-1)	0.009280	0.137742	0.067370	0.9463
INFLATION(-1)	0.511388	0.243010	2.104393	0.0353

McFadden R-squared	0.406291	Mean dependent var	0.161290
S.D. dependent var	0.373878	S.E. of regression	0.308720
Akaike info criterion	0.911702	Sum squared resid	2.382707
Schwarz criterion	1.189248	Log likelihood	-8.131375
Hannan-Quinn criter.	1.002175	Deviance	16.26275
Restr. deviance	27.39181	Restr. log likelihood	-13.69590
LR statistic	11.12906	Avg. log likelihood	-0.262302
Prob(LR statistic)	0.048880		

Obs with Dep=0	26	Total obs	31
Obs with Dep=1	5		

Malaysia

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1972 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-9.909127	3.702902	-2.676043	0.0074
INTEREST_RATE(-1)	71.98524	38.82787	1.853958	0.0637
CREDIT_PRIV_SECT_TO_GDP(-1)	3.038696	1.829279	1.661144	0.0967
DOMESTIC_CREDIT_GROWTH(-1)	-1.638597	1.222659	-1.340192	0.1802
GDP_GROWTH(-1)	0.234382	0.139959	1.674650	0.0940
INFLATION(-1)	1.039021	0.410623	2.530356	0.0114

McFadden R-squared	0.357390	Mean dependent var	0.162162
S.D. dependent var	0.373684	S.E. of regression	0.329514
Akaike info criterion	0.893983	Sum squared resid	3.365966
Schwarz criterion	1.155213	Log likelihood	-10.53868
Hannan-Quinn criter.	0.986079	Deviance	21.07737
Restr. deviance	32.79961	Restr. log likelihood	-16.39980
LR statistic	11.72224	Avg. log likelihood	-0.284829
Prob(LR statistic)	0.038798		

Obs with Dep=0	31	Total obs	37
Obs with Dep=1	6		

Mauritius

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1979 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.556772	5.502182	-0.464683	0.6422
INTEREST_RATE(-1)	41.78289	43.18819	0.967461	0.3333
CREDIT_PRIV_SECT_TO_GDP(-1)	-16.52079	8.136817	-2.030375	0.0423
DOMESTIC_CREDIT_GROWTH(-1)	0.262487	0.591748	0.443579	0.6573
GDP_GROWTH(-1)	0.019420	0.161675	0.120115	0.9044
INFLATION(-1)	0.432624	0.316539	1.366731	0.1717

McFadden R-squared	0.404818	Mean dependent var	0.100000
S.D. dependent var	0.305129	S.E. of regression	0.273481
Akaike info criterion	0.786967	Sum squared resid	1.795000
Schwarz criterion	1.067206	Log likelihood	-5.804503
Hannan-Quinn criter.	0.876618	Deviance	11.60901
Restr. deviance	19.50498	Restr. log likelihood	-9.752489
LR statistic	7.895972	Avg. log likelihood	-0.193483
Prob(LR statistic)	0.162063		

Obs with Dep=0	27	Total obs	30
Obs with Dep=1	3		

Mexico

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1983 2008
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-7.622584	2.257159	-3.377070	0.0007
INTEREST_RATE(-1)	-4.155907	10.01336	-0.415036	0.6781
CREDIT_PRIV_SECT_TO_GDP(-1)	36.51545	11.40257	3.202387	0.0014
DOMESTIC_CREDIT_GROWTH(-1)	-1.412188	1.462295	-0.965734	0.3342
GDP_GROWTH(-1)	0.005227	0.199877	0.026151	0.9791
INFLATION(-1)	0.032589	0.026046	1.251201	0.2109

McFadden R-squared	0.418550	Mean dependent var	0.230769
S.D. dependent var	0.429669	S.E. of regression	0.365810
Akaike info criterion	1.089741	Sum squared resid	2.676332
Schwarz criterion	1.380071	Log likelihood	-8.166638
Hannan-Quinn criter.	1.173346	Deviance	16.33328
Restr. deviance	28.09062	Restr. log likelihood	-14.04531
LR statistic	11.75734	Avg. log likelihood	-0.314101
Prob(LR statistic)	0.038268		

Obs with Dep=0	20	Total obs	26
Obs with Dep=1	6		

Netherlands

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1972 2008
Convergence achieved after 8 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-8.125349	6.527316	-1.244822	0.2132
INTEREST_RATE(-1)	-34.02102	21.18792	-1.605680	0.1083
CREDIT_PRIV_SECT_TO_GDP(-1)	1.063660	1.809473	0.587829	0.5566
DOMESTIC_CREDIT_GROWTH(-1)	2.811127	2.003933	1.402805	0.1607
GDP_GROWTH(-1)	0.288261	0.239283	1.204688	0.2283
INFLATION(-1)	0.108399	0.342128	0.316837	0.7514

McFadden R-squared	0.244690	Mean dependent var	0.135135
S.D. dependent var	0.346583	S.E. of regression	0.329348
Akaike info criterion	0.922580	Sum squared resid	3.362575
Schwarz criterion	1.183810	Log likelihood	-11.06773
Hannan-Quinn criter.	1.014676	Deviance	22.13546
Restr. deviance	29.30645	Restr. log likelihood	-14.65322
LR statistic	7.170989	Avg. log likelihood	-0.299128
Prob(LR statistic)	0.208231		

Obs with Dep=0	32	Total obs	37
Obs with Dep=1	5		

Niger

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1977 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-3.007085	1.780037	-1.689338	0.0912
INTEREST_RATE(-1)	-8.408889	25.52080	-0.329492	0.7418
CREDIT_PRIV_SECT_TO_GDP(-1)	12.02796	9.628600	1.249191	0.2116
DOMESTIC_CREDIT_GROWTH(-1)	-0.073269	0.184989	-0.396070	0.6921
GDP_GROWTH(-1)	-0.015813	0.078565	-0.201277	0.8405
INFLATION(-1)	-0.055081	0.258593	-0.213002	0.8313

McFadden R-squared	0.045480	Mean dependent var	0.093750
S.D. dependent var	0.296145	S.E. of regression	0.320611
Akaike info criterion	0.968958	Sum squared resid	2.672579
Schwarz criterion	1.243784	Log likelihood	-9.503332
Hannan-Quinn criter.	1.060055	Deviance	19.00666
Restr. deviance	19.91227	Restr. log likelihood	-9.956133
LR statistic	0.905601	Avg. log likelihood	-0.296979
Prob(LR statistic)	0.969815		

