Essays on Crises and Risk Management in Emerging Markets
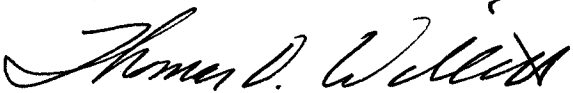
BY

Kunlavee Vannapanich

A Dissertation submitted to the Faculty of Claremont Graduate University in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Graduate Faculty of Economics

Claremont, California
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Approved by:

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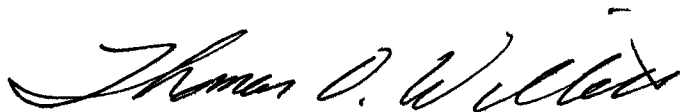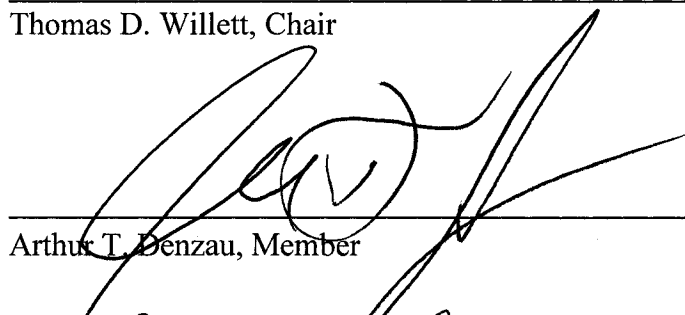We, the undersigned, certify that we have read this dissertation of Kunlavee Vannapanich and approve it as adequate in scope and quality for the degree of Doctor of Philosophy.
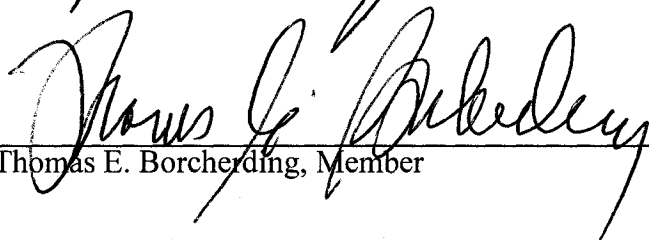
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Abstract of the Dissertation

Essays on Crises and Risk Management in Emerging Markets

by

Kunlavee Vannapanich

Claremont Graduate University: 2009

Emerging markets have experienced a number of crises in the past two decades. Much attention has been given to their characteristics as the source of crises and their severity. The characteristics of emerging markets in which they tend to rely heavily on foreign capital inflows that are typically short-term make them more susceptible to sharp changes in investors' confidence, and thus crises.

This dissertation begins with the analysis of underlying vulnerabilities to currency crises, banking crises, and sudden stops in 19 emerging market economies over the period of 1980-2003. Although these three types of crises are likely to have common origins, the findings show that they tend to be triggered by different factors. This dissertation further investigates the effect of these vulnerabilities on output costs of crises. The objective of this analysis is to see whether the factors that make crises more likely also make them more costly. The findings suggest that output costs of crises depend not only on the factors triggering crises but also on other factors that are not associated with the probability of crises. In some cases, the latter can be a major factor contributing to the severity of crises. The evidence on output costs confirms that

the characteristics of emerging markets are not only a source of growing crises incidence but also a source of more costly crises.

Banking crises are costly because they can impose not only output costs but also fiscal costs on the economy. Therefore, the last analysis focuses on fiscal costs of banking crises and the role of crisis management policies. Empirical literature on fiscal costs puts forward the use of strict rather than accommodating crisis resolution policies. However, this dissertation finds that some accommodating policies were in fact successful in reducing fiscal costs in emerging market economies and the effectiveness of crisis management policies depends significantly on initial macroeconomic conditions and shocks.

To:

My dad, mom, sisters, and Beard

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CHAPTER ONE

Introduction

Emerging markets tend to experience more crises than industrial countries and their crises also tend to be more costly than those in industrial countries. Much attention has been given to the characteristics of emerging market economies, in addition to fundamental problems, as the source of crises and their severity. They tend to rely heavily on foreign capital inflows that are typically short-term. This makes them more susceptible to shifts in investors' confidence, and can lead to liquidity and solvency problems. Liquidity and solvency problems are related. Liquidity problems can transform a solvent country into insolvency through increasing interest rate risks that increase its burden of debt service, while solvency problems can lead to liquidity problems because rollover will becomes more difficult. The latter is evident in the Argentina crisis in 2000.

Liquidity and solvency problems arise largely from risks in the public sector and the financial sector balance sheets. Focusing only on the public sector would be misleading because the recent experience of the Asian crisis has shown that deteriorating financial sector balance sheet can become a major source of fiscal vulnerability and sensitivity to various shocks. In this case, the financial sector's liabilities may be transferred to the public sector through government obligations to the financial sector, threatening public sector sustainability. Therefore, it is important for emerging market economies to have sound public debt and risk management policies

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and effective supervisory and regulatory regimes for the financial sector as well as sound monetary and fiscal policy, so that the vulnerability to crises can be minimized.

The dissertation synthesizes analyses of causes and consequences of crises and the role of crisis management policies in emerging market economies. This dissertation will be particularly useful for governments in terms of becoming aware of potential problems, and therefore being able to take action to avoid unfavorable events. This dissertation begins with the analysis of the potential vulnerability indicators of currency crises, banking crises, and sudden stops in 19 emerging markets over the period 1980-2003. The results suggest that the external sector variables such as current account balances and financial sector variables play an important role in triggering crises in emerging markets. Their tendency to rely heavily on short-term external sources of fund is found to be a major factor contributing to crises in the 1990s, but not before. The findings suggest that the balance sheet effects have become more disruptive these days.

Further analysis of the effect of these underlying vulnerabilities on output losses of crises is presented in chapter three. The objective of this analysis is to investigate whether the factors that make crises more likely also make them more costly. Only a few empirical studies on crises consider the determinants of crises and the determinants of output losses in the same model. However, using the same set of variables as for the likelihood of crises allows us to examine not only whether the set of variables that are associated with the occurrence of crises can also explain the output losses, but also whether there are other factors that may not be associated with the

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occurrence of crises but are likely to influence the output losses of crises. Moreover, considering the three types of crises together in the same model allows us to compare their distinct characteristics and explore what characteristic tends to trigger a particular type of problems.

The costs of crises can be approximated by losses in GDP during the event of crises (Bordo et al, 2001). In general, output loss is defined as the sum of the differences between the actual output and the estimated trend of potential output during the crisis period. However, economists have not reached a consensus on methodology in estimating output losses, especially whether GDP growth or GDP level should be used. The former has been used in IMF (1998), Aziz et al. (2000), Honohan and Klingebiel (2003), and Claessens et al. (2004), while the latter has been employed by Bordo et al. (2001), Hoggarth et al. (2002), and Mulder and Rocha (2001). Using GDP growth or GDP level provide different results in terms of magnitude of output losses and durations of crises which will certainly affect empirical results on output costs of crises. In chapter three, therefore, output costs of currency crises, sudden stops, and banking crises are estimated using both GDP growth rate and GDP level methods.

The analysis of the effects of crises on output costs provides an interesting conclusion that factors triggering crises are not the only ones that makes crises more severe or costly. The output costs of crises also depend on factors that are not associated with the probability of crises which, in some cases, can be a major factor contributing to the severity of crises.

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Another key finding is that the determinants of the output costs of crises have changed across decades. Maturity and currency compositions of external debt have become an important factor determining the output costs of crises in the recent period. This evidence confirms that the characteristics of emerging markets are not only a source of growing crises incidence but also a source of more costly crises. The findings encourage policy-makers to fully understand not only what causes crises but also what makes crises more costly in order to design and implement policies that can minimize the impact of crises on the economy.

Crises can adversely affect the public sector even if the root of crises does not lie in the public sector. The Asian crisis has demonstrated how the public sector was directly financially responsible for the crises caused by weaknesses in the financial sector. As a result, many of the financial sector's liabilities were transferred to the public sector, thus adding substantially to fiscal costs. Fiscal or resolution costs reflect fiscal outlay involving in financial system restructuring, recapitalization and bailout costs made to depositors and creditors due to government's implicit or explicit guarantees. Fiscal costs arise from crisis management policies adopted by governments with the purpose of restoring investor's confidence in the time of financial distress in order to minimize the effect of crises on the economy.

The existing empirical literature on fiscal costs focuses on the role of crisis management policies in determining the magnitude of fiscal costs. Crisis management policies such as liquidity support, blanket government guarantees, repeated recapitalizations, and forbearance are found to increase fiscal costs significantly. These

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findings favor using strict rather than accommodating policies to resolve crises. The use of accommodating crisis management policies, i.e. governments provide liquidity support, blanket guarantees as well as allowing insolvency banks and financial institutions to continue their operations, will result in moral hazard incentives which encourage banks and financial institutions to take on excessive risks. Consequently, these accommodating policies designed to reduce the severity of crises make crises more severe.

The analysis of fiscal costs and crisis management policies is advanced in chapter four. The focus is on fiscal costs in emerging market economies because managing crises in emerging market economies tend to be different than in developed countries due to their different characteristics and quality of institutions (Claessens et al., 2004). Thus, lessons from developed countries cannot simply be transferred to emerging markets. The findings suggest that some crisis management policies were in fact successful in reducing fiscal costs of banking crises in emerging market economies. Implicit government guarantees and forbearance are associated with lower fiscal costs, while liquidity support tends to increase fiscal costs substantially. Furthermore, this dissertation finds that the magnitude of fiscal costs is significantly affected by real exchange rate appreciation and the financial sector variables. This suggests that the effectiveness of crisis management policies depends significantly on initial conditions and shocks.

Governments incur fiscal costs with the purpose of minimizing the impact of crises on the economy. However, the results show that output losses of crises are

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unlikely to be reduced by accepting higher fiscal costs. Crisis management policies that increase fiscal costs are associated with increased output costs, while crisis management policy that decrease fiscal costs appear to decrease output costs as well. The findings suggest the validity of using selected accommodating policies to resolve crises in emerging markets because the costs of moral hazard incentives generated by the use of some types of accommodating policies appear to be outweighed by the benefits of preventing bank runs.

CHAPTER TWO

Fiscal and Financial Vulnerabilities and Crises in Emerging Markets

2.1 Introduction

Fiscal problems have long been considered a major cause of crises. Many crisis countries experienced fiscal vulnerability, which characterized by budget deficit, high public debt level and weak fiscal policies, prior to the crises. However, recent crises in the 1990s have shifted the attention of scholars and policy-makers from fiscal problems to financial sector problems as a cause of crises. Recent crises in emerging market economies have shown that there is an increasing linkage between public and financial sector's balance sheets. Under financial distress, financial sector's vulnerability can become a significant source of fiscal vulnerability through government's implicit guarantee and contingent liabilities.

Emerging market economies are particularly vulnerable to sudden stop, sharp changes in investor's confidence, and interest rates and exchange rates' swing (IMF 2004). This is because their domestic capital markets are less developed, their financing are less diversified and also their fiscal institutions are weaker than industrial countries. Governments in emerging market economies are often unable to borrow abroad in domestic currency and thus are typically forced to borrow in foreign currency at short maturity. Their high dependence on external source of fund especially when it is denominated in foreign currency make them more vulnerable to external shocks. When public sector's debt is denominated in foreign currency and

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government revenue is in domestic currency, this will lead to a currency mismatch in the public sector's balance sheet and thus make the public sector more vulnerable to exchange rate swings. In addition to the exchange rate risk, they also expose to rollover risk if investors and creditors lose confidence in the stability of the domestic currency and the fiscal position. Unlike industrial countries where they are able to borrow from international capital markets as long as they are solvent, emerging market countries are unlikely to borrow or rollover their debt if they are perceived illiquid.

External debt has been an important source of financing for emerging market economies and, at the same time, a source of vulnerability. Such vulnerability would be reduced by switching from external debt to domestic debt denominated in domestic currency. Based on the survey by the principal trade group for the emerging markets trading and investment community, there is an increasing shift of foreign-currency denominated debt to domestic-currency denominated debt in both public and private sectors in emerging markets. The share of domestic public debt denominated in local currency is growing and domestic public debt has now become an important source of financing for emerging market governments (Reinhart et al., 2003). Still the share of foreign-currency denominated debt is considerable.

The growth of local currency debt markets would reduce vulnerability to exchange rate risk. However, it also means that, when assessing vulnerability, we need to take more of domestic factors into account such as financial management by governments, domestic policy and domestic interest rate. Domestic banks are now significant holders of public debt and this implies an increasing linkage between

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financial sector's vulnerability and public sector's financial condition. The soundness of domestic financial sector is a key factor underlying the quality of financial sector and it depends on the structural and institutional factors, and government policy. Therefore, to avoid the future financial disruption, governments need to design policy that strengthen the soundness of financial system and monitor the financial sector's vulnerability through financial soundness indicators.

The objective of this chapter is to investigate the role of fiscal and financial vulnerabilities that makes government in emerging market economies vulnerable to crises and to assess the potential vulnerability indicators that can lead to government policy correction. The focus is on currency crisis, financial crisis, and sudden stop since emerging market economies are more vulnerable to these three types of crises particularly sudden stop which have tended to be the feature of emerging market economies. Although these three types of crises are likely to have common origins and a similar set of determinants, the findings show that they tend to be triggered by different factors. Furthermore, there is evidence that nature of crises has been changed. As international capital markets have become more integrated, the external and financial sector are the major sources of vulnerabilities and play an important role in triggering crises in emerging market economies.

This chapter proceeds as follow. Section 2.2 is begun by discussing theoretical and empirical literature on the determinants of crises. Section 2.3 presents empirical methodology and data used in this chapter. Section 2.4 reports the empirical results of the determinants of crises. Section 2.5 concludes the chapter.

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2.2 Literature Review on the Determinants of Crises: Theoretical and Empirical Evidence

2.2.1 Currency Crises

Much of the literature on crises has been using early warning system (EWS) models to identify the determinants and predictors of crises. The literature typically covers two types of crises: currency crises and banking crises. According to IMF (1998), a currency crisis occurs when a speculative attack on a currency results in a devaluation (or sharp depreciation) of the currency, or forces the authorities to defend the currency by expanding large volumes of international reserves or by sharply raising interest rates.

The indicators of currency in EWS models are based on the theoretical models of currency crises. The first generation of currency crisis model focuses on the fundamental disequilibrium such as budget deficit, decreasing reserves and growth rate of money supply as a cause of the currency crises (Krugman, 1979). The inconsistency between macroeconomic policy and a fixed exchange rate regime can lead to continued balance of payment deficits and trigger a crisis. The second generation crisis models add the government reaction function and political economy into the model. A government balances the benefits of maintaining the currency peg against the costs of giving up. Unlike the first generation model where there is a range of strong fundamental in which a speculative attack will not occur and a range of weak fundamental in which a speculative attack is inevitable, the second generation model introduces a vulnerable zone where the fundamental is neither so strong that a

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speculative attack will not occur nor so bad that it is inevitable. The second generation model shows that a speculative attack could be self-fulfilling if a government is in the vulnerable zone (Obstfels, 1996). An important characteristic of self-fulfilling crises is that they are fundamentally unpredictable and therefore anticipating crises is extremely difficult (Kaminsky et al., 1998).

Although searching for predictors of crises in the second generation model seems to be difficult task, the model, however, suggests possible indicators of vulnerability to a speculative attack. The suggested indicators are banking sector problems, the prospects for economic growth, and political variables. The vulnerability indicators of a currency crisis suggested in both first and second generation models do not differ significantly. Berg et al., 1999 explain that it is because both models have a similar implication in which attacks always occur in countries with weak or vulnerable fundamentals.

Many empirical studies on currency crises have attempted to assess the potential indicators of currency crises using EWS models. The findings, however, vary depending on analytical tools, sample selection, and definitions of variables. Eichengreen et al., 1995 use an event study of currency crisis and logit model to evaluate the causes and consequences of episodes of turbulences in foreign exchange markets. They use data from 1959 through 1993 for 20 industrial countries. Event studies are a univariate technique that provides a simple and intuitive summary of the relationship between crises and the variables of interest. The sample is divided into crisis windows and noncrisis or tranquil periods. The average value of each variable is

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computed for each period in the crisis window and then is plotted against the average value of the variable in the tranquil period. This method allows us to graphically compare the behavior of variables before, during and after crises.

According to Aziz et al., 2000, the advantage of the event study, beside simplicity, is it requires less demanding distributional assumptions of the variables. This technique may be more informative in extracting the behavior of variables over a longer time period than more formal econometric procedure. However, there are some disadvantages to this methodology as well. One of them is that it is difficult to extract the degree to which a particular pattern of a variable is influenced by the behavior of other variables. To overcome the problem of univariate analysis, they suggest more rigorous multivariate regression analyses such as a probit or logit regression model which account for the interactions and correlations between variables. Another disadvantage is that it is difficult to draw conclusions from the average behavior of variables since a large number of diverse countries are included in the sample. This problem can be circumvented by standardizing variables with respect to their country-specific means and standard deviations.