Obs with Dep=0	29	Total obs	32
Obs with Dep=1	3		

Norway

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1973 2007
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.899444	4.129714	-1.186388	0.2355
INTEREST_RATE(-1)	41.68312	24.92093	1.672615	0.0944
CREDIT_PRIV_SECT_TO_GDP(-1)	-0.891221	3.880084	-0.229691	0.8183
DOMESTIC_CREDIT_GROWTH(-1)	0.311460	0.342335	0.909809	0.3629
GDP_GROWTH(-1)	0.383659	0.459878	0.834263	0.4041
INFLATION(-1)	0.011100	0.255719	0.043406	0.9654

McFadden R-squared	0.215924	Mean dependent var	0.142857
S.D. dependent var	0.355036	S.E. of regression	0.335194
Akaike info criterion	0.985982	Sum squared resid	3.258303
Schwarz criterion	1.252613	Log likelihood	-11.25469
Hannan-Quinn criter.	1.078023	Deviance	22.50937
Restr. deviance	28.70814	Restr. log likelihood	-14.35407
LR statistic	6.198769	Avg. log likelihood	-0.321562
Prob(LR statistic)	0.287356		

Obs with Dep=0	30	Total obs	35
Obs with Dep=1	5		

Philippines

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1978 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-31.78812	10.23152	-3.106882	0.0019
INTEREST_RATE(-1)	109.1192	83.45809	1.307473	0.1911
CREDIT_PRIV_SECT_TO_GDP(-1)	24.10242	5.420732	4.446340	0.0000
DOMESTIC_CREDIT_GROWTH(-1)	0.331292	0.152154	2.177348	0.0295
GDP_GROWTH(-1)	0.455924	0.273422	1.667474	0.0954
INFLATION(-1)	1.441322	0.698261	2.064159	0.0390

McFadden R-squared	0.640675	Mean dependent var	0.129032
S.D. dependent var	0.340777	S.E. of regression	0.245542
Akaike info criterion	0.663449	Sum squared resid	1.507274
Schwarz criterion	0.940995	Log likelihood	-4.283454
Hannan-Quinn criter.	0.753922	Deviance	8.566908
Restr. deviance	23.84166	Restr. log likelihood	-11.92083
LR statistic	15.27475	Avg. log likelihood	-0.138176
Prob(LR statistic)	0.009251		

Obs with Dep=0	27	Total obs	31
Obs with Dep=1	4		

Portugal

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1979 2008
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-5.115962	2.063380	-2.479408	0.0132
INTEREST_RATE(-1)	-28.69643	32.42739	-0.884944	0.3762
CREDIT_PRIV_SECT_TO_GDP(-1)	0.000698	0.008949	0.077954	0.9379
DOMESTIC_CREDIT_GROWTH(-1)	0.533446	1.556213	0.342785	0.7318
GDP_GROWTH(-1)	0.111899	0.185911	0.601895	0.5472
INFLATION(-1)	0.251296	0.170919	1.470266	0.1415

McFadden R-squared	0.668737	Mean dependent var	0.300000
S.D. dependent var	0.466092	S.E. of regression	0.284572
Akaike info criterion	0.804713	Sum squared resid	1.943544
Schwarz criterion	1.084952	Log likelihood	-6.070694
Hannan-Quinn criter.	0.894364	Deviance	12.14139
Restr. deviance	36.65186	Restr. log likelihood	-18.32593
LR statistic	24.51047	Avg. log likelihood	-0.202356
Prob(LR statistic)	0.000173		

Obs with Dep=0	21	Total obs	30
Obs with Dep=1	9		

Senegal

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1977 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-1.765929	2.282192	-0.773786	0.4391
INTEREST_RATE(-1)	-98.56056	49.77622	-1.980073	0.0477
CREDIT_PRIV_SECT_TO_GDP(-1)	17.90211	11.64436	1.537406	0.1242
DOMESTIC_CREDIT_GROWTH(-1)	0.278694	0.101394	2.748611	0.0060
GDP_GROWTH(-1)	-0.340372	0.195379	-1.742112	0.0815
INFLATION(-1)	-0.597754	0.419388	-1.425300	0.1541

McFadden R-squared	0.498722	Mean dependent var	0.156250
S.D. dependent var	0.368902	S.E. of regression	0.284425
Akaike info criterion	0.809507	Sum squared resid	2.103342
Schwarz criterion	1.084332	Log likelihood	-6.952109
Hannan-Quinn criter.	0.900604	Deviance	13.90422
Restr. deviance	27.73753	Restr. log likelihood	-13.86876
LR statistic	13.83331	Avg. log likelihood	-0.217253
Prob(LR statistic)	0.016704		

Obs with Dep=0	27	Total obs	32
Obs with Dep=1	5		

South Africa

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1972 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	37.67763	15.80148	2.384436	0.0171
INTEREST_RATE(-1)	75.59633	30.05494	2.515271	0.0119
CREDIT_PRIV_SECT_TO_GDP(-1)	-76.73989	28.65593	-2.677976	0.0074
DOMESTIC_CREDIT_GROWTH(-1)	0.825625	0.753609	1.095562	0.2733
GDP_GROWTH(-1)	0.242055	0.370568	0.653201	0.5136
INFLATION(-1)	-0.124438	0.234109	-0.531537	0.5950

McFadden R-squared	0.411591	Mean dependent var	0.135135
S.D. dependent var	0.346583	S.E. of regression	0.297097
Akaike info criterion	0.790383	Sum squared resid	2.736265
Schwarz criterion	1.051613	Log likelihood	-8.622087
Hannan-Quinn criter.	0.882479	Deviance	17.24417
Restr. deviance	29.30645	Restr. log likelihood	-14.65322
LR statistic	12.06228	Avg. log likelihood	-0.233029
Prob(LR statistic)	0.033944		

Obs with Dep=0	32	Total obs	37
Obs with Dep=1	5		

Sri Lanka

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1979 2008
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-6.709104	3.089420	-2.171639	0.0299
INTEREST_RATE(-1)	17.87838	6.736687	2.653883	0.0080
CREDIT_PRIV_SECT_TO_GDP(-1)	-1.238602	4.299019	-0.288113	0.7733
DOMESTIC_CREDIT_GROWTH(-1)	0.170324	0.149150	1.141962	0.2535
GDP_GROWTH(-1)	0.020682	0.179540	0.115196	0.9083
INFLATION(-1)	0.261853	0.126569	2.068857	0.0386