Following earlier work by Girton and Roper (1977), Eichengreen et al., 1995 simply define a currency crisis as speculative pressure in the foreign exchange markets. A speculative attack is measured as a weighted average of changes in exchange rates, interest rates, and reserves. This definition includes both successful speculative attacks and when governments successfully defend against speculative attacks. The basic idea behind this definition is that, when it comes to defending

against speculative attacks, governments have three options. First, it can intervene in the foreign exchange markets by using international reserves. Second, it can increase interest rates in order to attract capital inflows. Third, it can let the currency depreciate.

Eichengreen et. al. (1995) conduct an event study by plotting the movements of various macroeconomic variables around different exchange rate episodes which are devaluations, revaluation, exchange rate flotations, fixings of exchange rates, and other exchange rate regime events. The graphics illustrate the behavior of a single variable for a four-year window around the time of exchange rate episodes, comparing its behavior with the average values in which no exchange rate episode occurred. A band of plus and minus two standard deviations is also included to show the extent of variation.

The result of the graphical analysis suggests that countries devalue most frequently in response to both external and internal imbalances. Devaluations typically occur when unemployment is high, monetary policy is loose, inflation is rapid, and the external accounts are weak. Consistent with the standard view, the devaluations in Europe in the early 1990s were preceded by generally weak external positions. Government budget deficits were larger than those in tranquil periods. Money and credit growth were also high.

Eichengreen et. al. (1995) develop more rigorous statistical tests by using a multinomial logit model and also introduce political variables into the model. This approach allows them to simultaneously compare the joint behavior of variables and periods of tranquility to crises and a variety of different events. The findings confirm

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the graphical result. Devaluations are preceded by political instability, budget and current account deficits and fast growth of money and prices. Although, their result shows that the effect of government budgets and the growth rate of domestic credit on the probably of crises are not statistically significant, they suggest that it is important to keep in mind that the government budget deficits and the growth rate of domestic credit represent the tool of fiscal and monetary policy respectively. The lack of discipline on both policies can provoke and be provoked by devaluation, exchange rate flotations and the like.

Frankel and Rose (1996) apply the Eichengreen, Rose, and Wyplosz approach using data from 1971 through 1992 for 105 developing and emerging economies. They define a currency crash as a nominal depreciation of the local currency of at least 25 percent in a year. They also require that the nominal exchange rate has increased at least 10 percent more than it did in the previous year. This ensures that high expected rates of depreciation in high inflation countries will not be considered as an independent crash. Their definition excludes the average of changes in international reserves and interest rates as suggested by Eichengreen et. al. (1995). They argue that, for the developing and emerging countries, unsuccessful speculative attacks are difficult to identify since reserves movements are notoriously noisy measures of exchange market intervention for almost all countries and there is a lack of long historical data on short-term interest rate in many sample countries. Furthermore, decreases in international reserves and increases in interest rate with the aim of defending against speculative attacks may be less relevant in these countries than

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sudden tightening of reserve requirements, emergency packages from the IMF or other foreign institutions, and especially the imposition of formal or informal controls on capital inflows.

The result of the graphical analysis shows that countries experiencing currency crashes tend to have high burdens of debt. Interestingly, the budget deficit is small and shrinking compared to the tranquil periods. The regression analysis suggests that most of the debt composition variables are not statistically significant. Only the FDI/debt ratio is consistently and significantly associated with currency crashes. They conclude that the debt composition variables have a weak but non-negligible effect on the currency crashes. The result of the current account and budget deficit is consistent with the graphical analysis. Both variables have positive sign and are not statistically significant. Their main finding is that currency crises occur when FDI inflows dry up, when reserves are low, when domestic credit growth is high, when world interest rate rises, and when the real exchange rate is overvalued.

Kaminsky et al. (1998) examine the various indicators suggested by alternative explanations of currency crises and propose a specific early warning system. The study covers the period from 1970 through 1995 for 15 developing countries and 5 industrial countries. The study focuses not only on the role of weak fundamentals in inducing currency crises but also the possibility of self-fulfilling crises. The signal approach has been used to investigate the behavior of the various indicators that tend to behave abnormally prior to crises. The signal approach is similar to the event study approach. However it allows a more direct comparison and ranking of alternative indicators, in

terms of their track record in failing to signal crises (Type I errors) and sending false alarms (Type II errors) (Hemming, Kell, and Schimmelpfennig, 2003). An indicator is said to send a signal about a possibility of currency crisis within a specific period of time (in this case 24 months), if the indicator exceeds the threshold value. The threshold is set in relation to percentiles of the distribution of the observations. A noise-to-signal ratio which is the ratio of false signals to good signals is computed for each threshold. The threshold that gives the lowest noise-to-signal ratio is called the optimal threshold. A signal that is followed by a currency crisis within 24 months is considered to be a good signal. A signal is considered to be a false alarm or noise if no crisis occurs within that time period.

A currency crisis is defined as a situation in which an attack on the currency leads to a sharp depreciation of the currency, a large decline in international reserves, or a combination of the two. Interest rates are not included in the definition because the lack of data on market-determined interest rates for developing countries. The exchange market pressure index is constructed based on the one that used by Eichengreen et al., 1995.

The main conclusion is that the signal approach can be useful as the basis for an early warning system of currency crises. The variables that have the best track record within this approach are exports, deviations of the real exchange rate from trend, the ratio of M2 to international reserves, output, and equity prices. They also suggest other useful indicators. These variables include the behavior of international reserves, the real exchange rate, domestic credit, credit to public sector, and domestic

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inflation. Other indicators such as the trade balance, export performance, money growth, real GDP growth, and the fiscal deficit are less good but still useful predictors of crises.

2.2.2 Banking Crises

A banking crisis is a situation in which actual or potential bank runs or failures induce banks to suspend the internal convertibility of their liabilities or which compels the government to intervene to prevent this by extending assistance on a large scale (IMF, 1998). Literature on banking crises focuses on theory of bank runs and bank insolvency. Maturity and currency mismatches in banks' balance sheet make banks expose to rollover and currency risks and can trigger a bank run. A run on a bank resulted from withdrawals by depositors as they are uncertain about the quality of a bank's asset and liquidity problem can threaten the banking sector as a whole if the depositors are incompletely informed. In this case, bank runs can occur despite the absence of the deterioration of banks' balance sheet. This suggests that bank runs can be self-fulfilling (Diamond and Dybvig, 1983). Bank runs can turn into bank insolvency as a sudden withdrawal of depositors leads to a drain on banks' funds and results in banking crises. Demirgüç-Kunt and Detragiache (1997) study the determinants of banking crises in developed and developing countries and find that banking crises tend to occur when GDP growth is low and inflation and real interest rates are high. They also find that besides weak macroeconomic conditions, structural

characteristics of the banking sector such as explicit deposit insurance schemes and the effectiveness of the legal system also play a role.

In terms of indicators of banking crises, some studies also use EWS models to assess the potential indicators. Goldstein et al. (2000) study a sample of 87 currency crises and 29 banking crises that occurred in 25 emerging market economies and smaller industrial countries over 1970-1995. Following the work by Kaminsky and Reinhart (1999), the signal approach is used to analyze the performance of indicators of currency and banking crises. Nine other indicators are added to the existing 15 indicators in Kaminsky and Reinhart (1999). The nine indicators are the current account balance, short-term capital inflows, foreign direct investment, the overall budget deficits, general government consumption, central bank credit to the public sector, net credit to the public sector, and the current account balance. The first four indicators are expressed as a share of GDP. Their findings suggest that, among the banking crisis indicators, the best-performing indicators are appreciation of the real exchange rate, a decline in stock prices, a fall in exports, a rise in the M2 multiplier, a fall in output, a rise in real interest rate on bank deposit, a high ratio of short-term capital inflows to GDP, and a ratio of current account deficit to investment.

2.2.3 Sudden Stops

The first and second generation crisis models focus on macroeconomic policy. The collapse of the exchange rate peg can be either because of a macroeconomic policy inconsistency or a government policy decision to balance the benefits of

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maintaining the peg, through tight monetary policies and high interest rates, against the costs of giving up. However, recent crises in emerging market economies have drawn attention to problems in financial sector and the behavior of international capital markets. Chang and Velasco (1999) emphasize the role of financial sector fragility in association with international illiquidity in causing crises. Many crises countries suffered from liquidity problems. They had high short-term debt especially external debt relative to liquid assets or international reserves, and thus were extremely vulnerable to a reversal of capital inflows or sudden stops. In emerging market economies where their access to international capital markets is limited, investors' confidence is crucial because their decision to extend credit or rollover debt depends on it. Uncertainty among investors and creditors about the ability to pay of a country may result in calling in loans and withdrawal of funds from banks. This kind of bank run can cause the collapse of a financial system.

Calvo et al. (2002) investigate the Argentina crisis and address three key characteristics that made Argentina vulnerable to a sudden stop in capital flows. Argentina was a relatively closed economy, highly indebted, and had a high degree of liability dollarization. They explain that being closed implies a sharp increase in the real exchange rate (depreciation) following the sudden stop. Sharp increases in the real exchange rate deteriorates highly dollarized balance sheets of both public and private sector because highly dollarized liabilities imply larger currency mismatches when the real exchange rate rises. Their findings highlight the importance of balance sheet effects in causing sudden stops.

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Sudden stops can create drastic effects on government fiscal sustainability through the effect of debt revaluation as a result of real exchange rate devaluation and the materialization of contingent liabilities. Currency mismatches in the public sector balance sheets and a high level of public debt made it difficult for Argentina to sustain its fiscal position in the event of real exchange rate swings. Calvo et al. (2002) suggest that high levels of public debt and dollarization are crucial in determining the effects of sudden stops on fiscal sustainability. Dollarization magnifies the effects of currency devaluation on public debts. High public debt levels mean a government has less ability to act as a lender of last resort and has little room for buffering the impact of debt revaluation.

2.2.4 Institution Arrangements

In addition to sudden stops and financial sector fragility, the role of moral hazard generated by government implicit or explicit guarantees of the financial sector is also considered to be a contributing factor in the recent crises especially the Asian crisis. Corsetti et al., 1998 show that the existence of implicit or explicit government guarantees leads to excessive borrowing from abroad. This explanation of crisis is based on the role of structural and policy distortion in causing crises. The expectation of a future bailout by a government or IMF support programs provided moral hazard incentives for the financial sector to borrow excessively from aboard at lower costs in order to lend at home. Willett et al. (2003) point out the role of moral hazard generated by perverse financial liberalization and perceptions of government's implicit or explicit

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guarantees of exchange rate stability that are much more important than the moral hazard caused by the expectation of a future bailout. Such guarantees generate an incentive for excessive unhedged foreign borrowing.

It is difficult to examine the importance of different types of moral hazard. However, moral hazard contributed a good deal in financial vulnerability in the Asian crisis and was the crucial factor underlying sustainability problem in these countries. The moral hazard incentives for excessive risk taking encourage the financial sector to operate with less consideration of the quantity and quality of loans. This lead to the buildup of foreign debts which a large share of them is short-term, foreign-currency denominated, and unhedged debts. All of these features create distortions in the structure of foreign debts which consequently affects the sustainability of a country.

Moral hazard problems are often the result of policy mistakes. Political pressures to maintain high economic growth rates encourage a government to implement policies that are typically based on short-term need and unsustainable. According to Acemoglu et al., 2002, weak macroeconomic policies are the consequences of underlying institutional problems. They find that better institutional quality proxied by constraint on the executive is associated with better economic outcomes. Countries with weak institutions are likely to create macroeconomic problems through a variety of micro and macro policies and are unable to deal with external shocks. This result is consistent with a study on the role of institutions on economic performance by the IMF (2003). They find that each of the institutional measures, namely aggregate governance, property rights, and constraints on the

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executive have statistically significant impact on economic performance while most of policy measures such as government size and inflation are not significant. Exchange rate overvaluation is the only policy measure that is consistently found to be statistically significant.

2.2.5 Fiscal Vulnerability, Sustainability and Crises

The concepts of fiscal vulnerability, sustainability and crises are related. Fiscal vulnerability is a situation in which a government is exposed to the possibility of failing to achieve its aggregate fiscal policy or objectives (Hemming and Petrie, 2002). A more specific definition of fiscal vulnerability given by Allen and others (2002) is the risk that liquidity or solvency conditions are violated and crises result. Their definition is related to a concept of fiscal sustainability in the sense that a condition for a country's fiscal sustainability, i.e. solvency, is not met. Fiscal policy can cause a financial crisis in three ways; through an overly expansionary fiscal policy and implicit or explicit guarantees which lead to an excessive borrowing of the public sector and excessive lending of the private sector respectively, through the maturity and currency composition of public debt which can be critical to perceptions of government liquidity, and through concerns about fiscal sustainability which can be triggered by uncertainty about government's commitment to fiscal adjustment (Hemming et al., 2003).

Fiscal vulnerability can be seen as overall vulnerability that arises from fiscal policy implementation that negatively affects a country's liquidity or solvency which

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can lead to crises. Fiscal vulnerability refers not only to vulnerability of the public sector but also vulnerability in the financial sector that arise from government obligations to the financial sector. The Asian crisis has shown that problems in the banking sector can be a major source of vulnerability in the public sector. The banking sector's liabilities can affect the government's fiscal position through government guarantees on banking sector's liabilities. Government contingent liabilities in the banking sector that arise from the explicit and implicit government insurance schemes increase government's exposure to fiscal risk.

The analysis of fiscal vulnerability to a financial crisis needs to go beyond problems in the short run. Hemming and Petrie (2000) point out that even if fiscal outcomes are not exposed to significant short-term risks, running persistent fiscal deficits may result in unsustainable debt levels that are a major source of fiscal vulnerability over the longer term. The longer-term fiscal vulnerability analysis involves an investigation of growing macroeconomic imbalances in the medium and long run. This reflects the concept of fiscal sustainability. The fiscal sustainability analysis focuses on a country's solvency which is determined by the present value of a government's budget constraint. As mentioned earlier, perception about a country's fiscal sustainability is important. Doubts about fiscal sustainability can lead to vulnerability and liquidity problem in the short run since uncertainty among investors and creditors about the country's fiscal position affect their decisions to rollover debts.

The Argentina crisis in 2000-2002 illustrates this point. Argentina faced mainly an insolvency problem. Concern about insolvency and weak fiscal policy created

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serious liquidity problems for the government when market conditions tightened and led to the eruption of a funding crisis in early 2001 (IMF, 2004). In the world with highly integrated international capital markets, developing and emerging market economies with less developed domestic financial markets have little choice but to rely heavily on external borrowing in foreign currencies. With the lack of fiscal discipline in Argentina and already high level of external debts, the government faced a liquidity problem in an attempt to finance its deficits. Sound fiscal policy is particularly important to Argentina where the convertibility regime has been adopted. Fiscal policy can be an effective instrument in managing the economies. In order for fiscal policy to perform this role, public debt level needs to be low enough to ensure that the government has ability to finance its deficit without creating insolvency problems.

The three main factors underlying the crisis in Argentina were weak fiscal policy, heavy reliance on external borrowing in foreign currency, and the fixed exchange rate convertibility regime. The combination of these three factors created a tightening liquidity constraint and proved to be disaster when the country was hit by the adverse external shocks. Lessons from the Argentina crisis highlight the need to include liquidity and fiscal sustainability indicators in the analysis of fiscal vulnerability.

Assessing fiscal sustainability focuses on debt sustainability since unsustainable debt levels, especially external public debt, are a major source of fiscal vulnerability. In the event of sudden stop, a level of public debt, in addition to the degree of dollarization, is crucial in determining the effects of sudden stop on fiscal

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sustainability. A high level of public debt implies that government has less ability to finance its deficit without generating sustainability problem. In countries with high external debt, more attention should be paid to external debt sustainability when assessing fiscal sustainability. According to IMF (2006), a government's fiscal position is sustainable when, at the credible levels of primary balances, the government is both solvent and liquid. In theory, a government is solvent if the present value of future primary balances exceeds the current stock of public debt. This constraint reflects the ability to pay of a country. However, this constraint is not practical for a government since it would be costly and politically difficult to run primary surpluses for a long period of time (IMF, 2004). In practice, solvency is assessed by checking whether the public debt to GDP ratio is stable rising or declining (IMF, 2006). Nevertheless, this constraint has a disadvantage as well. It is unlikely that a government would be able to maintain a stable debt to GDP ratio at all time especially when a government has to run expansionary fiscal policy. If government expenditure has to be temporarily high, it is less costly for a government to increase its debt instead of raising tax rates. Thus, it is important to keep in mind when assessing fiscal sustainability that it is necessary to take into consideration the behavior of the debt to GDP ratio along with fiscal policy objectives and the level of interest rates which will rise during crises.