McFadden R-squared	0.226326	Mean dependent var	0.133333
S.D. dependent var	0.345746	S.E. of regression	0.335764
Akaike info criterion	1.007604	Sum squared resid	2.705692
Schwarz criterion	1.287843	Log likelihood	-9.114058
Hannan-Quinn criter.	1.097255	Deviance	18.22812
Restr. deviance	23.56047	Restr. log likelihood	-11.78023
LR statistic	5.332353	Avg. log likelihood	-0.303802
Prob(LR statistic)	0.376679		

Obs with Dep=0	26	Total obs	30
Obs with Dep=1	4		

Sweden

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1972 2008
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-8.711406	3.913805	-2.225815	0.0260
INTEREST_RATE(-1)	31.82437	24.63651	1.291757	0.1964
CREDIT_PRIV_SECT_TO_GDP(-1)	5.234813	3.185622	1.643262	0.1003
DOMESTIC_CREDIT_GROWTH(-1)	0.247197	0.306812	0.805694	0.4204
GDP_GROWTH(-1)	0.002387	0.493300	0.004840	0.9961
INFLATION(-1)	0.430805	0.216195	1.992667	0.0463

McFadden R-squared	0.201806	Mean dependent var	0.135135
S.D. dependent var	0.346583	S.E. of regression	0.335078
Akaike info criterion	0.956547	Sum squared resid	3.480595
Schwarz criterion	1.217777	Log likelihood	-11.69612
Hannan-Quinn criter.	1.048643	Deviance	23.39225
Restr. deviance	29.30645	Restr. log likelihood	-14.65322
LR statistic	5.914203	Avg. log likelihood	-0.316111
Prob(LR statistic)	0.314657		

Obs with Dep=0	32	Total obs	37
Obs with Dep=1	5		

United States

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1972 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-63.46239	20.46575	-3.100908	0.0019
INTEREST_RATE(-1)	4.664790	30.81728	0.151369	0.8797
CREDIT_PRIV_SECT_TO_GDP(-1)	96.06603	30.76285	3.122793	0.0018
DOMESTIC_CREDIT_GROWTH(-1)	2.905901	1.627290	1.785730	0.0741
GDP_GROWTH(-1)	0.259874	0.367860	0.706448	0.4799
INFLATION(-1)	0.390147	0.274828	1.419607	0.1557

McFadden R-squared	0.401865	Mean dependent var	0.135135
S.D. dependent var	0.346583	S.E. of regression	0.309008
Akaike info criterion	0.798087	Sum squared resid	2.960066
Schwarz criterion	1.059317	Log likelihood	-8.764613
Hannan-Quinn criter.	0.890183	Deviance	17.52923
Restr. deviance	29.30645	Restr. log likelihood	-14.65322
LR statistic	11.77722	Avg. log likelihood	-0.236881
Prob(LR statistic)	0.037971		

Obs with Dep=0	32	Total obs	37
Obs with Dep=1	5		

Vanuatu

Dependent Variable: BANKING_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1986 2008
Convergence achieved after 8 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-20.35061	19.84938	-1.025252	0.3052
INTEREST_RATE(-1)	296.2207	148.0595	2.000686	0.0454
CREDIT_PRIV_SECT_TO_GDP(-1)	14.69204	38.92222	0.377472	0.7058
DOMESTIC_CREDIT_GROWTH(-1)	-2.221236	1.927020	-1.152679	0.2490
GDP_GROWTH(-1)	-0.960779	0.421415	-2.279889	0.0226
INFLATION(-1)	2.047453	1.300634	1.574197	0.1154

McFadden R-squared	0.452993	Mean dependent var	0.086957
S.D. dependent var	0.288104	S.E. of regression	0.278227
Akaike info criterion	0.844954	Sum squared resid	1.315973
Schwarz criterion	1.141170	Log likelihood	-3.716970
Hannan-Quinn criter.	0.919451	Deviance	7.433940
Restr. deviance	13.59020	Restr. log likelihood	-6.795101
LR statistic	6.156263	Avg. log likelihood	-0.161607
Prob(LR statistic)	0.291309		

Obs with Dep=0	21	Total obs	23
Obs with Dep=1	2		

Appendix 4: Regressions for Sovereign Debt Crises by Country

Argentina
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 8 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-6.075413	3.819693	-1.590550	0.1117
SHORT_TERM_EXTERNAL_DEBT(-1)	-6.538927	18.05844	-0.362098	0.7173
M2_TO_RESERVES(-1)	-1.058400	0.536110	-1.974220	0.0484
LONG_TERM_EXTERNAL_DEBT(-1)	26.52601	7.237964	3.664844	0.0002
GDP_GROWTH(-1)	0.160832	0.107584	1.494939	0.1349
INFLATION(-1)	0.019092	0.007246	2.634972	0.0084

McFadden R-squared	0.641142	Mean dependent var	0.500000
S.D. dependent var	0.506712	S.E. of regression	0.313564
Akaike info criterion	0.813273	Sum squared resid	3.146313
Schwarz criterion	1.071839	Log likelihood	-9.452183
Hannan-Quinn criter.	0.905269	Deviance	18.90437
Restr. deviance	52.67919	Restr. log likelihood	-26.33959
LR statistic	33.77482	Avg. log likelihood	-0.248742
Prob(LR statistic)	0.000003		

Obs with Dep=0	19	Total obs	38
Obs with Dep=1	19		

Bolivia
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 10 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-24.38151	10.55462	-2.310032	0.0209
SHORT_TERM_EXTERNAL_DEBT(-1)	-6.871277	27.47098	-0.250129	0.8025
M2_TO_RESERVES(-1)	1.880096	1.070157	1.756841	0.0789
LONG_TERM_EXTERNAL_DEBT(-1)	22.63456	8.375282	2.702543	0.0069
GDP_GROWTH(-1)	0.514194	0.344610	1.492103	0.1357
INFLATION(-1)	0.192500	0.084638	2.274402	0.0229

McFadden R-squared	0.643028	Mean dependent var	0.473684
S.D. dependent var	0.506009	S.E. of regression	0.308474
Akaike info criterion	0.809668	Sum squared resid	3.045001
Schwarz criterion	1.068234	Log likelihood	-9.383692
Hannan-Quinn criter.	0.901664	Deviance	18.76738
Restr. deviance	52.57387	Restr. log likelihood	-26.28694
LR statistic	33.80649	Avg. log likelihood	-0.246939
Prob(LR statistic)	0.000003		