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2.3 Empirical Methodology and Data

2.3.1 Methodology

In order to investigate the probability of crises and their potential vulnerabilities, a panel data for 19 emerging markets and a fixed effects logit model are employed. When using panel data, the cross-sectional and time series dimensions of the data will be disregard. Consequently, the true relationship between the dependent and explanatory variables across countries will be distorted. Using fixed effects takes into account the specific characteristics of each country, and thus allows intercept to vary across countries but still constant over time. The formal specification is as follows:

$$L_{i,t} = \ln\left[\frac{P_{i,t}}{1-P_{i,t}}\right] = \alpha_i + \beta_k X_{k,i,t} + \varepsilon_{i,t}$$

where $L_{i,t}$ is a crisis dummy which takes a value of one when a crisis occurs in country i at time t and a value of zero otherwise, $\ln[P_{i,t}/1-P_{i,t}]$ is the odds of a crisis occurring which is the probability that a crisis occurs ($P_{i,t}$) divided by the probability that a crisis does not occur ($1-P_{i,t}$), α_i is the country-specific effect which picks up the unobserved country-specific characteristics, β_k is the coefficient of kth explanatory variable, X is a vector of explanatory variables, and $\varepsilon_{i,t}$ is the error term.

2.3.2 Data

The panel dataset consists of fiscal, financial, external, structural and institutional variables and three crisis variables; currency crises, banking crises, and sudden stops, for 19 emerging market economies over the period 1980-2003. The

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model is estimated with annual data since fiscal and institutional data are available on an annual basis. The sample of countries are Argentina, Brazil, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, the Philippines, Poland, Russia, Thailand, Turkey, and Venezuela. A country selection is based on the availability of data on foreign currency denominated public debt.

Currency Crises

There have been many controversies on how to measure currency crises. Methods and criteria employed by empirical studies to construct currency crisis indices vary greatly in terms of the components of Exchange Market Pressure (EMP) index, the weighting schemes, the crisis thresholds (standard deviation and mean of the EMP index), and the crisis window. In this dissertation, a currency crisis is said to occur if the EMP index which is a weighted average of monthly changes in the nominal exchange rates and in international reserves exceeds the country-specific mean by more than a given amount. Frequently, two standard deviations is used. The weights attached to each component of the EMP index are assumed to be equal. Many studies such as Eichengreen et al., (1994) and (1995), Bordo et al., (2001), Aziz et al., (2000), and Berg and Pattilo, (1999) employ a different weighting scheme, namely precision weight which equalizes the variance of each component of the EMP and can be obtained from the inverse of the variance of each component. However, the precision weights are not appropriate for the calculation of currency crisis indices because the

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behaviors of exchange rates, international reserves, and interest rates are influenced by macroeconomic policies, and thus the precision measures will lead to an underestimation of the unsuccessful speculative attacks under pegged exchange rate regimes (Nitithanprapas and Willett, 2000). Furthermore, Nitithanprapas and Willett (2000) employ different weighting schemes, namely equal weights and ratio weights in their sensitivity analysis and find that their results are not affected by different weighting schemes.

The definition of currency crisis used in this dissertation captures both successful speculative attack where there is a substantial nominal currency devaluation and unsuccessful speculative attack where an authority successfully defends its currency by selling international reserves. Ideally, a change in interest rates should be included in the crisis index as unsuccessful speculative attack also reflects a situation in which an authority increases interest rates to attract capital inflows with the aim of counterbalancing the speculative pressures on domestic currency. However the currency crisis index used in this dissertation does not include a change in interest rates because of a lack of reliable data on interest rates that can be comparable across countries. Furthermore, this dissertation does not include Hong Kong where the government successfully defended the speculative attack by raising interest rates in the sample.

An annual version of the crisis index is constructed for each country in the sample. A crisis year is defined as a year that contains one or more crisis months. A currency crisis dummy is then constructed for the entire sample period where a

currency crisis dummy is equal to 1 in a crisis year and 0 otherwise. Crises occurring in three consecutive years are treated as the same crisis in order to avoid double-counting the same crisis episode. There is no consensus on how to choose crisis windows and these crisis windows vary substantially among empirical studies from 3 months (Eichengreen et al., 1994), 12 months (Glick and Moreno, 1999), 24 months (Glick and Hutchison, 2001), to 36 months (Frankel and Rose, 1996). Given that currency crises usually last, on average, 2-3 years (Hutchison and Noy, 2002), this dissertation imposes a three-year crisis window on the data. With this methodology, 51 currency crisis episodes are identified. A two-year crisis window which yields 63 episodes of currency crisis is also used to test the robustness of the results. Methodology and criteria employed in this dissertation are similar to Hemming et al. (2003) who construct the currency crisis indices based on the criteria used in the IMF's main early warning system model. However, Hemming et al. (2003) use a three standard deviation crisis threshold which yields a smaller number of crisis episodes than this dissertation because only severe currency crises will be captured by their criteria.

Banking Crises

A banking crisis is more difficult to identify because banking problems are not easily observed and it requires more judgment on the criteria used to identify a banking crisis. Therefore, banking crises are usually identified and dated by researchers based on surveys of banking sector problems. Data on banking crises used in this dissertation

are from Caprio and Klingebiel (2003) and are classified either being systemic or border line banking crises. A systemic banking crisis is defined as a situation in which much and all of bank capital being exhausted, while a border line or non-systemic banking crisis is a smaller banking crisis in which there is evidence of significant banking problems such as government intervention in banks and financial institutions. The criteria of Caprio and Klingebiel (2003) yield 27 systemic banking crises and 5 non-systemic banking crisis episodes in 19 emerging market economies during the period 1980-2003.

Sudden Stops

A sudden stop is usually defined as major and unexpected reductions in capital inflows that result in disruptive economic condition. Calvo et al. (2004) define a sudden stop as a situation in which there is a significant decline of capital flows by at least two standard deviations below its sample means in one year and there is a fall in GDP by any amount. The former criterion reflects the major and unexpected reductions in capital flows while the latter captures the costly consequences of sudden stops on the economy. Hutchison et al. (2007) follow Calvo et al. (2004) but exclude the fall in GCP criterion and define a sudden stop as a year in which the capital account decreases by at least two standard deviations and there is a reduction in the current account deficits in the year of sudden stops or a year following sudden stops.

To capture the major and unexpected characteristics of sudden stops, this dissertation follows Edwards (2004) and Jeanne and Rancier (2006) in identifying a

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sudden stop as when net capital inflows have declined by at least five percent of GDP in one year. Since sudden stops can occur without a reversal of current account and including the output contraction criterion may cause an endogeneity problem due to this dissertation (Chapter 3) also attempts to explain output losses of sudden stops, the omission of both criteria is justified. However, the definition of sudden stops used in Hutchison et al. (2007) is also used to test the robustness of the results. Following Edwards (2004) and Jeanne and Rancier (2006), 35 sudden stop episodes in 19 emerging market economies are identified during the period 1980-2003.

Independent Variables

Independent variables used in this chapter are based on the first and second generation crisis models, literatures on sudden stops, and fiscal sustainability. Several variables suggested by the literatures may all matter but including all of them into the model might not be very useful in understanding the real cause of vulnerability to crises since some are related among themselves. The independent variables are categorized into four groups: fiscal sector, financial sector, external sector, and structural and institutional indicators[1]. All variables are lagged one year in order to capture the delayed response of output to macroeconomic variables and avoid endogeneity problems. Data description and source are reported in Table 2.1.

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[1] Some studies find the relevance of corporate sector's vulnerability on financial crises. Corporate sector has played a major role in some crisis countries such as Indonesia. However, focusing on the banking sector is justified because the banking sector play a much larger role in emerging market economies than in mature economies (Chang and Velasco, 1999) and there is evidence that corporate vulnerability were transmitted through the banking system.

Fiscal sector indicators are overall balance and foreign currency denominated public debt to total public debt. The former indicator describes the initial fiscal position of a country while the latter reflects the currency structure of public debt. A larger portion of foreign currency denominated public debt means a government is more vulnerable to a change in exchange rate and thus increase the probability of crises. Currency mismatch in the public sector balance sheet and a high level of public debt are crucial in determining the effects of crises on fiscal sustainability. However, a public debt indicator is not included in this dissertation because, according to IMF (2005a), public debt is a stock resulting from the accumulation of the flow of public sector deficits or overall balances. Including a public debt indicator would result in correlation among these variables. Furthermore, a level of public debt might not be as important as the structure of public debt as several crises have shown that the structure of public debt was a major source of vulnerability to crises. Hemming et al. (2003) study fiscal causes of crises in emerging market economies in the 1990s and find that despite high debt to GDP ratios in many countries, they were not a cause for solvency concerns. On the other hand, structure and maturity of public debt were the important factors that made these countries vulnerable to exchange rate and rollover risks, and hence to solvency and liquidity problems.

For the vulnerability indicator of the financial sector, the growth rate of domestic credit provided by banking sector is used. This financial sector indicator has been used in many empirical studies such as Frankel and Rose (1996), Demirgüç-Kunt and Detragiache (1997), and Kaminsky et al. (1998) as an indicator of financial sector

vulnerability. This vulnerability indicator focuses on credit expansion in the banking sector which can be seen as banking sector weaknesses. The basic idea behind this indicator is that there is a trade-off between quantity and quality of loans. When there is a rapid increase in domestic lending, it is difficult for banks to screen good loans from bad loans in a short period of time. As a result, the quality of loans will decrease as the quantity of loans increases, and thus increasing the vulnerability of the banking sector to crises. Some studies suggest non-performing loans (NPLs) as an indicator of quality of loans in the banking sector. However, NPLs are not included in this dissertation as a vulnerability indicator because data on NPLs are difficult to compare across countries due to differences in classification of NPLs and they are generally available from 1998 onward.

The vulnerability indicators of the external sector are short-term external debt to GDP, current account balance, and real exchange rate overvaluation[2]. The first indicator is a useful indicator of fiscal vulnerability and liquidity stress. The maturity structure of external debt can be a signal of liquidity problems while a level of external debt can reflect an unstable and disproportionate debt service burden. A high ratio of short-term debt to GDP means a country is more vulnerable to liquidity and solvency problems, and thus increasing the probability of crises. Focusing only on public debt would be misleading since financial sector debt can be transferred to the public sector following crises due to government obligations to the financial sector. Therefore the liquidity indicator consists of both short-term external public and private debt. The

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[2] Real exchange rate overvaluation is defined as the deviation of the real exchange rate from its long-term trend. Hodrick-Prescott (HP) filter is applied to the annual real exchange rate in order to obtain a smooth estimate of long-term real exchange rate trend.

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current account balance as a percentage of GDP and real exchange rate overvaluation are external imbalance indicators. Increasing current account deficit will lead to unsustainable external positions of a country while real exchange rate overvaluation will decrease competitiveness of the economy, thus worsening the current account deficit.

Structural and institutional indicators are trade openness and constraints on the executive respectively. Trade openness can make a country less vulnerable to crises because it can reduce the size of real exchange rate swings following a devaluation, and thus decrease the risk of currency mismatches in both public and private sector balance sheets (Calvo et al., 2004). Furthermore, higher trade openness may mean a country will be able to generate a larger trade surplus through export revenues to facilitate current account adjustment and service its external debt. For the institutional indicator, constraints on the executive is used to capture underlying institutional problems. According to Acemoglu et al. (2002) and IMF (2003), using the executive constraint indicator to examine the effect of institutions on the economy is appropriate because it measures institutional and other constraints placed on the executive which determines whether the executive will be induced to pursue policies that are unsustainable in order to remain in power. A country with fewer constraints on the executive is likely to experience more fighting between various groups and uncertain political environment, thus making a country vulnerable to crises.

2.4 Empirical Results

Table 2.3 presents regression results of the probability of currency crises, banking crises, and sudden stops using fixed effects logit estimation. The overall performances of currency crises and sudden stops models are statistically significant indicated by p-value (prob>chi-square) of 0.00. This suggests that the models fit the data very well. For currency crises (Column 1-3), the external, structural and institutional indicators play a role in causing crises. Currency crises are more likely in a country with large current account deficit, real exchange rate overvaluation, low degree of trade openness, and low quality of institutions. The indicators that increase the probability of currency crises also increase the probability of sudden stops except for trade openness which tends to decrease the probability of currency crises but tends to increase the probability of sudden stops. The difference in the impact of trade openness on the probability of crises reflects an ambiguous role of trade openness. While trade openness can make a country less vulnerable to crises because it can reduce the risk of currency mismatches after crises, it can also make a country more vulnerable to crises through higher vulnerability to external shocks. The latter is consistent with Corsetti et al. (1998), Milesi-Ferretti and Razin (1999), and Detragiache and Spilimbergo (2001) who find that greater trade openness makes a country more vulnerable to external shocks. Therefore, in the case of sudden stops, the positive coefficient on trade openness, though not significant, indicates that the benefits of trade openness are outweighed by the detriment of exposure to external vulnerabilities. The factors causing sudden stops are generally similar to those of

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currency crises but they are not completely the same. Only current account deficits and the quality of institutions play a role in triggering sudden stops. Real exchange rate overvaluation, while having the expected positive sign, is not a statistically significant predictor of sudden stops.

For banking crises (Column 4-6), domestic credit growth and real exchange rate overvaluation have the expected positive signs and are statistically significant at the 5 and 10 percent level respectively, suggesting that banking crises are more likely in a country with high domestic credit growth and real exchange rate overvaluation. Domestic credit growth is consistently found to be a significant predictor of banking crises, however, a connection between real exchange rate overvaluation and banking crises is less prevalent. Real exchange rate overvaluation can increase vulnerability of the banking sector through a loss of competitiveness of the economy. A loss of competitiveness due to real exchange rate overvaluation can weaken exports and economic performance which can lead to business failures and a decline of loan quality, thus increasing vulnerability of the banking sector to crises.

The coefficients on overall balance and foreign currency denominated public debt are not statistically significant in any regressions. Adding fiscal policy variable or overall balance does not alter the result. However, when foreign currency denominated public debt enters the regressions, the coefficient on executive constraint loses its significance in both currency crises and sudden stops regressions. Furthermore, the significance of domestic credit growth in the banking crises regression is eliminated while the coefficient on current account balance is strengthened. The unstable pattern

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of coefficients in the regression for banking crises might reflect the fact that, when foreign currency public debt is considered, real exchange rate overvaluation and external sector are more important than domestic credit growth in precipitating banking crises. The result is consistent with Eichengreen and Rose (1998) who find that exchange rate overvaluation and slowing output growth are more important than credit booms in causing banking crises. Although fiscal sector vulnerability did not trigger crises, there is evidence that fiscal tightening prior to crises tended to make crises more likely as indicated by a positive sign of coefficient on fiscal balance in most regressions.

Robustness of the Results

In order to test the robustness of the results, a number of tests are performed. Different currency crisis window and different specification of sudden stops are considered in order to see whether the benchmark regression is sensitive to different specifications of crisis dummy variables. In the case of currency crisis dummy, two-year currency crisis window is now imposed which yields 63 currency crisis episodes compared with 51 currency crisis episodes using three-year window. Sudden stop dummy is defined as a year in which the capital account decreases by at least two standard deviations and there is a reduction in the current account deficits in the year of sudden stops or a year following sudden stops. This definition follows Hutchison et al. (2007) which take account of current account reversals following sudden stops. Regression results are presented in Table 2.4. The signs and significances of

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coefficients remain the same in most regressions. However, the coefficient on executive constraints in the sudden stops regressions loses its significance, while the coefficient on overall balance gains significance.

Another robustness test is performed by estimating the same regression but over a different period of time. The regressions are estimated over the period 1990-2003 and the results are reported in Table 2.5. The coefficient on real exchange rate overvaluation in the currency crisis regressions loses its significance but the sign remain unchanged. However, a major difference is the coefficient on short-term external debt to GDP. When the regressions are estimated over the period 1980-2003, the coefficient on short-term external debt to GDP has the expected positive signs in most regressions but none of them are statistically significant. However, when the regressions are estimated over the period 1990-2003, the coefficient on short-term debt to GDP becomes significant in the regressions for currency crises and banking crises. This suggests that short-term external debt is a source of vulnerability in the 1990-present period but not before.

An alternative liquidity indicator is also tested. The short-term external debt to international reserves suggested by many empirical literatures as the single most useful liquidity indicator is used to examine whether the variable can contribute more or less to the model. The results show that the coefficient on short-term external debt to reserves is insignificant and negative in the period 1980-2003 and positive in the period 1990-2003. However, one conclusion can be drawn that liquidity problems did not increase the vulnerability to crises in the previous era but it tended to be a part of

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the vulnerability from 1990 onward. Thus, it is obvious that in the 1990s as international capital markets have become more integrated, the external sector was one of the major factors that put emerging market economies more at risk.