Obs with Dep=0	20	Total obs	38
Obs with Dep=1	18		

Burkina Faso
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.987173	1.152320	-0.856683	0.3916
SHORT_TERM_EXTERNAL_DEBT(-1)	117.8793	53.31582	2.210963	0.0270
M2_TO_RESERVES(-1)	-1.277163	0.635138	-2.010842	0.0443
LONG_TERM_EXTERNAL_DEBT(-1)	5.763722	3.485933	1.653423	0.0982
GDP_GROWTH(-1)	-0.077993	0.128866	-0.605229	0.5450
INFLATION(-1)	-0.196634	0.068235	-2.881702	0.0040

McFadden R-squared	0.434025	Mean dependent var	0.394737
S.D. dependent var	0.495355	S.E. of regression	0.390244
Akaike info criterion	1.075124	Sum squared resid	4.873300
Schwarz criterion	1.333690	Log likelihood	-14.42735
Hannan-Quinn criter.	1.167120	Deviance	28.85470
Restr. deviance	50.98231	Restr. log likelihood	-25.49115
LR statistic	22.12760	Avg. log likelihood	-0.379667
Prob(LR statistic)	0.000495		

Obs with Dep=0	23	Total obs	38
Obs with Dep=1	15		

Burundi
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-5.191108	2.730207	-1.901360	0.0573
SHORT_TERM_EXTERNAL_DEBT(-1)	-36.82550	36.43490	-1.010721	0.3122
M2_TO_RESERVES(-1)	-0.069571	0.653738	-0.106420	0.9152
LONG_TERM_EXTERNAL_DEBT(-1)	3.944515	2.079698	1.896676	0.0579
GDP_GROWTH(-1)	0.111553	0.084612	1.318406	0.1874
INFLATION(-1)	-0.080206	0.135285	-0.592872	0.5533

McFadden R-squared	0.370207	Mean dependent var	0.078947
S.D. dependent var	0.273276	S.E. of regression	0.264379
Akaike info criterion	0.663675	Sum squared resid	2.236679
Schwarz criterion	0.922242	Log likelihood	-6.609834
Hannan-Quinn criter.	0.755671	Deviance	13.21967
Restr. deviance	20.99051	Restr. log likelihood	-10.49526
LR statistic	7.770843	Avg. log likelihood	-0.173943
Prob(LR statistic)	0.169325		

Obs with Dep=0	35	Total obs	38
Obs with Dep=1	3		

Cape Verde
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1987 2008
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	2.518805	5.013169	0.502438	0.6154
SHORT_TERM_EXTERNAL_DEBT(-1)	25.30406	31.34912	0.807170	0.4196
M2_TO_RESERVES(-1)	0.321141	0.194891	1.647797	0.0994
LONG_TERM_EXTERNAL_DEBT(-1)	1.363701	8.730796	0.156194	0.8759
GDP_GROWTH(-1)	-0.468907	0.201663	-2.325204	0.0201
INFLATION(-1)	-0.269071	0.242801	-1.108196	0.2678

McFadden R-squared	0.265456	Mean dependent var	0.727273
S.D. dependent var	0.455842	S.E. of regression	0.445453
Akaike info criterion	1.406271	Sum squared resid	3.174851
Schwarz criterion	1.703828	Log likelihood	-9.468980
Hannan-Quinn criter.	1.476366	Deviance	18.93796
Restr. deviance	25.78192	Restr. log likelihood	-12.89096
LR statistic	6.843956	Avg. log likelihood	-0.430408
Prob(LR statistic)	0.232507		

Obs with Dep=0	6	Total obs	22
Obs with Dep=1	16		

Côte d'Ivoire
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.815566	1.781443	-1.580497	0.1140
SHORT_TERM_EXTERNAL_DEBT(-1)	12.22194	7.127585	1.714738	0.0864
M2_TO_RESERVES(-1)	-0.025482	0.020021	-1.272737	0.2031
LONG_TERM_EXTERNAL_DEBT(-1)	4.347412	2.352675	1.847859	0.0646
GDP_GROWTH(-1)	-0.189385	0.119520	-1.584546	0.1131
INFLATION(-1)	-0.122745	0.108827	-1.127898	0.2594

McFadden R-squared	0.507428	Mean dependent var	0.578947
S.D. dependent var	0.500355	S.E. of regression	0.363868
Akaike info criterion	0.986307	Sum squared resid	4.236796
Schwarz criterion	1.244873	Log likelihood	-12.73983
Hannan-Quinn criter.	1.078303	Deviance	25.47966
Restr. deviance	51.72784	Restr. log likelihood	-25.86392
LR statistic	26.24818	Avg. log likelihood	-0.335259
Prob(LR statistic)	0.000080		

Obs with Dep=0	16	Total obs	38
Obs with Dep=1	22		

Dominican Republic
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-17.04550	5.413782	-3.148539	0.0016
SHORT_TERM_EXTERNAL_DEBT(-1)	-86.22683	51.22183	-1.683400	0.0923
M2_TO_RESERVES(-1)	0.565020	0.187804	3.008566	0.0026
LONG_TERM_EXTERNAL_DEBT(-1)	53.76626	19.14474	2.808409	0.0050
GDP_GROWTH(-1)	0.617608	0.248044	2.489911	0.0128
INFLATION(-1)	0.044048	0.066716	0.660236	0.5091

McFadden R-squared	0.655880	Mean dependent var	0.657895
S.D. dependent var	0.480783	S.E. of regression	0.276693
Akaike info criterion	0.757930	Sum squared resid	2.449897
Schwarz criterion	1.016496	Log likelihood	-8.400672
Hannan-Quinn criter.	0.849926	Deviance	16.80134
Restr. deviance	48.82407	Restr. log likelihood	-24.41204
LR statistic	32.02273	Avg. log likelihood	-0.221070
Prob(LR statistic)	0.000006		

Obs with Dep=0	13	Total obs	38
Obs with Dep=1	25		

Egypt
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 8 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-31.79609	12.40491	-2.563185	0.0104
SHORT_TERM_EXTERNAL_DEBT(-1)	-211.2642	87.46916	-2.415300	0.0157
M2_TO_RESERVES(-1)	0.267972	0.216133	1.239850	0.2150
LONG_TERM_EXTERNAL_DEBT(-1)	52.73396	19.88818	2.651523	0.0080
GDP_GROWTH(-1)	1.698709	0.781653	2.173227	0.0298
INFLATION(-1)	0.304736	0.252935	1.204798	0.2283

McFadden R-squared	0.697492	Mean dependent var	0.184211
S.D. dependent var	0.392859	S.E. of regression	0.243857
Akaike info criterion	0.604817	Sum squared resid	1.902915
Schwarz criterion	0.863383	Log likelihood	-5.491524
Hannan-Quinn criter.	0.696813	Deviance	10.98305
Restr. deviance	36.30660	Restr. log likelihood	-18.15330
LR statistic	25.32355	Avg. log likelihood	-0.144514
Prob(LR statistic)	0.000121		

Obs with Dep=0	31	Total obs	38
Obs with Dep=1	7		

El Salvador
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-3.707469	3.549378	-1.044540	0.2962
SHORT_TERM_EXTERNAL_DEBT(-1)	-13.87588	26.01174	-0.533447	0.5937
M2_TO_RESERVES(-1)	-6.302829	7.823877	-0.805589	0.4205
LONG_TERM_EXTERNAL_DEBT(-1)	11.81471	4.038359	2.925621	0.0034
GDP_GROWTH(-1)	-0.192831	0.255020	-0.756141	0.4496
INFLATION(-1)	0.103807	0.113780	0.912347	0.3616

McFadden R-squared	0.376554	Mean dependent var	0.052632
S.D. dependent var	0.226294	S.E. of regression	0.214980
Akaike info criterion	0.572889	Sum squared resid	1.478931
Schwarz criterion	0.831455	Log likelihood	-4.884883
Hannan-Quinn criter.	0.664884	Deviance	9.769766
Restr. deviance	15.67060	Restr. log likelihood	-7.835298
LR statistic	5.900830	Avg. log likelihood	-0.128550
Prob(LR statistic)	0.315989		

Obs with Dep=0	36	Total obs	38
Obs with Dep=1	2		

Ethiopia
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1983 2008
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-6.280128	3.497573	-1.795568	0.0726
SHORT_TERM_EXTERNAL_DEBT(-1)	143.1024	139.5649	1.025346	0.3052
M2_TO_RESERVES(-1)	0.011939	0.025847	0.461936	0.6441
LONG_TERM_EXTERNAL_DEBT(-1)	5.502493	4.177482	1.317179	0.1878
GDP_GROWTH(-1)	0.254087	0.155891	1.629906	0.1031
INFLATION(-1)	0.215615	0.104035	2.072528	0.0382

McFadden R-squared	0.383386	Mean dependent var	0.730769
S.D. dependent var	0.452344	S.E. of regression	0.388135
Akaike info criterion	1.179884	Sum squared resid	3.012972
Schwarz criterion	1.470214	Log likelihood	-9.338492
Hannan-Quinn criter.	1.263489	Deviance	18.67698
Restr. deviance	30.28960	Restr. log likelihood	-15.14480
LR statistic	11.61261	Avg. log likelihood	-0.359173
Prob(LR statistic)	0.040499		

Obs with Dep=0	7	Total obs	26
Obs with Dep=1	19		

Gambia
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-8.933118	2.422491	-3.687575	0.0002
SHORT_TERM_EXTERNAL_DEBT(-1)	9.624847	13.34251	0.721367	0.4707
M2_TO_RESERVES(-1)	0.281771	0.051817	5.437778	0.0000
LONG_TERM_EXTERNAL_DEBT(-1)	2.634712	0.848491	3.105172	0.0019
GDP_GROWTH(-1)	0.472211	0.110835	4.260473	0.0000
INFLATION(-1)	-0.110366	0.055234	-1.998174	0.0457

McFadden R-squared	0.610996	Mean dependent var	0.105263
S.D. dependent var	0.311012	S.E. of regression	0.186606
Akaike info criterion	0.577586	Sum squared resid	1.114293
Schwarz criterion	0.836152	Log likelihood	-4.974131
Hannan-Quinn criter.	0.669582	Deviance	9.948262
Restr. deviance	25.57368	Restr. log likelihood	-12.78684
LR statistic	15.62542	Avg. log likelihood	-0.130898
Prob(LR statistic)	0.007999		

Obs with Dep=0	34	Total obs	38
Obs with Dep=1	4		

Ghana
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2007
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.328584	1.910325	0.172004	0.8634
SHORT_TERM_EXTERNAL_DEBT(-1)	-56.76775	30.81046	-1.842483	0.0654
M2_TO_RESERVES(-1)	0.131132	0.135747	0.965999	0.3340
LONG_TERM_EXTERNAL_DEBT(-1)	7.572277	5.420928	1.396860	0.1625
GDP_GROWTH(-1)	-0.098577	0.087128	-1.131399	0.2579
INFLATION(-1)	-0.115357	0.045186	-2.552906	0.0107

McFadden R-squared	0.338316	Mean dependent var	0.297297
S.D. dependent var	0.463373	S.E. of regression	0.402261
Akaike info criterion	1.129669	Sum squared resid	5.016225
Schwarz criterion	1.390899	Log likelihood	-14.89888
Hannan-Quinn criter.	1.221765	Deviance	29.79775
Restr. deviance	45.03321	Restr. log likelihood	-22.51660
LR statistic	15.23546	Avg. log likelihood	-0.402672
Prob(LR statistic)	0.009402		

Obs with Dep=0	26	Total obs	37
Obs with Dep=1	11		

Guatemala
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-11.76619	4.889002	-2.406665	0.0161
SHORT_TERM_EXTERNAL_DEBT(-1)	176.0095	47.72864	3.687712	0.0002
M2_TO_RESERVES(-1)	1.438379	0.902496	1.593780	0.1110
LONG_TERM_EXTERNAL_DEBT(-1)	-4.937478	7.807812	-0.632377	0.5271
GDP_GROWTH(-1)	-0.484887	0.365552	-1.326452	0.1847
INFLATION(-1)	0.276355	0.217532	1.270406	0.2039

McFadden R-squared	0.505353	Mean dependent var	0.578947
S.D. dependent var	0.500355	S.E. of regression	0.369142
Akaike info criterion	0.989132	Sum squared resid	4.360517
Schwarz criterion	1.247698	Log likelihood	-12.79351
Hannan-Quinn criter.	1.081128	Deviance	25.58701
Restr. deviance	51.72784	Restr. log likelihood	-25.86392
LR statistic	26.14083	Avg. log likelihood	-0.336671
Prob(LR statistic)	0.000084		

Obs with Dep=0	16	Total obs	38
Obs with Dep=1	22		

Jamaica
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.561299	2.194463	-1.167164	0.2431
SHORT_TERM_EXTERNAL_DEBT(-1)	30.51128	21.99404	1.387252	0.1654
M2_TO_RESERVES(-1)	-0.042971	0.044028	-0.975971	0.3291
LONG_TERM_EXTERNAL_DEBT(-1)	0.279026	1.134918	0.245856	0.8058
GDP_GROWTH(-1)	0.280185	0.171788	1.630989	0.1029
INFLATION(-1)	0.011905	0.019708	0.604082	0.5458