Table 2.6 presents the marginal effects of each independent variable estimated at its mean value. The magnitude of the short-term debt variable confirms a more important role of external vulnerability in the recent period. In the 1980s, the probability of crises tended to be most influenced by current account balance. The marginal effect of -0.3478 (Column 1) suggests that, by holding other variables constant at their mean value, the probability of currency crises will increase by about .35 percent if there is a reduction in current account balances by one percent of GDP. In the 1990s, on the other hand, the probability of crises tends to be increased the most by the magnitude of short-term debt. Compared with negative coefficient on current account balance of -0.0007, the coefficient on short-term debt of 0.0010 (Column 4) suggests that, by holding everything constant at its mean value, a one percent increase in the ratio of short-term debt to GDP increases the probability of currency crises by 0.001 percent.

2.5 Conclusion

This chapter investigates the role of potential vulnerability indicators of crises using fixed effects logit model approach. The focus is on currency crises, banking crises, and sudden stops since emerging market economies are more vulnerable to these three types of crises especially sudden stops which have tended to be the feature

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of emerging market economies. Many empirical studies have attempted to assess the potential vulnerability indicators of crises by using EWS models. The aim of EWS models is to predict crises rather than explain crises. However, EWS models can help identify economic weaknesses and vulnerabilities which can shed light on causes of crises. The findings provide useful information and policy implications for policy-makers. Emerging market economies are more vulnerable to currency crises, banking crises, and sudden stops. Although these three types of crises are likely to have common origins and a similar set of determinants, they tend to be triggered by different factors. Determinants of currency crises and sudden stops are similar and are likely to be triggered by the external sector while banking crises tend to be influenced by domestic credit growth and real exchange rate overvaluation. It is noteworthy that these indicators are just a possible set of vulnerability indicators and should not be seen as a true reason for countries' vulnerability. In the case of South Africa, having a high level of short-term debt and low levels of reserves does not necessarily mean that the country is vulnerable to a crisis. A sound solvency indicator, low debt level to export ratio, appears to help the country avoid a crisis despite the high debt levels and low reserves.

Furthermore, the findings provide important evidence regarding the nature of crises. The characteristics of crises in the 1990s were different from those in the earlier period. Short-term external debt is found to be a source of vulnerability in the 1990-present period but not before. The evidence suggests that as international capital markets have become more integrated, the external and financial sectors are the major

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sources of vulnerabilities and play an important role in triggering crises in emerging

market economies.

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Table 2.1: Data Descriptions

Variable	Description and Source
Currency crisis dummy	A currency crisis is said to occur if the EMP index which is a weighted average of monthly changes in the nominal exchange rates and in international reserves exceeds its mean by more than two standard deviations. Then a crisis year is defined as a year that contains one or more crisis months. A currency crisis dummy is equal to 1 in a crisis year and 0 otherwise. Crises occurring in three consecutive years are treated as the same crisis. Source: International Financial Statistics (IFS) for data on monthly exchange rates and international reserves.
Banking crisis dummy	A banking crisis dummy is equal to 1 in the first year of each banking crisis episodes (both systemic and non-systemic banking crises), and 0 otherwise. A systemic banking crisis is defined as a situation in which much and all of bank capital being exhausted, while a non-systemic banking crisis is a smaller banking crisis in which there is evidence of significant banking problems such as government intervention in banks and financial institutions. Source: the banking crisis definition and data are from Caprio and Klingebiel (2003).
Sudden stop dummy	Sudden stop dummy is equal to 1 if net capital inflows have declined by at least 5 percent of GDP in one year, and 0 otherwise. Source: Edwards (2004) for the sudden stop data.
Overall balance	Central government overall balance, in percent of GDP. Source: World Economic Outlook (WEO).
Foreign currency denominated public debt	Central government foreign currency denominated debt, in percent of total public debt. Source: Jeanne and Guscina (2006).
Short-term external debt	Short-term external debt is defined as debt (both public and private external debt) that has an original maturity of one year or less, in percent of GDP. Source: World Development Indicators (WDI).
Current account balance	Current account balance, in percent of GDP. Source: WDI.
Real exchange rate overvaluation	The deviation of the real exchange rate from its long-term trend. Hodrick-Prescott (HP) filter is applied to the annual real exchange rate in order to obtain a smooth estimate of long-term real exchange rate trend. Source: IFS for the real exchange rate data.
Domestic credit growth	The growth rate of domestic credit provided by banking sector, in percent of GDP. Source: WDI.
Trade openness	The sum of exports and imports, in percent of GDP. Source: WDI.
Constraint on executive	The constraint on executive variable is scaled 1-7 with 1 indicating least constraint or unlimited authority and 7 indicating most constraint. Source: Polity IV dataset.

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Table 2.2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Currency crisis dummy	411	.1532847	.3607008	0	1
Banking crisis dummy	456	.0701754	.255723	0	1
Sudden stop dummy	431	.0812065	.2734694	0	1
Overall balance$_{(t-1)}$	390	-2.482672	3.194622	-15.29488	6.070693
Foreign currency denominated public debt$_{(t-1)}$	386	48.58992	28.51738	.0001284	100
Short-term external debt$_{(t-1)}$	360	8.20095	6.017063	0	40.932
Current account balance$_{(t-1)}$	400	-1.506002	4.54535	-14.49845	18.03534
Real exchange rate overvaluation$_{(t-1)}$	406	-3.907262	253.3021	-2226.055	1924.408
Domestic credit growth$_{(t-1)}$	378	3.08125	20.10562	-64.23572	193.0538
Trade openness$_{(t-1)}$	408	58.246	37.3794	11.54567	228.8752
Constraint on executive$_{(t-1)}$	437	6	1.891581	1	7

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Table 2.3: The Probability of Crises

	Currency Crises			Banking Crises			Sudden Stops		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Current Account to GDP$_{(t-1)}$	-0.1871*** (0.002)	-0.1907*** (0.001)	-0.1962*** (0.001)	-0.0566 (0.355)	-0.0708 (0.295)	-0.1289* (0.091)	-0.2474*** (0.001)	-0.2531*** (0.001)	-0.2450*** (0.004)
Real Exchange Rate Overvaluation$_{(t-1)}$	0.0018* (0.063)	0.0018* (0.068)	0.0018* (0.070)	0.0020* (0.074)	0.0019* (0.086)	0.0019* (0.081)	0.0035 (0.217)	0.0034 (0.227)	0.0033 (0.239)
Openness$_{(t-1)}$	-0.0284* (0.058)	-0.0352** (0.041)	-0.0377** (0.034)	-0.0143 (0.377)	-0.0244 (0.204)	-0.0072 (0.702)	0.0080 (0.491)	0.0059 (0.638)	0.0024 (0.861)
Executive Constraint$_{(t-1)}$	-0.0328** (0.039)	-0.0315* (0.053)	-0.0050 (0.916)	0.0453 (0.756)	0.0561 (0.717)	-0.0005 (0.995)	-0.0347** (0.041)	-0.0340** (0.049)	0.1124 (0.453)
Short-term Debt to GDP$_{(t-1)}$	0.0444 (0.357)	0.0409 (0.393)	0.0386 (0.413)	0.0142 (0.788)	0.0099 (0.853)	-0.0269 (0.664)	0.0085 (0.830)	0.0097 (0.806)	0.0296 (0.479)
Domestic Credit Growth$_{(t-1)}$	-0.0052 (0.629)	-0.0036 (0.737)	-0.0048 (0.662)	0.0180** (0.021)	0.0185** (0.020)	0.0076 (0.502)	0.0018 (0.869)	0.0020 (0.853)	0.0034 (0.766)
Overall Balance$_{(t-1)}$		0.0667 (0.377)	0.0761 (0.352)		0.1240 (0.134)	0.0624 (0.499)		0.0385 (0.634)	0.0431 (0.641)
Foreign Currency Denominated Public Debt to Total Public Debt$_{(t-1)}$			-0.0202 (0.246)			0.0259 (0.240)			-0.0037 (0.843)
No. of Observations	297	297	283	294	294	261	259	259	238
Chi-Square	32.96	33.76	31.41	12.76	15.26	11.51	24.61	24.84	21.58
Prob > Chi-Square	0.0000	0.0000	0.0001	0.0470	0.0328	0.1745	0.0004	0.0008	0.0058
Log-Likelihood	-78.0698	-77.6708	-76.2038	-56.9985	-55.7499	-52.0653	-57.6067	-57.4908	-53.7077

Dependent variables are currency crisis dummy, banking crisis dummy, and sudden stop dummy. Estimation method is fixed effects logit model. *, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively. The numbers in parentheses are p-values.

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Table 2.4: Robustness Test: Using Different Crisis Specification

	Currency Crises			Sudden Stops		
	(1)	(2)	(3)	(4)	(5)	(6)
Current Account to GDP$_{(t-1)}$	-0.1395*** (0.005)	-0.1454*** (0.004)	-0.1915*** (0.001)	-0.2671** (0.018)	-0.2789** (0.011)	-0.2433** (0.034)
Real Exchange Rate Overvaluation$_{(t-1)}$	0.0015* (0.081)	0.0015* (0.092)	0.0014 (0.102)	0.0043 (0.190)	0.0045 (0.218)	0.0048 (0.211)
Openness$_{(t-1)}$	-0.0254* (0.052)	-0.0348** (0.025)	-0.0348** (0.031)	0.0125 (0.555)	0.0063 (0.786)	0.0046 (0.851)
Executive Constraint$_{(t-1)}$	-0.0289* (0.064)	-0.0274* (0.087)	-0.0010 (0.981)	0.1692 (0.436)	0.2078 (0.384)	0.1948 (0.428)
Short-term Debt to GDP$_{(t-1)}$	0.0630 (0.122)	0.0582 (0.152)	0.0455 (0.277)	-0.0052 (0.931)	-0.0043 (0.944)	0.0054 (0.931)
Domestic Credit Growth$_{(t-1)}$	0.0047 (0.629)	0.0057 (0.439)	-0.0097 (0.338)	-0.0304 (0.166)	-0.0250 (0.253)	-0.0231 (0.297)
Overall Balance$_{(t-1)}$		0.0910 (0.187)	0.0788 (0.310)		0.2730* (0.060)	0.2933* (0.066)
Foreign Currency Denominated Public Debt to Total Public Debt$_{(t-1)}$			-0.0246 (0.133)			0.0068 (0.783)
No. of Observations	310	310	283	272	272	260
Chi-Square	31.43	33.25	33.24	16.68	20.76	19.13
Prob > Chi-Square	0.0000	0.0000	0.0001	0.0105	0.0041	0.0142
Log-Likelihood	-92.8241	-91.9137	-86.7170	-39.3104	-37.2710	-35.4153

Dependent variables are currency crisis dummy and sudden stop dummy. Estimation method is fixed effects logit model.
*, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively. The numbers in parentheses are p-values.

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Table 2.5: Robustness Test: Using Different Period of 1990-2003

	Currency Crises			Banking Crises			Sudden Stops		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Current Account to GDP$_{(t-1)}$	-0.2654** (0.021)	-0.2660** (0.023)	-0.2706** (0.023)	-0.1177 (0.128)	-0.1503 (0.100)	-0.1591 (0.118)	-0.3819*** (0.003)	-0.3962*** (0.002)	-0.3808*** (0.005)
Real Exchange Rate Overvaluation$_{(t-1)}$	0.0038 (0.310)	0.0039 (0.306)	0.0041 (0.310)	0.0013 (0.256)	0.0012 (0.289)	0.0011 (0.299)	0.0030 (0.351)	0.0030 (0.376)	0.0031 (0.374)
Openness$_{(t-1)}$	-0.1296*** (0.006)	-0.1317*** (0.0006)	-0.1344*** (0.006)	-0.0538* (0.089)	-0.0492 (0.116)	-0.0367 (0.323)	-0.0125 (0.499)	-0.0166 (0.388)	-0.0163 (0.409)
Executive Constraint$_{(t-1)}$	-0.0792 (0.640)	-0.0899 (0.649)	0.1075 (0.894)	0.0268 (0.649)	0.0305 (0.618)	-0.5472 (0.364)	-0.1616 (0.725)	-0.1174 (0.789)	-0.0410 (0.946)
Short-term Debt to GDP$_{(t-1)}$	0.3712** (0.029)	0.4061** (0.029)	0.4127** (0.026)	0.3498** (0.016)	0.3160** (0.027)	-0.3068** (0.048)	0.0747 (0.260)	0.0830 (0.201)	0.0897 (0.182)
Domestic Credit Growth$_{(t-1)}$	-0.0202 (0.185)	-0.0216 (0.188)	-0.0211 (0.202)	0.0091 (0.343)	0.0116 (0.245)	0.0072 (0.565)	-0.0081 (0.582)	0.0086 (0.558)	-0.0078 (0.593)
Overall Balance$_{(t-1)}$		-0.1170 (0.514)	-0.0981 (0.592)		0.1367 (0.251)	0.0599 (0.665)		0.1343 (0.429)	0.1508 (0.432)
Foreign Currency Denominated Public Debt to Total Public Debt$_{(t-1)}$			-0.0162 (0.565)			-0.0079 (0.802)			0.0100 (0.720)
No. of Observations	189	189	175	190	190	163	176	176	161
Chi-Square	36.72	37.15	32.26	20.27	21.81	15.67	26.03	26.68	21.84
Prob > Chi-Square	0.0000	0.0000	0.0001	0.0025	0.0027	0.0474	0.0002	0.0004	0.0052
Log-Likelihood	-31.9936	-31.7800	-31.5859	-35.1677	-34.4013	-32.2664	-35.1398	-34.8181	-32.9623

Dependent variables are currency crisis dummy, banking crisis dummy, and sudden stop dummy. Estimation method is fixed effects logit model.
*, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively. The numbers in parentheses are p-values.

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Table 2.6: The Probability of Crises: Marginal Effects

	1980-2003			1990-2003		
	Currency Crises (1)	Banking Crises (2)	Sudden Stops (3)	Currency Crises (4)	Banking Crises (5)	Sudden Stops (6)
Current Account to GDP$_{(t-1)}$	-0.3478* (0.079)	-0.0137 (0.381)	-0.0509** (0.013)	-0.0007 (0.690)	-0.0277 (0.217)	-0.0900 (0.198)
Real Exchange Rate Overvaluation$_{(t-1)}$	0.0003 (0.139)	0.0005* (0.082)	0.0007 (0.257)	0.0000 (0.724)	0.0003 (0.309)	0.0007 (0.437)
Openness$_{(t-1)}$	-0.0053*** (0.000)	-0.0035 (0.331)	0.0016 (0.388)	-0.0004 (0.653)	-0.0127*** (0.005)	-0.0029 (0.429)
Executive Constraint$_{(t-1)}$	-0.0061 (0.135)	0.0110 (0.762)	-0.0071* (0.070)	-0.0002 (0.716)	0.0006 (0.664)	-0.0381 (0.661)
Short-term Debt to GDP$_{(t-1)}$	0.0082 (0.440)	0.0035 (0.791)	0.0017 (0.826)	0.0010 (0.682)	0.0825* (0.090)	0.0176 (0.290)
Domestic Credit Growth$_{(t-1)}$	-0.0010 (0.632)	0.0044** (0.032)	0.0004 (0.869)	-0.0000 (0.706)	0.0022 (0.387)	-0.0019 (0.595)
No. of Observations	319	319	313	325	325	313
Chi-Square	32.96	12.76	24.61	36.72	20.27	26.03
Prob > Chi-Square	0.0000	0.0000	0.0001	0.0470	0.0328	0.1745
Log-Likelihood	-78.0698	-77.6708	-76.2038	-56.9985	-55.7499	-52.0653

Dependent variables are currency crisis dummy, banking crisis dummy, and sudden stop dummy.
*, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively. The numbers in parentheses are p-values.

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Appendix Table A2.1: Empirical Studies on the Determinants of Crises

Study	Approach	Sample	Fiscal Variables	Other Variables	Findings
1. Currency Crises					
Moreno (1995)	Nonparametric test of differences between quiet periods and periods of speculative pressure.	7 Asia-Pacific countries; 1980-1994.	Fiscal deficit as a ratio of expenditure relative to the United States.	Exchange rate, net foreign assets, log interest rate, central bank domestic credit, narrow and broad money, inflation, deviation of output growth from mean, exports/imports (all variables relative to the United States).	Expansionary fiscal policy and growth in monetary aggregates are associated with depreciation periods. Internal imbalances are also associated with depreciation periods.
Caramazza, Ricci, and Salgado (2000)	Probit model.	61 industrial and emerging market countries; 1990-1998.	Fiscal deficit (significant only when interacted with real exchange rate), short-term debt/reserves.	Real effective exchange rate, current account, exports, GDP growth, unemployment rate, banking crisis, trade linkages, M2/reserves, financial market linkages, short-term share of debt to Bank for International Settlements member banks, stock market variability, exchange rate regime, capital controls.	Trade spillovers and financial linkages play an important role after controlling for domestic and external fundamentals. Exchange rate regimes and capital controls do not play a significant role.
Nitithanprapas and Willett (2000)	Exchange market pressure by OLS.	26 emerging market economies involving the 1994 Mexican crisis and the 1997 Asian Crisis.	Fiscal deficit.	Current account, real exchange rate, FDI, domestic credit growth, reserves/imports, short-term debt/reserves.	Economic fundamentals play a substantial role in explaining the contagion effects during the 1994 Mexican crisis and the 1997 Asian crisis and their interactions matter. Composite indicators are more useful than single indicators.
Eichengreen, Rose, and Wyplosz (1995)	Event study of currency crisis and multinomial logit model.	20 industrial countries; 1959-1993.	Fiscal deficits.	Reserves, exports, imports, current account, credit growth, M1, real effective exchange rate, interest rate, government bond yield, stock market index, CPI, wage rate, unemployment rate, employment, real output growth.	Devaluations are preceded by political instability, budget and current account deficits and fast growth of money, and prices.
Kharas and Mishra (2000)	Ordered probit to explain number of currency crises.	32 emerging and industrial countries; 1980-1997.	Actuarial deficit.	Number of banking crises, change in real exchange rate, change in reserves.	Actuarial deficit is more closely linked to currency crises than conventional measures of deficit.