McFadden R-squared	0.297302	Mean dependent var	0.500000
S.D. dependent var	0.506712	S.E. of regression	0.416895
Akaike info criterion	1.289936	Sum squared resid	5.561653
Schwarz criterion	1.548503	Log likelihood	-18.50879
Hannan-Quinn criter.	1.381932	Deviance	37.01758
Restr. deviance	52.67919	Restr. log likelihood	-26.33959
LR statistic	15.66160	Avg. log likelihood	-0.487073
Prob(LR statistic)	0.007880		

Obs with Dep=0	19	Total obs	38
Obs with Dep=1	19		

Kenya
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-1.354953	1.434829	-0.944331	0.3450
SHORT_TERM_EXTERNAL_DEBT(-1)	-21.74045	32.03603	-0.678625	0.4974
M2_TO_RESERVES(-1)	0.200299	0.138328	1.448005	0.1476
LONG_TERM_EXTERNAL_DEBT(-1)	-1.517931	2.894412	-0.524435	0.6000
GDP_GROWTH(-1)	-0.053542	0.082832	-0.646401	0.5180
INFLATION(-1)	0.122336	0.074436	1.643517	0.1003

McFadden R-squared	0.161213	Mean dependent var	0.289474
S.D. dependent var	0.459606	S.E. of regression	0.449373
Akaike info criterion	1.325151	Sum squared resid	6.461951
Schwarz criterion	1.583718	Log likelihood	-19.17788
Hannan-Quinn criter.	1.417147	Deviance	38.35576
Restr. deviance	45.72766	Restr. log likelihood	-22.86383
LR statistic	7.371904	Avg. log likelihood	-0.504681
Prob(LR statistic)	0.194418		

Obs with Dep=0	27	Total obs	38
Obs with Dep=1	11		

Lesotho
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1981 2007
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-8.562099	5.669469	-1.510212	0.1310
SHORT_TERM_EXTERNAL_DEBT(-1)	-731.7996	569.9245	-1.284029	0.1991
M2_TO_RESERVES(-1)	2.162957	1.735029	1.246640	0.2125
LONG_TERM_EXTERNAL_DEBT(-1)	8.156761	6.225065	1.310309	0.1901
GDP_GROWTH(-1)	0.290439	0.357496	0.812425	0.4165
INFLATION(-1)	0.098950	0.089498	1.105613	0.2689

McFadden R-squared	0.480338	Mean dependent var	0.208333
S.D. dependent var	0.414851	S.E. of regression	0.316710
Akaike info criterion	1.031863	Sum squared resid	1.805498
Schwarz criterion	1.326377	Log likelihood	-6.382359
Hannan-Quinn criter.	1.109998	Deviance	12.76472
Restr. deviance	24.56352	Restr. log likelihood	-12.28176
LR statistic	11.79880	Avg. log likelihood	-0.265932
Prob(LR statistic)	0.037651		

Obs with Dep=0	19	Total obs	24
Obs with Dep=1	5		

Madagascar
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-3.662726	1.342634	-2.728015	0.0064
SHORT_TERM_EXTERNAL_DEBT(-1)	-38.50915	21.00404	-1.833417	0.0667
M2_TO_RESERVES(-1)	0.033483	0.023843	1.404353	0.1602
LONG_TERM_EXTERNAL_DEBT(-1)	6.619076	2.542999	2.602863	0.0092
GDP_GROWTH(-1)	-0.021728	0.126833	-0.171311	0.8640
INFLATION(-1)	0.033230	0.055783	0.595692	0.5514

McFadden R-squared	0.287187	Mean dependent var	0.526316
S.D. dependent var	0.506009	S.E. of regression	0.437832
Akaike info criterion	1.301982	Sum squared resid	6.134300
Schwarz criterion	1.560548	Log likelihood	-18.73766
Hannan-Quinn criter.	1.393978	Deviance	37.47532
Restr. deviance	52.57387	Restr. log likelihood	-26.28694
LR statistic	15.09855	Avg. log likelihood	-0.493096
Prob(LR statistic)	0.009949		

Obs with Dep=0	18	Total obs	38
Obs with Dep=1	20		

Mauritius
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1978 2008
Convergence achieved after 8 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	4.001337	5.586190	0.716291	0.4738
SHORT_TERM_EXTERNAL_DEBT(-1)	-340.7505	1521.593	-0.223943	0.8228
M2_TO_RESERVES(-1)	-2.467024	1.688598	-1.460989	0.1440
LONG_TERM_EXTERNAL_DEBT(-1)	-6.484528	10.67213	-0.607613	0.5434
GDP_GROWTH(-1)	0.395231	0.340089	1.162138	0.2452
INFLATION(-1)	0.283175	0.221982	1.275668	0.2021

McFadden R-squared	0.470705	Mean dependent var	0.129032
S.D. dependent var	0.340777	S.E. of regression	0.272361
Akaike info criterion	0.794170	Sum squared resid	1.854516
Schwarz criterion	1.071716	Log likelihood	-6.309630
Hannan-Quinn criter.	0.884643	Deviance	12.61926
Restr. deviance	23.84166	Restr. log likelihood	-11.92083
LR statistic	11.22240	Avg. log likelihood	-0.203536
Prob(LR statistic)	0.047144		

Obs with Dep=0	27	Total obs	31
Obs with Dep=1	4		

Nepal
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-16.36710	11.73557	-1.394657	0.1631
SHORT_TERM_EXTERNAL_DEBT(-1)	44.69337	196.2508	0.227736	0.8199
M2_TO_RESERVES(-1)	-0.546793	1.679165	-0.325634	0.7447
LONG_TERM_EXTERNAL_DEBT(-1)	24.92477	13.21118	1.886642	0.0592
GDP_GROWTH(-1)	0.576092	0.630459	0.913766	0.3608
INFLATION(-1)	0.036301	0.118766	0.305654	0.7599

McFadden R-squared	0.487625	Mean dependent var	0.078947
S.D. dependent var	0.273276	S.E. of regression	0.234443
Akaike info criterion	0.598816	Sum squared resid	1.758829
Schwarz criterion	0.857383	Log likelihood	-5.377511
Hannan-Quinn criter.	0.690812	Deviance	10.75502
Restr. deviance	20.99051	Restr. log likelihood	-10.49526
LR statistic	10.23549	Avg. log likelihood	-0.141513
Prob(LR statistic)	0.068831		