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Appendix Table A2.1: (cont.)

Study	Approach	Sample	Fiscal Variables	Other Variables	Findings
Currency Crises (cont.)					
Frankel and Rose (1996)	Event study of currency crisis and multinomial logit model.	105 developing and emerging market economies; 1971-1992.	Fiscal deficit, debt composition variables; commercial banks, concessional debt, variable rate debt, short-term, FDI, external public debt, multilateral debt (all expressed as percentage of total debt), external debt/GNP.	Domestic credit, reserves/imports, current account, real per capita output growth, degree of overvaluation, real effective exchange rate, OECD output growth, foreign interest rate.	Fiscal deficit tends to be small and shrinking in countries experiencing a crisis. Currency crises tend to occur when FDI inflows dry up, reserves are low, output growth is low, the domestic credit growth is high, the level of foreign interest rates are high, and when the real exchange rate is overvalued. Neither current account nor government budget deficits seem to play an important role in a crisis.
Kaminsky, Lizondo, and Reinhart (1998)	Signal approach.	15 developing countries and 5 industrial countries; 1970-1995.		Real exchange rate, banking crisis, exports, stock prices, M2/international reserves, output, excess M1 balances, international reserves, M2 multiplier, real interest rate, domestic credit/GDP, terms of trade, real interest rate differential, imports, bank deposits, lending rate/deposit rate.	Signal approach can be useful as the basis for an early warning system of currency crises. The best indicators are appreciation of real exchange rate, banking crisis, a decline in stock prices, a fall in export, a high ratio of M2 to reserves, current account deficit.
Siwińska (2000)	Event study of currency crisis.	30 developing countries; 1980-1999 and 20 Central European and CIS countries; 1992-1999	Government budget deficit, government consumption, external public debt, domestic public debt, public revenue, short-term debt, long-term public debt owed to private creditors, debt service to revenue, debt service to reserves.		Fiscal imbalances: large deficits and rapidly growing short and medium-term liabilities are the key determinants of the recent financial turbulences in transition economies. The most reliable indicator is the ratio of government budget deficit. The indebtedness level is a less reliable indicator.

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Appendix Table A2.1: (cont.)

Study	Approach	Sample	Fiscal Variables	Other Variables	Findings
2. Banking Crises					
Eichengreen and Arteta (2000)	Event study of banking crises and probit model.	75 developing and emerging market economies; 1975-1997.	Fiscal deficit/GNP.	Total external debt, reserves, current account balance, real exchange rate, overvaluation, domestic credit growth, output per capita growth, M2/reserves, external factors, exchange rate regimes, external shocks, financial liberalization, institutional variables.	Perverse sign on budget deficit, but due to correlation with debt/GNP and current account. Robust causes of banking crises include rapid domestic credit growth and large bank liabilities relative to reserves.
Demirgüç-Kunt and Detragiache (1997)	Logit model.	65 developing, emerging market, and industrial countries; 1980-1994.	Fiscal deficit.	GDP growth, terms of trade, exchange rate depreciation, real interest rate, inflation, M2/reserves, private debt, domestic credit growth, banks' cash and reserves/assets, deposit insurance, quality of legal system and contract enforcement.	Low GDP growth, excessively high real interest rates, and high inflation increase the likelihood of a banking crisis.
Angkinand (2005)	Logit model.	49 emerging market and industrial countries; 1975-2002.		Real GDP per capita, real GDP growth rate, current account balance, domestic credit growth, M2/reserves, inflation, explicit insurance, institutional variables.	Real GDP growth rate, inflation, explicit deposit insurance, and institutional variables such as rule of law, corruption, and bureaucratic quality are found to be significant determinants of banking crises.
3. Currency crises and Banking Crises					
Aziz, Caramazza, and Salgado (2000)	Event study of currency and banking crises.	20 industrial and 30 developing countries; 1975-1997.	Fiscal deficit.	Real effective exchange rate, export growth, trade balance, terms of trade, inflation, M1 growth, M2 growth, domestic credit growth, interest rate, change in stock prices, change in reserves, M2/reserves, M2/M1, output growth, world interest rate, unemployment rate, current account.	Typically, economies are overheated prior to crises. The financial vulnerability is increasing. Some trigger, such as increasing world interest rates or declining terms of trade, usually exacerbate the vulnerability of an economy to a crisis. Moreover, the behaviors of variables in particular crises differ from average pattern.

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Appendix Table A2.1: (cont.)

Currency crises and Banking Crises (cont.)

Study	Approach	Sample	Fiscal Variables	Other Variables	Findings
Goldstein, Kaminsky, and Rienhart (2000)	Signal approach.	25 emerging market and smaller industrial countries; 1970-1995.	Fiscal deficit, central bank credit to public sector, government consumption, net credit to public sector.	Bank deposit, credit rating, current account, domestic credit, interest rate differential, excess M1 balances, exports, FDI, imports, lending-deposit interest rate, M2 multiplier, M2/reserves, output, real exchange rate, real interest rate, reserves, short-term capital inflows, stock prices, terms of trade.	Among the currency crisis indicators, the best-performing indicators are appreciation of real exchange rate, banking crisis, a decline in stock prices, a fall in export, a high ratio of M2 to international reserves, output, and current account deficit relative to both GDP and investment. The best-performing indicators for banking crises are appreciation of real exchange rate, a decline in stock prices, a fall in export, a rise in M2 multiplier, output, a rise in real interest rate on bank deposit, a high ratio of short-term capital inflows to GDP, and a ratio of current account deficit to investment.
Angkinand and Willett (2006)	Logit model.	111 emerging market and developing countries; 1990-2003.		Type of exchange rate regime (hard pegs, adjustable parities, crawls, tightly managed, other managed, independent floats), domestic credit growth, currency crisis dummy, GDP per capita, M2/reserve, inflation, OECD growth, interest rate differential, current account balance, ratio of foreign liabilities to foreign assets.	The finding confirms the importance of distinguishing among a wider variety of regimes than just fixed versus flexible rates. Soft pegs and other intermediate exchange rate regimes are associated with higher probabilities of baking crises than are the corner regimes. The major effects of exchange rate regimes on the frequency of banking crises come through their indirect effects on factors such asdomestic credit creation, and the incidence of currency crises.

Appendix Table A2.1: (cont.)

Study	Approach	Sample	Fiscal Variables	Other Variables	Findings
Currency crises and Banking Crises (cont.)					
Hemming, Kell, and Schimmelpfennig (2003)	Event study, signal, and probit model.	29 emerging market economies; 1970-2000.	Overall balance, primary balance, actuarial deficit, total financing, change in net claims on government, total debt, public external debt, short-term debt, long-term debt, foreign debt, foreign currency debt, total expenditure, interest expenditure, defense expenditure, social expenditure, total revenue, international trade taxes, nontax revenue, grants	Exchange rate overvaluation, current account deficit, reserves growth, export growth, M2/reserves, short-term debt/reserves.	Fiscal policy has significantly contributed to past crises. The change of net claims of the banking sector on government, public debt level and composition variables are consistently important. Fiscal problems are the main causes of crises in many countries, and a contributing factor elsewhere. However, in a few countries, fiscal vulnerability is the indirect causes of crises. For EWS model, fiscal variables slightly improve the predictive power of the existing model. The contribution of fiscal variables to the model is that their inclusion reduces the probabilities of sending false signals.
4. Sudden Stops					
Calvo, Izquierdo, and Mejia (2004)	Probit model	32 emerging market and industrial countries; 1990-2001.	Total public debt, external public debt, Fiscal revenue, public balance.	Absorption of tradable goods, current account balance, financial dollarization, terms of trade growth, exchange rate regime, credit growth, deposit rate, FDI, GDP, lending rate, M2, money market rate, real exchange rate depreciation dummy, reserves.	Large real exchange rate fluctuations accompanied by sudden stops are the characteristic of emerging market economies. Combination of openness and domestic liability dollarization is a key determinant of the probability of sudden stops.
Bordo, Cavallo, and Meissner (2007)	Probit model	20 emerging market economies; 1880-1913.		Current account balance, trade openness, gold coverage ratio, hard currency debt to total debt, hard currency debt to GDP, total debt to GDP, real GDP per capita, money growth, UK consol rate.	Higher levels of hard currency debt to total debt and current account deficits increase the probability of sudden stops, while openness and commitment to gold standard had the opposite effect.

CHAPTER THREE

The Costs of Crises: The Output Costs

3.1 Introduction

Emerging market economies have experienced a number of crises in the past two decades and most of them have resulted in severe economic recessions. The more often crises occur, the more time and resources countries have to spend on cleaning up crises. There is evidence that crises have grown more frequent. Bordo et al. (2001) find that the occurrence of crisis has been double that of the Bretton Woods and gold standard periods since 1973. They explain that the combination of capital mobility and the financial safety net which encourage banks and corporations to accumulate excessive foreign currency denominated debt are not only the source of the growing crisis incidence but also the factor that makes recent crises different from the past. In the pre-1972 period, large current account deficits did not lead to sudden stops. Trade flows were balancing by capital flows and creditors were willing to finance trade deficits in the time of difficulty. By contrast, lending in the post-1972 was less related to trade. The inconsistency between trade flows and capital flows weakened creditors' confidences, thus increasing vulnerability to reversals of capital inflows or sudden stops. As mentioned by many literatures, the characteristic of emerging market economies is they are particularly vulnerable to sudden stops and sharp changes in investor's confidence. Therefore it should not be surprising that a number of recent crises occurred in emerging market economies.

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Much of the empirical literature attempts to explain what causes crises and eventually predict crises. However, less work has been done on what factors make crises more costly. The latter is found to be as important as the former. The empirical literature on output costs of crises focuses heavily on currency and banking crises. Only a few studies contribute to the output costs of sudden stops. Moreover, none of these studies considers these three types of crises together in their analyses. Crises in emerging market economies tend to have different characteristics and each type of crises tend to be triggered by different factors. Considering all of them together in the same model allows us to compare their distinct characteristics and explore what characteristic tends to trigger a particular type of problems.

This chapter investigates whether the set of macroeconomic, structural, and institutional variables that are associated with the occurrence of currency crises, banking crises, and sudden stops in emerging markets can also explain output losses of the three types of crises, in other words, to test whether the factors that make crises more likely also make them more costly. Furthermore, this chapter investigates if there are other factors that may not be associated with the probability of crises but is likely to influence output losses of crises. The results show that output costs of crises depend not only on the factors triggering crises but also the factors that are not associated with the occurrence of crises. In some cases, the magnitude of output costs can be most influenced by the latter. Another key finding is that the determinants of output costs of crises in emerging markets have changed across decades. Maturity and currency compositions of external debt have become an important factor determining output

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costs of crises in the recent period. The findings suggest that policy-makers should fully understand not only what causes crises but also what makes them more costly in order to design and implement policies that allow a country to reduce the impact or even avoid crises.

Sections 3.2 and 3.3 review the literature on the effects of crises on the economy and the determinants of output costs of crises respectively. Section 3.4 discusses the measures of output losses of crises including methodologies and estimation of the potential trend. Section 3.5 presents empirical methodology and data used in this chapter. Section 3.6 reports the empirical results of the determinants of output costs during 1980-2003. This section also presents empirical results of changing nature of output costs of crises. Section 3.7 concludes the chapter and discusses policy implications

3.2 The Effects of Currency Crises, Sudden Stops and Banking Crises on the Economy

Crises usually result in misallocation and under utilization of resources (IMF, 1998), thus leading to losses of aggregate output and economic recessions. However, crises can have the opposite effect on the economy. In this case, there will be no output losses but output gains accompanying crises. Crises can affect the economy through various channels and different types of crises tend to have different effects on the economy. Furthermore, the impact of crises on the economy can also be different even if the types of crises are the same.

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The impact of currency crises on the economy can be devided into the following channels. First, currency crises can have an expansionary effect on the outputs through the volume effect of devaluation. With wage and price rigidities, a currency devaluation would induce an improvement in current account balance since nominal devaluation increase country's competitiveness and thus, increase exports and encourage employment and output. It is evident that some currency crises were not followed by output losses. Aziz et al. (2000) find that, in 50 industrial and emerging markets economies, 40 percent of the currency crises have not been contractionary. Gupta et al. (2003) report a similar finding. They find that 40 percent of crises in their sample have an expansionary effect on output. Second, currency crises can have a contractionary effect through the price effects. Unlike the volume effect, a devaluation may not improve current account balance in the short-run since the volume of exports and imports may remain level after the devaluation partly due to pre-existing contracts for export and import goods. Along with the lower price of exports caused by the devaluation, the current account balance could be deteriorated in the short-run. A devaluation tends to work better for industrial countries than for developing countries. This is because the Marshall-Lerner condition[3] which is a condition for a currency devaluation to improve current account balances is likely to be fulfilled in industrial countries. This is consistent with finding by Aziz et al. (2000) in which currency crises in industrial countries have normally been expansionary.

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[3] This condition says that a currency devaluation will improve current account balance if the sum of the elasticity of demand for exports and imports is greater than one.

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Currency crises can also have a contractionary effect on output through balance sheet effects. The third generation crisis models emphasize the role of the financial sector in causing currency crises and the balance sheet effects associated with devaluations. In countries where the financial and corporate sectors have currency and maturity mismatches on their balance sheets, they are exposed to both exchange rate and rollover risks and this may lead to currency and banking crises. Banks and corporates' balance sheets will be deteriorated through increasing debt burden following the devaluation. The balance sheet effects are associated with disruption in the financial market. As banks become more careful with lending, investment and consumption will be decreased and eventually reducing economic growth of a country. The extent of the contraction will depend on quality of the financial sector (Disyatat, 2001) and their dependence on external finance (Stone, 2000 and Dell'Ariccia et al., 2004). The more unsound and highly dependent on external source of fund the financial sector is, the more severe economic recession a country will experience.

The Asian crisis is an excellent example of how highly dependent on external source of fund and unsound financial sector could create vulnerability to crises and resulted in substantial aggregate output losses. The same is also true for the public sector. Crises in Argentina (2000-2002), Brazil (1998-1999), and Russia (1998) have shown that their high dependence on external source of funds by the public sector can be a major factor in causing crises. In this case currency crises can have a contractionary effect on output because, following crises, governments will face an

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increasing public debt burden. In order to achieve improvement in budget balance, governments need to cut their spending, thus resulting in a reduction in output.

Sudden stops can affect the economy through current account adjustment and balance sheet effects due to real exchange rate devaluation. The impact on the economy is fairly similar to that of currency crises. According to Dornbusch et al. (1995) and Calvo et al. (2004), sudden stops tend to result in major current account reversals. An immediate reduction of capital inflows or sudden stops needs to be offset by a reduction in current account deficits. A sharp reduction in current account deficits requires the compression of consumption, investment and import spending, therefore causing a decline in output and weakening the financial system (Bordo et al., 2001). This is consistent with findings by Edwards (2002) and Edwards (2004) in which current account reversals negatively affect investment and growth. The magnitude of the effect of current account reversals will depend on the degree of trade openness of a country. A country with a higher degree of trade openness is less likely to suffer from lower growth relative to trend. This is because a country with higher trade openness tends to have better ability to generate more trade and have higher export growth than a country with lower trade openness. Their explanation is based on the idea that a country that is more open is more capable of absorbing the rapid technological advances, and thus experiences higher productivity growth.

Milesi-Ferretti and Razin (1999), Chari et al. (2005), and Kaminsky (2006), on the other hand, find that there is no obvious evidence that sudden stops and current account reversals have unfavorable effects on output. In fact, sudden stops can lead to

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an increase in output (Chari et al., 2005). They argue that a reduction in output following sudden stops can be accounted for by several factors, not sudden stops alone. Differences in the findings may reflect the fact that not all sudden stops and current account reversals are disruptive. As pointed out by Adalet and Eichengreen (2005), current account deficits can develop for different reasons and, therefore, can be eliminated for very different reasons. For example, current account deficits can reflect an increase in investment in export-support infrastructure or they can reflect an increase in consumption due to currency overvaluation. Since the implications of these deficits are different, they are likely to have different effects on output. In addition, current account reversals can be a result of favorable terms of trade shocks. In this case, the reversals may induce an increase in output growth.

Crises can be very costly, especially banking crises, because they can impose not only output costs but also fiscal costs on the economy. For the output costs, banking crises affect the aggregate output through the credit channel. Disruption of the financial market due to banking crises limits banks' ability to extend their loans. Accordingly, households and firms are automatically forced to reduce their spending and investment and this can lead to a reduction in the aggregate output. Banking crises can also generate fiscal cost in the resolution of the financial system difficulty. Fiscal costs or resolution costs reflect fiscal outlay involving in financial system restructuring, recapitalization and bailout costs made to depositors and creditors due to government's implicit or explicit guarantees. In the event of banking crises, a government incurs fiscal costs in order to prevent or minimize the effect of crises on

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the economy. As a result, financial sector's liabilities will be transferred to the public sector, thus increasing the fiscal costs of crises and imposing costs to taxpayers.

3.3 Literature Review on the Determinants of Costs of Crises

The empirical literature on the costs of crises has focused heavily on the costs of currency and banking crises but not much on the costs of sudden stops. In fact, most literature on the costs of currency crises has incorporated the effects of sudden stops on output as a part of the costs of currency crises. In this type of analyses, sudden stops are considered as a factor that makes currency crises more likely. There are, however, a number of studies arguing that crises come in different varieties and they should not be treated as the same event. Kaminsky (2006) investigates whether crises are of different varieties and finds that crises can be distinguished into six types. Four of them are associated with domestic fragility; current account deficits, fiscal imbalances, financial excesses, and foreign debt unsustainability. The other two types are sudden stops and self-fulfilling crises. She also finds that variables associated with one type of crises are different than others, and therefore the effects on real economy are likely to be different.

Sudden stops are associated with currency crises, however, they are distinct events. Several studies (Milesi-Ferretti and Razin, 1998 and 1999 and Cavallo and Frankel, 2007) find that the correlations among them are surprisingly low. According to Milesi-Ferretti and Razin (1999), current account reversals due to sudden stops and currency crises have different characteristics. Current account reversals due to sudden

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stops are likely to occur when current account deficits are large, foreign exchange reserves are low, and terms of trade are deteriorated while currency crises tend to occur in a country with low foreign exchange reserves, exchange rate overvaluation, and unfavorable external conditions such as high interest rates and low growth in industrial countries. The effects on the economy of both events are also different. Current account reversals are not systematically associated with a decline in output whereas currency crises tend to result in a reduction of economic growth in the crisis year. Even though the study does not focus directly on capital flow reversals or sudden stops, it does show that current account reversals occur in the period of recession where reversals in capital inflows cause a decline in investment and worsen liquidity problems. Furthermore, as pointed out by Calvo et al. (2004) and Edwards (2004), current account reversals and sudden stops are closely related. Current account reversals tend to be a result of sudden stops.

3.3.1 Currency Crises

The possible set of explanatory variables of currency crises and sudden stops suggested by the theoretical literature are rather similar regardless of their different characteristics. However, the factors that trigger each type of crises and their effects on the economy may vary. Hutchison and Noy (2002) investigate the effects of currency crises on the output growth. The study focuses on emerging market economies since they tend to be particularly vulnerable to sudden stops and exchange rates' swing due to their maturity and structure composition of foreign debt. They explain that output

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growth is a function of external factors, domestic policy, lagged output growth and the occurrence of currency crisis. External factors include growth in foreign output and real exchange rate overvaluation. Domestic policies are changes in government budgets and credit growth. The structural factor is trade openness. Their results show that real exchange rate overvaluation, growth in foreign output and openness are important factors worsening the output growth. In addition, they find that currency crises in emerging market economies, on average, are contractionary.

Gupta et al. (2003) investigate the behavior of output during currency crises and find that a large share of crises in the sample had an expansionary effect on output although the majority of currency crises in the sample are contractionary. The effects of currency crises on output depend on many factors including the conditions of domestic and external sectors during crises, macroeconomic policies in resolving crises and structural characteristics of a country. They find that capital inflows prior to crises, capital account liberalization, business cycle booms, and income per capita are associated with a contraction in output. Tight monetary and fiscal policies have contractionary and expansionary effects on output respectively. Export growth rate, short-term debt to reserve, and trade openness are found to be significant depending on specification of the output growth. Bordo et al. (2001), on the other hand, find that the costs of currency crises are not systematically influenced by a government's budget balance, structure of financial system, exchange rate regime, or capital account regime. The only factor that significantly influences the costs is current account deficit.

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Differences in conclusions in the empirical literature on the effects of currency crises on output are a result of different measures, periods, and country samples employed by these studies. Hutchison and Noy (2002) and Gupta et al. (2003) use real GDP growth rates and a difference between the average of pre- and post-crisis GDP growth rates to estimate the output effects of currency crises respectively while Bordo et al. (2001) employ a output loss measure that is estimated by adding up the difference between the potential trend and the actual growth rate in the years following the crisis until the actual growth rate returned to its trend. Regarding the period sample, focusing on different periods tends to yield different results. As mentioned by Bordo et al. (2001), crises in the post-1973 period tend to have different characteristics from crises in the previous period. Choosing a different sample period will, therefore, result in different conclusions among studies. Focusing on different group of countries also affects the result because different group of countries tend to have different characteristics and how they respond to crises is also different. As pointed out by Glick and Hutchison (2001) and Kaminsky (2006), crises in emerging market economies tend be triggered by different factors and have different characteristics than those in developed countries.

3.3.2 Sudden Stops

One characteristic of emerging market economies is that they are more vulnerable to capital flows reversals or sudden stops. Emerging market economies have been heavily relying on foreign capital inflows that are typically short-run. Short-

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term capital inflows make a country more vulnerable to liquidity problems. This is because short-term capital inflows are usually susceptible to capital flight during the time of economic distress as investors and creditors will be able to pull their money out in a short period of time. In addition to liquidity problems, foreign currency component of debt also makes a country more vulnerable to solvency problems. A country with a high level of foreign currency denominated debt will suffer from an increasing debt burden following a devaluation.

Sudden stops are not only a major cause of recent disruption in emerging market economies but also a cause of a dramatic reduction in output. High levels of foreign currency denominated debt especially at short maturity are a crucial determinant of the effects of sudden stops on output. Moreover, Milesi-Ferretti and Razin (1999), Calvo et al. (2004), and Edwards (2004) emphasize the role of trade openness in mitigating the adverse effects of sudden stops on output. As Calvo et al. (2004) put it the extent of the contraction following sudden stops will depend inversely on the degree of trade openness of the economy. A country with a higher degree of trade openness tends to have less contraction in output than a country that is relatively closed due to their better abilities to generate more trade. Their finding is consistent with Edwards (2004) in which the costs of current account reversals will depend on the degree of trade openness of the economy. A country with a higher degree of trade openness is less likely to suffer from lower growth relative to trend. Similar to Milesi-Ferretti and Razin (1999), the study does not focus directly on sudden stops. However, the study tests the joint incidence of sudden stops and current account reversals and

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finds that these two are statistically related although there are observed differences between the two events.

Bordo et al. (2007) study the determinants of sudden stops and the effects on output of 20 emerging market economies during 1880-1913. Even though the focus is on the first era of globalization, their results confirm that a high ratio of foreign currency debt and current account deficits are positively associated with the probability of sudden stops. Additionally, trade openness negatively affects the likelihood of sudden stops but the result varies among different specifications of sudden stops. For the output effects, they assume that the determinants of sudden stops indirectly affect output growth. They therefore construct a sudden stop dummy using probit regression of sudden stops on a set of the determinants of sudden stops. They include the sudden stop dummy and a set of the determinants of growth suggested by the literature in the growth regression and then estimate the effects of these variables on growth. The results show that sudden stops cause a decline in output growth.

The effects of sudden stops on output are not only influenced by macroeconomic variables but also macroeconomic policy during the event of sudden stops. On theoretical grounds, economists have come to different conclusions regarding whether macroeconomic policy tightening during crises is more favorable to achieving growth target. Fischer (1998) argues that implementing tight macroeconomic policy during crises is justified because tight monetary policy helps restore confidence in the domestic currency while tight fiscal policy helps cover the restructuring costs of financial sector and reduce current account deficits. Stiglizt (1999), on the other hand,

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argues that tight monetary and fiscal policies during crises can lead to substantial economic slowdown. The reason is that tight macroeconomic policy will worsen growth rate and that, in turn, will reduce confidence rather than increase it.

On empirical grounds, there is no clear evidence from historical data on how and which policies have influenced the aggregate output during crises. Hutchison et al. (2007) attempt to fill this gap by investigating the effects of monetary and fiscal policies on the output costs of sudden stops. Since the focus is on the effects of macroeconomic policies, they control for a number of factors that are likely to influence output following sudden stops. Their results support the view that tight macroeconomic policies during crises worsen output losses. Both measures of monetary and fiscal policies which are changes in interest rates and fiscal stance respectively indicate that increases in interest rates and fiscal balances negatively affect output costs.

3.3.3 Banking Crises

For the costs of banking crises, there are two types of costs involved: output costs and fiscal costs. Aside from macroeconomic variables such as real GDP growth rate, output costs of banking crises tend to be significantly influenced by resolution policies. Boyd et al. (2004) explain that the magnitude of output losses of banking crises is not completely accounted for by initial shocks but rather the banking sector and banking crisis policy variables. Resolution policy variables such as liquidity support are consistently found to be associated with output losses by adding significant

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amount of costs to the economy. Angkinand (2008) explores more on the relationship between output cost of banking crises and banking regulation. She finds that comprehensive deposit insurance coverage and strict bank capital adequacy requirements tend to reduce the output costs of crises. A real GDP growth rate and inflation have a negative and positive impact on output costs respectively suggesting that a country with a lower economic growth rate and poor macroeconomic policy proxied by high inflation is likely to experience more severe crises.

Resolution policies are also greatly responsible for fiscal costs. Fiscal costs are rather a transfer cost from the banking sector to the public sector (Hoggarth et al., 2002), and thus the magnitude of fiscal costs will depend on how crises are resolved (Dziobek and Pazarbasioglu, 1997) and the importance of a banking system in a country. Fiscal costs tend to be higher in a country with poor resolution policy and the greater importance of banking system. Based on the estimated fiscal costs reported by Caprio and Klingebiel (2003), fiscal costs in emerging market economies are likely to be higher than those in developed countries. On average, fiscal costs in emerging market economies and developed countries are 18.6 and 12.8 percent of GDP respectively[4].

Overall, the determinants of output costs of currency crises and sudden stops are macroeconomic and external variables while the determinants of costs of banking crises, in addition to macroeconomic variables, tend to be crisis management policies. Although economists have not reached a consensus on all of the determinants of the

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[4] The calculation is based on 19 emerging market economies which is the country sample used in this dissertation and 5 developed countries that experienced systemic banking crises during 1970-2003.

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costs of crises and the effects on the economy, one thing we know for certain is crises in emerging market economies are triggered by multiple vulnerabilities (Kaminsky, 2006). Furthermore, one type of crisis can be triggered by the other. This implies that factors causing one type of crises can also indirectly cause another type. Crises of all types in emerging market economies are likely to have common origins and a similar set of determinants usually in a context of structure rigidities and financial sector weaknesses (IMF, 1998). However different types of crises tend to be triggered by different reasons, and thus the effects on the economy tend to be different.

3.4 Measuring Costs of Crises: Conceptual Issues and Empirics

A number of methods are used to investigate the severity or depth of crises. While some studies focus on the behaviors of exchange rates and international reserves during crises (Sachs, Tornell, and Velasco, 1996, Furman and Stiglitz, 1998, and Kaminsky and Reinhart, 1999), other focus on the impact of crises on the economy or output (Bordo et al., 2001, Hoggarth et al., 2002, and Hutchison and Noy, 2002). Additionally, some studies use fiscal costs of crisis resolution to measure the severity of banking crises (Caprio and Klingebiel, 2003 and Honohan and Klingebiel, 2003).

The behaviors of exchange rates and international reserves during crises and fiscal costs may not reflect the overall cost of crises to the economy but rather the narrow measure of the size of crises. The overall cost of crises to the economy should reflect welfare losses which can be approximated by losses in GDP during the event of crises (Bordo et al, 2001). There are two types of studies on the effects of crises on the

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economy. One focuses on economic performance or economic growth, while the other focuses on output losses which can be estimated by the difference between the actual GDP and the potential GDP trend. The literatures on the costs of crises are derived from the latter but the former can shed some light on the determinants of costs of crises.

3.4.1 Methodologies in Estimating Output Losses

Output loss is defined as the sum of the differences between the actual output and the potential output trend during the crisis period. Methodologies to measure output losses have been the subject of much controversy since there is no common way to measure output losses. However, there are two approaches commonly used by empirical studies to estimated output losses.

1) Losses in output growth rate. This approach, used in IMF (1998), Aziz et al. (2000), Honohan and Klingebiel (2003), and Claessens et al. (2004), provides a rough estimation of output losses by adding up the difference between the actual GDP growth rate and the potential GDP growth trend in the years following the crisis until the time when the actual GDP growth returned to its trend. The formal specification is as follows:

$$\text{Estimated losses in output growth (\%)} = \sum_{t=t_0}^{N} (g^* - g_t) \tag{1}$$

where g_t is the actual GDP growth rate during the crisis period, g^* is the potential GDP growth trend which is the average of GDP growth rate in the period

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prior to crisis[5], t_0 is the beginning of the crisis year, N is the period that the actual GDP growth rate returned to its trend. Thus, N- t_0 represents duration of crises.

2) Losses in output level. In stead of using the growth rate of GDP, this approach uses GDP level to calculate output losses. The output losses are calculated by summing up the difference between the actual GDP level and the potential GDP trend over the crisis period. This approach is used in Bordo et al. (2001), Hoggarth et al. (2002), and Mulder and Rocha (2001). The formal specification is as follows:

$$\text{Estimated losses in output level (\%)} = \sum_{t=t_0}^{N}(GDP^* - GDP_t) \qquad (2)$$

where GDP_t is the actual GDP during the crisis period, GDP^* is the potential GDP trend which is based on the past GDP levels smoothed by Hodrick-Prescott filter (HP filter)[6].

The two methods provide different results in terms of magnitude of output losses and durations of crises. The differences are due to several reasons. As pointed out by Claessens et al. (2004), who employ the GDP growth rate methodology, the differences can be accounted for by other factors determining the GDP level, different assumptions made about the potential trend and the timing of pre- and post-crisis period.

Different estimates provided by both methodologies will certainly affect empirical results on the costs of crises. Hoggarth et al. (2002) show that the magnitude

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[5] A number of pre-crisis years used to calculate potential growth trend can be vary. For example, Bordo et al. (2001) use five-year pre-crisis growth rates while Hoggarth et al. (2001) and Angkinand (2005) use three-year pre-crisis growth rates.

[6] See the estimating potential trend section for more discussion.

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of output losses provided by the GDP level method is much larger than those of the GDP growth rate method. They explain that using GDP growth to calculate output losses leads to underestimation of the magnitude of output losses because it does not take into account a reduction in the output level in previous years. After crises, the actual growth rate may return to its pre-crisis growth rate but there might be permanent loss in the output level. In this case, the level of GDP will not return to its pre-crisis GDP level. This argument is supported by empirical evidences from the Asian crises. Angkinand (2005) uses graphical analysis to compare output losses estimated by both methods for five crisis-hit Asian countries. She finds that the Asian countries recovery from crises as indicated by a return of GDP growth to its pre-crisis growth trend within a few years. However, the actual GDP level for all five Asian countries does not return to its potential GDP trend indicating the permanent losses in output for these countries. Her result is consistent with Cerra and Saxena (2003) who investigate output recovery from the Asian crises and find that the actual output level for six Asian countries does not return to its potential output trend. However, their findings could also reflect that the old growth rate was no longer sustainable.

3.4.2 Estimating Potential Trend

One of the main reasons for wide variations in estimated output losses in addition to the difference in methodologies is the difference in estimated trend of potential output. A high trend leads to high estimated output losses while a low trend

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leads to underestimation of output losses. These differences obviously depend on potential trend assumptions used by empirical studies.