Obs with Dep=0	35	Total obs	38
Obs with Dep=1	3		

Niger
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.470020	1.257680	-1.963949	0.0495
SHORT_TERM_EXTERNAL_DEBT(-1)	-43.21506	29.13814	-1.483110	0.1380
M2_TO_RESERVES(-1)	0.216986	0.284623	0.762361	0.4458
LONG_TERM_EXTERNAL_DEBT(-1)	6.187273	1.760774	3.513950	0.0004
GDP_GROWTH(-1)	0.057751	0.065635	0.879878	0.3789
INFLATION(-1)	-0.028197	0.036165	-0.779682	0.4356

McFadden R-squared	0.369260	Mean dependent var	0.473684
S.D. dependent var	0.506009	S.E. of regression	0.413547
Akaike info criterion	1.188432	Sum squared resid	5.472686
Schwarz criterion	1.446998	Log likelihood	-16.58021
Hannan-Quinn criter.	1.280428	Deviance	33.16042
Restr. deviance	52.57387	Restr. log likelihood	-26.28694
LR statistic	19.41345	Avg. log likelihood	-0.436321
Prob(LR statistic)	0.001609		

Obs with Dep=0	20	Total obs	38
Obs with Dep=1	18		

Panama
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	4.805675	3.143802	1.528619	0.1264
SHORT_TERM_EXTERNAL_DEBT(-1)	12.34896	4.510081	2.738079	0.0062
M2_TO_RESERVES(-1)	-0.090641	0.088544	-1.023680	0.3060
LONG_TERM_EXTERNAL_DEBT(-1)	-4.928667	3.874403	-1.272110	0.2033
GDP_GROWTH(-1)	-0.055886	0.131788	-0.424058	0.6715
INFLATION(-1)	-1.596926	0.537311	-2.972071	0.0030

McFadden R-squared	0.559406	Mean dependent var	0.394737
S.D. dependent var	0.495355	S.E. of regression	0.349879
Akaike info criterion	0.906908	Sum squared resid	3.917297
Schwarz criterion	1.165474	Log likelihood	-11.23125
Hannan-Quinn criter.	0.998904	Deviance	22.46249
Restr. deviance	50.98231	Restr. log likelihood	-25.49115
LR statistic	28.51981	Avg. log likelihood	-0.295559
Prob(LR statistic)	0.000029		

Obs with Dep=0	23	Total obs	38
Obs with Dep=1	15		

Peru
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 8 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-5.162085	3.169989	-1.628423	0.1034
SHORT_TERM_EXTERNAL_DEBT(-1)	45.73916	17.85881	2.561154	0.0104
M2_TO_RESERVES(-1)	-0.956534	0.441502	-2.166545	0.0303
LONG_TERM_EXTERNAL_DEBT(-1)	-0.053225	8.436041	-0.006309	0.9950
GDP_GROWTH(-1)	0.058924	0.109972	0.535809	0.5921
INFLATION(-1)	0.039800	0.015114	2.633357	0.0085

McFadden R-squared	0.629783	Mean dependent var	0.394737
S.D. dependent var	0.495355	S.E. of regression	0.319802
Akaike info criterion	0.812487	Sum squared resid	3.272745
Schwarz criterion	1.071054	Log likelihood	-9.437259
Hannan-Quinn criter.	0.904483	Deviance	18.87452
Restr. deviance	50.98231	Restr. log likelihood	-25.49115
LR statistic	32.10779	Avg. log likelihood	-0.248349
Prob(LR statistic)	0.000006		

Obs with Dep=0	23	Total obs	38
Obs with Dep=1	15		

Rwanda
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2006
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.885188	2.949803	0.300084	0.7641
SHORT_TERM_EXTERNAL_DEBT(-1)	-172.0841	77.29527	-2.226322	0.0260
M2_TO_RESERVES(-1)	-1.411237	0.780440	-1.808257	0.0706
LONG_TERM_EXTERNAL_DEBT(-1)	7.138565	2.030899	3.514977	0.0004
GDP_GROWTH(-1)	0.024142	0.138382	0.174457	0.8615
INFLATION(-1)	-0.236987	0.184380	-1.285320	0.1987

McFadden R-squared	0.464127	Mean dependent var	0.117647
S.D. dependent var	0.327035	S.E. of regression	0.290431
Akaike info criterion	0.741139	Sum squared resid	2.361804
Schwarz criterion	1.010497	Log likelihood	-6.599363
Hannan-Quinn criter.	0.832998	Deviance	13.19873
Restr. deviance	24.63032	Restr. log likelihood	-12.31516
LR statistic	11.43159	Avg. log likelihood	-0.194099
Prob(LR statistic)	0.043463		

Obs with Dep=0	30	Total obs	34
Obs with Dep=1	4		

Senegal
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 4 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.238371	1.285614	-1.741091	0.0817
SHORT_TERM_EXTERNAL_DEBT(-1)	-111.8108	34.19119	-3.270164	0.0011
M2_TO_RESERVES(-1)	0.063375	0.021878	2.896706	0.0038
LONG_TERM_EXTERNAL_DEBT(-1)	10.75683	3.821967	2.814475	0.0049
GDP_GROWTH(-1)	-0.141806	0.108793	-1.303441	0.1924
INFLATION(-1)	-0.000819	0.041469	-0.019742	0.9842

McFadden R-squared	0.306434	Mean dependent var	0.447368
S.D. dependent var	0.503897	S.E. of regression	0.437331
Akaike info criterion	1.269578	Sum squared resid	6.120272
Schwarz criterion	1.528144	Log likelihood	-18.12197
Hannan-Quinn criter.	1.361573	Deviance	36.24395
Restr. deviance	52.25735	Restr. log likelihood	-26.12868
LR statistic	16.01340	Avg. log likelihood	-0.476894
Prob(LR statistic)	0.006806		

Obs with Dep=0	21	Total obs	38
Obs with Dep=1	17		

Seychelles
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1974 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.376013	2.119731	0.177387	0.8592
SHORT_TERM_EXTERNAL_DEBT(-1)	-57.34230	23.26060	-2.465212	0.0137
M2_TO_RESERVES(-1)	0.004332	0.068291	0.063434	0.9494
LONG_TERM_EXTERNAL_DEBT(-1)	14.05644	7.542081	1.863736	0.0624
GDP_GROWTH(-1)	0.109926	0.084956	1.293922	0.1957
INFLATION(-1)	-0.427413	0.176991	-2.414889	0.0157