One assumption regarding the potential trend is the number of pre-crisis years used to calculate the potential trend. This is a crucial assumption especially when using a GDP growth rate to calculate the potential trend. The potential growth trend is defined as the average of GDP growth rates in the pre-crisis period usually three or five years. Prior to crises, GDP growth rates tend to be different from normal due to unusual economic condition. However, there is no agreement on whether the unusual economic condition prior to crises is influenced by economic boom or recession. Empirical results show evidence in support of both views. Demirgüç-Kunt and Detragiache (1997), Milesi-Ferretti and Razin (1999), and Bussiere and Fratzscher (2002) find that crises are likely to be preceded by recessions whereas Bordo et al. (2001) and Corsetti et al (1999) argue that high economic growth makes countries more vulnerable to crises. Based on historical data of Asian countries in the 1990s, Corsetti et al (1999) show that all Asian countries in their sample had high economic growth rates in the period leading up to the crisis. Different conclusions among empirical studies are partly due to a lack of a clear pattern for economic growth in the pre-crisis period. Aziz et al. (2000) observe the behavior of output growth prior to crises and conclude that, on average, output growth was significantly below its normal rate in 24 months before a crisis. For the rest of the pre-crises period, output growth slightly increased before slowing down in the last few months prior to the crisis.

As the behavior of output growth prior to crises is unstable, it is crucial to choose an appropriate number of pre-crisis years to estimate the potential trend. Choosing a short pre-crisis period may result in a bias of estimated output losses. For example a country that experiences economic boom prior to crises will result in overestimation of output losses. This is because the potential growth trend is based on pre-crisis growth rates which, in this case, are unusually high due to economic boom. Therefore, the potential growth trend will be inflated and output losses will be overstated. On the other hand, as pointed out by Angkinand (2005), using a long pre-crisis period may not reflect a true tranquil period especially in countries that experience multiple crises.

In the case of the GDP level method, a number of pre-crisis years chosen to calculate the potential trend may not be as of concern as in the GDP growth method. The potential level trend is based on long-term historical GDP levels usually from the beginning of the sample period up until the last year before a crisis occurs or ten years prior to a crisis. After the period is chosen, the Hodrick-Prescott filter will be applied to GDP levels for the chosen period to obtain a smooth estimate of the GDP level trend. Then the potential GDP level trend is given by assuming that the GDP level trend will grow at a constant rate of the average three-year pre-crisis growth rates of the HP filter estimates[7]. The potential GDP level trend obtained from this method, however, will be high and, in some cases, makes recovery impossible because it is

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[7] This method follows Mulder and Rocha (2001).

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based on the assumption that the potential trend should reflect GDP levels if crises had not occurred.

Alternatively, some studies calculate the potential GDP level trend by applying the HP filter for the entire sample period. This method will produce downward biases or smaller output losses because it takes into account a reduction in output following crises. This method is not appropriate for calculating the potential trend for a country with multiple crises because it means that crises in the future will be taken into account when calculating the output losses of crises in the past.

3.5 The Determinants of Output Costs of Crises: Empirical Methodology and Data

3.5.1 Methodology

To investigate the determinants of output costs of crises, ordinary least square (OLS) with White's heteroscedasticity-consistent standard errors is employed. When data is cross-section, the problem of heteroscedasticity in which the error terms of each explanatory variable have different variances is commonly present. Heteroscedasticity does not produce biased OLS estimators. However, these estimators are no longer efficient, in other words they do not have minimum variance. As a result, the t-value will be smaller (larger) than it is supposed to be making statistically significant (insignificant) variables seem to be insignificant (significant). Disregarding heteroscedasticity when using OLS estimation will result in misleading conclusions. This problem can be corrected by using White's heteroscedasticity-consistent standard

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errors which allows for consistent variances of OLS estimators and corrects for heteroscedasticity without altering the values of estimated coefficients. The model can be expressed as follows:

$$Cost_i = \alpha + \beta_k X_{k,i} + \varepsilon_i$$

where $Cost_i$ is estimated output costs of crisis i, β_k is the coefficient of kth explanatory variable, X is a vector of explanatory variable, ε_i is the normally distributed error term.

3.5.2 Data

Dates of Crises

Currency Crises

A currency crisis is said to occur if the EMP index which is a weighted average of monthly changes in the nominal exchange rates and in international reserves exceeds the country-specific mean by more than a given amount. Frequently, two standard deviations is used. The weights attached to each component of the EMP index are assumed to be equal. An annual version of the crisis index is constructed for each country in the sample. A crisis year is defined as a year that contains one or more crisis months. A currency crisis dummy is then constructed for the entire sample period where a currency crisis dummy is equal to 1 in a crisis year and 0 otherwise. Crises occurring in three consecutive years are treated as the same crisis in order to avoid double-counting the same crisis episode. With this methodology, 51 currency crisis episodes are identified.

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Banking Crises

Data on banking crises are from Caprio and Klingebiel (2003) and are classified either systemic or border line banking crises. A systemic banking crisis is defined as a situation in which much and all of bank capital being exhausted, while a border line or non-systemic banking crisis is a smaller banking crisis in which there is evidence of significant banking problems such as government intervention in banks and financial institutions. The criteria of Caprio and Klingebiel (2003) yield 27 systemic banking crises and 5 non-systemic banking crisis episodes in 19 emerging market economies during the period 1980-2003.

Sudden Stops

Data on sudden stops are from Edwards (2004). Sudden stop is identified as when net capital inflows have declined by at least five percent of GDP in one year. During the period 1980-2003, this definition yields 35 sudden stop episodes in 19 emerging market economies considered in this dissertation.

Output Costs of Crises

Output costs of crises are estimated using both GDP growth rate and GDP level methods discussed above. The potential GDP growth trend is defined as the average of GDP growths in the three years prior to a crisis. For the potential GDP level trend, the HP filter is applied to GDP levels from the beginning of the sample period up to each crisis year. The GDP level trend is assumed to grow at a constant rate of the average

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three-year pre-crisis growth rates of the HP filter estimates. In the case that the average three-year pre-crises growth rates is a negative value, the GDP level trend is then assumed to be constant from the crisis year onward. This prevents the potential output level trend from declining over time.

Tables 3.1-3.3 present the estimated output losses of currency crises, sudden stops, and banking crises and for 19 emerging market economies from 1980-2003. The results show that the two estimating methods yield different results in terms of the magnitude of output losses and durations of crises. The average losses of output growth are higher than those of output levels for all three types of crises, with banking crises have the highest average output losses. The average of output growth losses of currency crises, sudden stops, and banking crises are 11.36, 14.56, and 17.70 percent of GDP respectively while the average of output level losses of currency crises, sudden stops, and banking crises are 9.85, 13.42, and 15.63 percent of GDP respectively. The most costly crisis was the Mexican crisis in 1982 which resulted in significant output losses of 95.80 percent and 92.70 percent of GDP estimated using the GDP growth and GDP level methods respectively. For several crises, there were no output losses, but rather output gains indicated by higher actual GDP than its trend following crises. The latter will be given a value of zero since this dissertation is not interested in output gains of crises. Crises with no output losses account for approximately 23 percent of total crisis episodes meaning that most of crises in the sample have a contractionary effect on output. This finding is consistent with Hutchison and Noy (2002) in which crises in emerging market economies, on average, are contractionary.

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Hoggarth et al. (2002) point out that the magnitude of output losses provided by the GDP level method is much larger than those of the GDP growth rate method. However, this is not the case for emerging market economies, or at least for the country sample in this dissertation. The results in Table 3.1-3.3 show that the GDP growth method provides larger output losses for all three types of crises. Moreover, the results provided by Hoggarth et al. show that even though the average output losses of all countries in their sample estimated by the GDP growth method are smaller than those estimated by the GDP level method, the opposite is true for emerging market economies. This can be due to the fact that crises in emerging market economies were usually preceded by high growth rates. It is noteworthy that although the growth rates were high especially in Asian economies, they grew at diminishing rate. This can be a reason why there are different conclusions on the economic conditions prior to crises among empirical studies.

The average recovery time where the actual output returned to its trend estimated by each method is also different. The average recovery time of output level is slightly shorter than that of output growth. However, the former yields more crises with permanent losses in output in which the actual GDP never returns to its trend. The average recovery time of output growth for currency crises, sudden stops, and banking crises are 1.8, 2.0, and 2.8 years respectively.

Independent Variables

The determinants of the costs of crises suggested by the literature are similar to the determinants of crises. In the previous chapter, the factors causing crises have been investigated and the results show that the external sector, financial sector, and structural and institutional indicators all play a role in the occurrence of crises. However, none of the public sector variables is significant. The determinants of currency crises and sudden stops are similar, but not completely the same. This confirms the findings by Milesi-Ferretti and Razin (1999) and Kaminsky (2006) that currency crises and sudden stops are distinct events.

This chapter examines whether the set of macroeconomic, structural, and institutional variables that are associated with the occurrence of crises can also explain the output losses of crises. Thus, the set of explanatory variables used in this chapter will be the same as in the previous chapter. Furthermore, this chapter will investigate whether there are other factors that may not be associated with the occurrence of crises but are likely to influence the output losses of crises. Similar to the previous chapter, the sample consists of 51 episodes of currency crises, 35 episodes of sudden stops, and 32 episodes of systemic and non-systemic banking crises in 19 emerging market economies[8] over the period of 1980-2003. The explanatory variables are categorized into four groups; public sector, external sector, financial sector, and structural and institutional indicators. All variables are lagged one year in order to capture the

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[8] Argentina, Brazil, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, the Philippines, Poland, Russia, Thailand, Turkey, and Venezuela.

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delayed response of output to macroeconomic variables and avoid endogeneity

problems.

3.6 Empirical Results

Tables 3.5-3.7 present results of the determinants of output costs of crises. The

results vary depending on the output cost measures. Table 3.5 shows that factors that

make currency crises more likely also make them more costly. A decrease in the

current account balance before crises and fewer constraints on the executive increase

output costs of currency crises. A rise in real exchange rate overvaluation tends to

increase output costs, but the variable is statistically significant only in the growth loss

regression. Openness, on the other hand, is not a significant determinant of output costs

although it is negatively associated with the probability of currency crises. It is

interesting that output of costs of currency crises are also influenced by other factors

that are not associated with the occurrence of crises in my regressions. These variables

are short-term external debt to GDP, foreign currency denominated public debt, and

domestic credit growth. The first two variables tend to increase output costs of

currency crises while the last tends to decrease them. However, other studies such as

Hutchison and Noy (2005) find mixed result on domestic credit growth.

The determinants of output costs of sudden stops are presented in Table 3.6.

Output costs of sudden stops are higher for a country with fewer constraints on the

executive[9] and exchange rate overvaluation. The latter is not associated with the occurrence of sudden stops in my results, but it significantly influences output costs of sudden stops. The effects of sudden stops on output will be materialized through current account adjustment and balance sheet effects due to real exchange rate depreciation. Theoretically, the extent of output losses will depend on trade openness and a level of foreign currency denominated debt. However, the results show that the effect of sudden stops on output does not seem to depend on trade openness and the level of foreign currency denominated debt as suggested by many empirical literatures.

Table 3.7 presents the results of output costs of banking crises. Output costs of banking crises are higher for a country with exchange rate overvaluation, a high short-term debt to GDP ratio, and high domestic credit growth prior to crises. The magnitude of output costs of banking crises significantly depends on short-term external debt. One percent increase in short-term external debt to GDP will increase output costs of banking crises by about one percent.

The results of the determinants of output costs of crises provide an important implication. The costs of crises depend not only on the factors triggering crises but also on other factors. In some cases, the latter can be a major factor contributing to output costs or severity of crises. Therefore it is important for policy-makers to understand not only what they are vulnerable to but also what influences the costs of crises.

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[9] Angkinand and Willett (2008) study the costs of banking crises and the role of domestic institutions and find that both too few and too many veto players are associated with higher output costs of banking crises. An absence or excessive number of any veto players can lead to policy volatility and inflexibility of policy responses respectively. Their findings underline the importance of political institutions in alleviating the severity of banking crises.

Changing Nature of Output Costs of Crises

Empirical results from the previous chapter show that nature of crises has changed across the decades of 1980s and 1990s. It is also likely that the determinants of output costs will be affected by the changing nature of crises. Therefore this section investigates the determinants of output costs of crises over the period 1990-2003 which will be compared with the results of the 1980s estimated earlier. The results show that the determinants of output costs of crises also have been different from the earlier period. Table 3.8 presents the determinants of output costs of currency crises over the period 1990-2003. A major difference between the two decades is that current account balances were no longer a significant determinant of output costs of currency crises in the 1990s. The magnitude of output costs positively and significantly depends on real exchange rate overvaluation and short-term external debt, with the latter having the strongest effect on the magnitude of output costs.

The results of output costs of sudden stops shown in Table 3.9 also suggest a distinct characteristic of output costs in the 1990s. In the 1980s, output costs of sudden stops were determined by real exchange rate overvaluation and institutional quality. However, in the 1990s, output costs were determined by fiscal balances and foreign currency denominated public debt in addition to real exchange rate overvaluation and executive constraints. These two fiscal variables have the strongest effect on the magnitude of output costs of sudden stops. An increase in the overall fiscal balance by one percent increases output costs by almost three percent in the case of output level losses. This suggests that fiscal tightening prior to sudden stops make sudden stops

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more costly. The finding is consistent with Razin and Sadka (2004) and Hutchison et al. (2007) who find that high budget balance or fiscal surplus might not help achieving growth target during crises and fiscal tightening at the time of sudden stops significantly worsens output losses. In addition to fiscal balance, the magnitude of output costs of sudden stops in the post-1990 period also significantly depended on the currency composition of public debt. A one percent increase in foreign currency public debt to total public debt increases the output growth losses and output level losses by 0.1915 and 0.1522 percent respectively. As mentioned earlier, the extent of output losses of sudden stops partly depends on level of foreign currency denominated public debt. While the results in the previous section do not show any evidence supporting this statement, the results for the 1990s show that the effect of sudden stops on output depends on a currency composition of public debt as suggested by many empirical literatures. The finding confirms that the balance sheet effects have become more important in causing severe crises in the recent period. The determinants of output costs of banking crises in the 1990s were not much different from the earlier period. Short-term external debt and domestic credit growth still were significant determinants of output losses. Real exchange rate overvaluation, however, was not a significant predictor of output costs of banking crises in the 1990s.

One thing worth mentioning is the role of trade openness in determining output costs of crises. On one hand, trade openness can be beneficial to economic growth through reducing the size of real exchange rate swings and facilitating the current account adjustment after a devaluation. Therefore, a country with more trade openness

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is likely to experience lower output costs. On the other hand, trade openness can be detrimental to a country through its exposure to external shocks. Even though the results show that trade openness is not a significant determinant of output costs in both 1980s and 1990s, its positive signs in the 1980s and negative signs in the 1990s suggest that the behavior of trade openness also has changed across the decades. The benefits of trade openness on economic growth tend to outweigh the vulnerability to external shocks in the recent period.

3.7 Conclusion

Crises are disruptive and costly in terms of output losses. Although some crises may result in output gains, it is rarely the case in emerging market economies. On average, the output costs of crises in emerging market economies are 10-17 percent of GDP. However, in the case of the Mexican crisis in 1982, the costs were as large as the size of GDP. Crises cannot easily be predicted. The changing nature of crises makes it more difficult to rely on EWS models to anticipate crises. Even so, knowing how to reduce their impacts can be more important and useful for policy-makers in order to design preventive and corrective policies.

Different types of crises are triggered by different factors and their effects on the economy are different. Output costs of crises depend not only on the factors triggering crises but also the factors that are not associated with the occurrence of crises. In some cases, the latter can be a major factor contributing to the severity of crises. Output costs of currency crises tend to be determined by external factors. The

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magnitude of output costs in the 1980s was most influenced by current account deficits while in the 1990s short-term external debt was a major factor determining the magnitude of output costs of currency crises. The determinants of output costs of banking crises in the 1990s were not much different from the previous period. Short-term external debt played the most important role in determining the magnitude of output costs in both decades. A significant changing nature of output costs of crises is found in sudden stops. Overall fiscal balance and foreign currency denominated public debt have been the important determinants of output costs of sudden stops from 1990 onward.

The findings provide an interesting conclusion regarding the characteristics of emerging market economies. As mentioned earlier, one important characteristic of emerging market economies is that they tend to rely heavily on foreign capital inflows that are typically short-term. Both currency and maturity compositions of inflows make them more vulnerable to solvency and liquidity problems. Even though the results from the previous chapter show that short-term external debt and foreign currency denominated public debt do not influence the probability of crises, it is the output costs of crises that these two variables significantly determine. The results show that this characteristic of emerging market economies makes their crises more costly. The findings are supported by Aziz et al. (2000) in which crises in emerging market economies tend to be more severe than crises in industrial countries. Moreover, short-term external debt is not only a significant determinant of output costs in both periods but also a determinant of the probability of currency and banking crises from the 1990s

onward. This also suggests that the balance sheet effects have become more disruptive these days.

Regarding policy implications, it is obvious that knowing both causes and costs of crises provides a more comprehensive picture of what a country is vulnerable to. Relying on long historical data may provide a misleading conclusion because of the changing nature of crises. In the post-1990 period, the severity of crises depends on the maturity and currency compositions of external debt rather than trade-related vulnerabilities as in the previous period. Therefore, emerging market economies should avoid accumulating foreign currency debt particularly short-term in order to reduce risks of crises. The fiscal sector may not consistently play an important role in the occurrence of crises, however, once crises have occurred, the costs of crises would depend significantly on the fiscal sector. This emphasizes the importance of sound government debt management and resolution policies in determining the depth of crises.