McFadden R-squared	0.562058	Mean dependent var	0.257143
S.D. dependent var	0.443440	S.E. of regression	0.303860
Akaike info criterion	0.842152	Sum squared resid	2.677598
Schwarz criterion	1.108783	Log likelihood	-8.737664
Hannan-Quinn criter.	0.934193	Deviance	17.47533
Restr. deviance	39.90330	Restr. log likelihood	-19.95165
LR statistic	22.42797	Avg. log likelihood	-0.249648
Prob(LR statistic)	0.000434		

Obs with Dep=0	26	Total obs	35
Obs with Dep=1	9		

Sri Lanka
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 7 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.133099	2.994143	-0.712424	0.4762
SHORT_TERM_EXTERNAL_DEBT(-1)	1.927701	38.17502	0.050496	0.9597
M2_TO_RESERVES(-1)	-1.484892	0.925226	-1.604898	0.1085
LONG_TERM_EXTERNAL_DEBT(-1)	19.26984	10.13749	1.900849	0.0573
GDP_GROWTH(-1)	-0.549883	0.419839	-1.309746	0.1903
INFLATION(-1)	-0.084521	0.085623	-0.987136	0.3236

McFadden R-squared	0.510383	Mean dependent var	0.289474
S.D. dependent var	0.459606	S.E. of regression	0.301706
Akaike info criterion	0.904975	Sum squared resid	2.912847
Schwarz criterion	1.163541	Log likelihood	-11.19452
Hannan-Quinn criter.	0.996971	Deviance	22.38904
Restr. deviance	45.72766	Restr. log likelihood	-22.86383
LR statistic	23.33862	Avg. log likelihood	-0.294593
Prob(LR statistic)	0.000291		

Obs with Dep=0	27	Total obs	38
Obs with Dep=1	11		

St Vincent and the Grenadines
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1977 2008
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-1.402265	2.320552	-0.604281	0.5457
SHORT_TERM_EXTERNAL_DEBT(-1)	-41.17722	20.45706	-2.012861	0.0441
M2_TO_RESERVES(-1)	-0.260830	0.475411	-0.548641	0.5833
LONG_TERM_EXTERNAL_DEBT(-1)	13.07421	8.888111	1.470978	0.1413
GDP_GROWTH(-1)	-0.237554	0.174489	-1.361426	0.1734
INFLATION(-1)	-0.292468	0.338563	-0.863852	0.3877

McFadden R-squared	0.334145	Mean dependent var	0.156250
S.D. dependent var	0.368902	S.E. of regression	0.336463
Akaike info criterion	0.952162	Sum squared resid	2.943389
Schwarz criterion	1.226987	Log likelihood	-9.234592
Hannan-Quinn criter.	1.043259	Deviance	18.46918
Restr. deviance	27.73753	Restr. log likelihood	-13.86876
LR statistic	9.268344	Avg. log likelihood	-0.288581
Prob(LR statistic)	0.098828		

Obs with Dep=0	27	Total obs	32
Obs with Dep=1	5		

Togo
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 5 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	3.517179	2.964919	1.186265	0.2355
SHORT_TERM_EXTERNAL_DEBT(-1)	-7.539698	14.65300	-0.514550	0.6069
M2_TO_RESERVES(-1)	0.654722	0.602469	1.086731	0.2772
LONG_TERM_EXTERNAL_DEBT(-1)	-5.389897	4.417074	-1.220241	0.2224
GDP_GROWTH(-1)	-0.063184	0.076117	-0.830084	0.4065
INFLATION(-1)	0.232009	0.105324	2.202818	0.0276

McFadden R-squared	0.345499	Mean dependent var	0.657895
S.D. dependent var	0.480783	S.E. of regression	0.406435
Akaike info criterion	1.156722	Sum squared resid	5.286061
Schwarz criterion	1.415288	Log likelihood	-15.97771
Hannan-Quinn criter.	1.248717	Deviance	31.95542
Restr. deviance	48.82407	Restr. log likelihood	-24.41204
LR statistic	16.86866	Avg. log likelihood	-0.420466
Prob(LR statistic)	0.004756		

Obs with Dep=0	13	Total obs	38
Obs with Dep=1	25		

Uganda
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1984 2008
Convergence achieved after 11 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-52.21153	29.20616	-1.787689	0.0738
SHORT_TERM_EXTERNAL_DEBT(-1)	969.5333	518.4041	1.870227	0.0615
M2_TO_RESERVES(-1)	44.56881	26.24150	1.698409	0.0894
LONG_TERM_EXTERNAL_DEBT(-1)	-26.54665	17.35751	-1.529404	0.1262
GDP_GROWTH(-1)	-1.295763	0.790326	-1.639530	0.1011
INFLATION(-1)	0.569831	0.424235	1.343197	0.1792

McFadden R-squared	0.759980	Mean dependent var	0.720000
S.D. dependent var	0.458258	S.E. of regression	0.245034
Akaike info criterion	0.764641	Sum squared resid	1.140787
Schwarz criterion	1.057171	Log likelihood	-3.558011
Hannan-Quinn criter.	0.845776	Deviance	7.116021
Restr. deviance	29.64767	Restr. log likelihood	-14.82383
LR statistic	22.53164	Avg. log likelihood	-0.142320
Prob(LR statistic)	0.000415		

Obs with Dep=0	7	Total obs	25
Obs with Dep=1	18		

Venezuela
Dependent Variable: DEBT_CRISIS_DUMMY
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1971 2008
Convergence achieved after 6 iterations
QML (Huber/White) standard errors & covariance

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-6.618359	2.351988	-2.813943	0.0049
SHORT_TERM_EXTERNAL_DEBT(-1)	4.841366	9.094380	0.532347	0.5945
M2_TO_RESERVES(-1)	0.178000	1.421356	0.125232	0.9003
LONG_TERM_EXTERNAL_DEBT(-1)	5.892790	3.138735	1.877441	0.0605
GDP_GROWTH(-1)	0.070619	0.107090	0.659431	0.5096
INFLATION(-1)	0.031572	0.030555	1.033304	0.3015

McFadden R-squared	0.245411	Mean dependent var	0.105263
S.D. dependent var	0.311012	S.E. of regression	0.319417
Akaike info criterion	0.823621	Sum squared resid	3.264879
Schwarz criterion	1.082187	Log likelihood	-9.648804
Hannan-Quinn criter.	0.915617	Deviance	19.29761
Restr. deviance	25.57368	Restr. log likelihood	-12.78684
LR statistic	6.276070	Avg. log likelihood	-0.253916
Prob(LR statistic)	0.280275		

Obs with Dep=0	34	Total obs	38
Obs with Dep=1	4		