Table 3.1: Estimated Output Losses of Currency Crises

Country	Date of Crisis	Duration (years) [a]	Losses in Output Growth (%)	Losses in Output Level (%)
Argentina	1982	1	7.85	14.03
	1989	2	15.38	10.20
Brazil	1982	2	10.49	37.55
	1985	0	0.00	0.00
	1998	2	6.34	1.72
	2002	-	0.81	0.59
Chile	1982	2	28.49	28.07
	1985	0	0.00	0.00
	1999	-	15.54	12.60
China	1981	1	3.83	0.00
	1986	3	7.90	0.00
	1989	3	14.6	1.52
	1992	0	0.00	0.00
	1994	-	30.80	0.00
Colombia	1983	1	0.85	9.91
	1995	-	23.25	0.00
Hungary	1990	4	25.33	19.85
India	1990	4	10.57	0.00
Indonesia	1983	0	0.00	0.28
	1986	3	1.48	0.12
	1997	-	44.81	29.85
Israel	1983	3	5.97	2.88
	1988	2	7.39	1.13
Korea	1983	0	0.00	0.00
	1986	0	0.00	0.00
	1997	2	18.67	11.38
Malaysia	1982	3	3.78	7.48
	1985	3	14.53	7.19
	1992	1	0.32	0.00
	1994	1	0.23	0.00
	1997	-	43.11	15.20
Mexico	1982	3	28.92	92.70
	1985	2	3.35	26.60
	1990	0	0.00	0.00
	1994	2	9.49	3.72
Philippines	1983	4	25.59	43.42
	1990	6	20.56	0.00
Poland [b]	1989	n/a	n/a	n/a
Russia	1998	1	3.19	0.00
Thailand	1980	7	21.58	33.32
	1997	-	44.35	32.09
Turkey	1981	0	0.00	1.03
	1983	0	0.00	0.00
	1991	1	2.95	0.32
	1994	1	10.44	4.12
	2001	1	9.41	7.92
Venezuela	1984	0	0.00	3.77
	1986	0	0.00	0.00
	1989	1	13.87	4.16
	1994	3	14.66	11.73
	2002	-	17.35	16.23
Average		**1.8**	**11.36**	**9.85**

[a] Duration of crises is when output growth returned to its trend. (-) indicates that at the end of sample period, a crisis has not yet returned to its trend.
[b] Data on GDP is not available.

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Table 3.2: Estimated Output Losses of Sudden Stops

Country	Date of Crisis	Duration (years) [a]	Losses in Output Growth (%)	Losses in Output Level (%)
Argentina	1989	2	15.38	10.20
	2001	2	15.09	21.79
Brazil	1983	1	5.16	19.67
	2002	0	0.00	0.59
Chile	1982	1	17.51	28.07
	1983	1	4.64	8.84
	1991	0	0.00	0.00
	1998	-	32.86	11.96
Czech Republic	1996	0	0.00	0.00
	1997	6	16.53	0.00
	2003	0	0.00	0.00
Hungary	1990	4	25.33	19.85
	1994	0	0.00	1.79
	1996	0	0.00	0.00
Indonesia	1997	-	44.81	29.85
Israel	1983	3	5.97	2.88
	1988	2	7.39	1.13
	1998	2	4.41	2.47
Korea	1997	2	18.67	11.38
Malaysia	1987	0	0.00	0.00
	1994	1	0.23	0.00
	1997	1	2.36	15.02
	1998	-	36.52	17.04
Mexico	1982	13	95.80	92.70
	1995	1	9.56	3.66
Philippines	1983	4	25.59	43.42
	1997	0	0.00	0.00
	1998	-	11.50	0.00
Poland [b]	1981	n/a	n/a	n/a
	1994	0	0.00	0.00
Thailand	1997	-	44.35	32.08
Turkey	1994	1	10.44	4.12
	2001	1	9.41	7.92
Venezuela	1980	6	27.75	58.01
	1994	3	7.70	11.73
Average		**2.0**	**14.56**	**13.42**

[a] Duration of crises is when output growth returned to its trend. (-) indicates that at the end of sample period, a crisis has not yet returned to its trend.

[b] Data on GDP is not available.

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Table 3.3: Estimated Output Losses of Banking Crises

Country	Date of Crisis	Duration (years) [a]	Losses in Output Growth (%)	Losses in Output Level (%)
Argentina	1980	6	33.30	14.70
	1989	2	15.38	10.20
	1995	2	13.11	0.00
	2001	2	15.09	21.79
Brazil	1990	3	10.03	12.11
	1994	0	0.00	0.00
Chile	1981	8	39.56	35.65
China	1998	-	9.20	0.00
Colombia	1982	4	6.68	21.58
Czech Republic [b]	1991	n/a	n/a	n/a
Hungary	1991	2	13.07	15.79
India	1993	0	0.00	0.00
Indonesia	1994	1	0.26	0.00
	1997	-	44.81	29.85
Israel	1980	0	0.00	0.00
Korea	1997	2	18.67	11.38
Malaysia	1985	3	14.53	7.19
	1997	-	42.66	15.20
Mexico	1981	13	92.28	85.54
	1994	2	9.49	3.72
Philippines	1981	7	35.23	59.97
	1998	2	7.65	0.00
Poland	1991	n/a	n/a	n/a
Russia	1995	0	0.00	9.62
	1998	1	3.19	0.00
Thailand	1983	0	0.00	2.02
	1997	-	44.35	32.09
Turkey	1982	0	0.00	0.00
	1994	1	10.44	4.12
	2000	2	9.47	6.71
Venezuela	1980	6	27.75	58.01
	1994	3	14.66	11.73
Average		**2.8**	**17.70**	**15.63**

[a] Duration of crises is when output growth returned to its trend. (-) indicates that at the end of sample period, a crisis has not yet returned to its trend.

[b] Data on GDP is not available.

Table 3.4: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Currency crisis					
Losses in output growth	50	15.02494	25.75548	0	171.32
Losses in output level	50	9.853432	16.61215	0	92.69862
Overall balance$_{(t-1)}$	45	-2.433096	3.115434	-13.51099	2.91403
Foreign currency denominated					
public debt$_{(t-1)}$	48	46.98213	30.53502	.0001508	100
Short-term external debt$_{(t-1)}$	43	8.339053	6.088071	1.457484	30.49261
Current account balance$_{(t-1)}$	48	-3.62211	4.001356	-14.49845	5.742569
Real exchange rate	47	89.97286	294.7485	-181.9028	1924.408
overvaluation$_{(t-1)}$	47	4.471888	12.3118	-24.6181	46.99554
Domestic credit growth$_{(t-1)}$	49	49.22555	31.20842	14.29298	157.9414
Trade openness$_{(t-1)}$	49	4.387755	2.148801	1	7
Constraint on executive$_{(t-1)}$					
Sudden stop	34	17.97779	30.50388	0	171.32
Losses in output growth	34	13.42241	19.77773	0	92.69862
Losses in output level	31	-1.820345	3.380145	-10.48326	2.91403
Overall balance$_{(t-1)}$					
Foreign currency denominated	31	45.9906	29.82707	.0102031	100
public debt$_{(t-1)}$	29	190.3882	262.757	25.50996	1275.686
Short-term external debt$_{(t-1)}$	33	-5.165369	3.159892	-14.49845	-.7532831
Current account balance$_{(t-1)}$	33	67.5384	335.6901	-42.27343	1924.408
Real exchange rate	33	4.221185	15.87417	-24.6181	72.53264
overvaluation$_{(t-1)}$	33	66.79902	35.64033	15.74346	179.9059
Domestic credit growth$_{(t-1)}$	33	5.484848	1.970425	1	7
Trade openness$_{(t-1)}$					
Constraint on executive$_{(t-1)}$					
	30	19.87535	29.74734	0	157.6849
Banking crisis	30	15.63224	20.77632	0	85.53683
Losses in output growth	27	-1.52029	3.281298	-11.4122	5.486739
Losses in output level					
Overall balance$_{(t-1)}$	26	54.20582	35.17618	.0001793	100
Foreign currency denominated	26	8.986847	5.942656	1.457484	26.262
public debt$_{(t-1)}$	27	-2.268343	2.91808	-8.086056	3.880008
Short-term external debt$_{(t-1)}$	27	109.9182	388.3326	-38.6349	1924.408
Current account balance$_{(t-1)}$	24	5.806508	13.87317	-24.6181	37.97872
Real exchange rate	27	50.10234	33.29823	13.24375	157.9414
overvaluation$_{(t-1)}$	27	4.62963	2.096667	1	7
Domestic credit growth$_{(t-1)}$					
Trade openness$_{(t-1)}$					
Constraint on executive$_{(t-1)}$					

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Table 3.5: The Output Costs of Currency Crises
Dependent Variables: Output growth loss and output level loss of currency crises during the period 1980-2003

	Output Growth Losses			Output Level Losses		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	1.0852 (0.761)	1.8205 (0.646)	-0.2828 (0.956)	-7.6617 (0.226)	-10.7021 (0.209)	-3.1654 (0.751)
Current Account to GDP$_{t-1}$	-1.1609*** (0.008)	-1.1448*** (0.009)	-1.1634** (0.011)	-1.4271** (0.019)	-1.4934** (0.027)	-1.5037** (0.023)
Real Exchange Rate Overvaluation$_{t-1}$	0.0134*** (0.000)	0.0130*** (0.000)	0.0078 (0.113)	0.0040 (0.377)	0.0057 (0.232)	0.0077* (0.054)
Openness$_{t-1}$	0.0566 (0.316)	0.0559 (0.334)	0.0637 (0.259)	0.1298 (0.352)	0.1327 (0.336)	0.1452 (0.303)
Executive Constraint$_{t-1}$	-0.1223*** (0.001)	-0.1185*** (0.002)	-0.6456 (0.389)	-0.0884 (0.114)	-0.1043** (0.036)	-1.4795 (0.123)
Short-term Debt to GDP$_{t-1}$	0.6730** (0.023)	0.6556** (0.024)	0.5650** (0.043)	0.8446*** (0.000)	0.9165*** (0.000)	1.0503*** (0.000)
Domestic Credit Growth$_{t-1}$	-0.4756*** (0.004)	-0.4510*** (0.009)	-0.5520*** (0.006)	-0.0587 (0.672)	-0.1613 (0.275)	-0.2777* (0.059)
Overall Balance$_{t-1}$		0.2202 (0.617)	0.2751 (0.532)		-0.9197 (0.338)	-1.1481 (0.263)
Foreign Currency Denominated Public Debt to Total Public Debt$_{t-1}$			0.1180** (0.030)			-0.0730 (0.417)
No. of Observations	41	41	40	41	41	40
Chi-square (F-stat)	15.35	13.12	5.97	11.99	11.07	16.02
Prob > Chi-square (Prob > F)	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
R-squared	0.4641	0.4662	0.5109	0.3388	0.3601	0.3894

*, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively. The numbers in parentheses are p-values.
The coefficients are estimated using OLS estimation with robust standard error.

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Table 3.6: The Output Costs of Sudden Stops
Dependent Variables: Output growth loss and output level loss of sudden stops during the period 1980-2003

	Output Growth Losses			Output Level Losses		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.5352 (0.956)	0.1863 (0.987)	-18.4218 (0.243)	-0.8154 (0.926)	-1.1383 (0.916)	1.4321 (0.925)
Current Account to GDP$_{t-1}$	-1.4628 (0.326)	-1.4674 (0.331)	-2.0964 (0.250)	-2.3519* (0.097)	-2.3498 (0.104)	-2.3375 (0.176)
Real Exchange Rate Overvaluation$_{t-1}$	0.0180*** (0.000)	0.0173*** (0.000)	0.0182*** (0.004)	0.0104*** (0.000)	0.0107*** (0.001)	0.0051 (0.319)
Openness$_{t-1}$	0.0809 (0.541)	0.0812 (0.560)	0.0687 (0.606)	-0.0306 (0.809)	-0.0307 (0.810)	0.0159 (0.902)
Executive Constraint$_{t-1}$	-0.1823*** (0.001)	-0.1770*** (0.004)	1.9554 (0.296)	-0.1862*** (0.000)	-0.1886*** (0.000)	-1.8110 (0.305)
Short-term Debt to GDP$_{t-1}$	0.1130 (0.849)	0.1133 (0.846)	0.0648 (0.913)	0.2946 (0.611)	0.2945 (0.624)	0.1850 (0.746)
Domestic Credit Growth$_{t-1}$	0.0682 (0.780)	0.0765 (0.759)	0.1395 (0.618)	-0.0388 (0.838)	-0.0425 (0.826)	-0.1552 (0.470)
Overall Balance$_{t-1}$		0.4252 (0.770)	0.3857 (0.807)		-0.1903 (0.890)	-0.3656 (0.802)
Foreign Currency Denominated Public Debt to Total Public Debt$_{t-1}$			0.1152 (0.144)			0.1132 (0.132)
No. of Observations	29	29	27	29	29	27
Chi-square (F-stat)	58.32	46.63	28.35	14.77	12.25	11.73
Prob > Chi-square (Prob > F)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R-squared	0.1923	0.1970	0.2247	0.2048	0.2059	0.2537

*, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively. The numbers in parentheses are p-values.
The coefficients are estimated using OLS estimation with robust standard error.

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Table 3.7: The Output Costs of Banking Crises

Dependent Variables: Output growth loss and output level loss of banking crises during the period 1980-2003

	Output Growth Losses			Output Level Losses		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-3.9499 (0.459)	-0.8221 (0.900)	-2.3233 (0.654)	-3.2190 (0.454)	-6.2818 (0.204)	-6.3314 (0.232)
Current Account to GDP$_{t-1}$	1.1801 (0.142)	1.1610 (0.128)	1.2575* (0.097)	0.2135 (0.756)	0.2321 (0.743)	-0.1004 (0.884)
Real Exchange Rate Overvaluation$_{t-1}$	0.0113* (0.063)	0.0106* (0.089)	0.0086 (0.240)	0.0086** (0.022)	0.0093** (0.021)	0.0068 (0.188)
Openness$_{t-1}$	-0.0229 (0.461)	-0.0217 (0.532)	-0.0103 (0.763)	-0.0624 (0.173)	-0.0635 (0.192)	-0.0697 (0.222)
Executive Constraint$_{t-1}$	1.5003 (0.193)	1.3303 (0.251)	1.2901 (0.346)	1.4183 (0.143)	1.5848 (0.149)	1.0626 (0.368)
Short-term Debt to GDP$_{t-1}$	1.6440*** (0.008)	1.4858** (0.019)	1.3552** (0.018)	1.0068** (0.020)	1.1617** (0.011)	1.0761** (0.025)
Domestic Credit Growth$_{t-1}$	-0.4698*** (0.003)	-0.4589*** (0.003)	-0.3945** (0.025)	-0.1521 (0.146)	-0.1628* (0.096)	-0.1138 (0.379)
Overall Balance$_{t-1}$		0.5686 (0.377)	0.9740 (0.237)		-0.5568 (0.385)	-0.3908 (0.599)
Foreign Currency Denominated Public Debt to Total Public Debt$_{t-1}$			0.0571 (0.482)			0.0515 (0.501)
No. of Observations	23	23	22	23	23	22
Chi-square (F-stat)	7.51	5.50	9.70	4.60	5.51	4.27
Prob > Chi-square (Prob > F)	0.0006	0.0028	0.0002	0.0067	0.0027	0.0103
R-squared	0.7015	0.7133	0.7250	0.5310	0.5528	0.5962

*, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively. The numbers in parentheses are p-values.
The coefficients are estimated using OLS estimation with robust standard error.

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Table 3.8: The Output Costs of Currency Crises
Dependent Variables: Output growth loss and output level loss of currency crises during the period 1990-2003

	Output Growth Losses			Output Level Losses		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	3.7270 (0.471)	-1.2218 (0.919)	-13.8871 (0.430)	-2.6702 (0.232)	-5.1017 (0.289)	-9.1389 (0.292)
Current Account to GDP$_{t-1}$	0.5184 (0.626)	0.2449 (0.811)	0.7167 (0.604)	0.8674 (0.217)	0.7330 (0.219)	0.9083 (0.200)
Real Exchange Rate Overvaluation$_{t-1}$	0.0128*** (0.000)	0.0136*** (0.001)	0.0041 (0.572)	0.0081*** (0.000)	0.0085*** (0.000)	0.0065** (0.016)
Openness$_{t-1}$	-0.0024 (0.966)	-0.0006 (0.992)	0.0162 (0.697)	-0.0071 (0.744)	-0.0062 (0.778)	-0.0008 (0.974)
Executive Constraint$_{t-1}$	-0.0611 (0.166)	-0.0649 (0.136)	2.2169 (0.345)	-0.0950*** (0.001)	-0.0969*** (0.000)	0.6897 (0.728)
Short-term Debt to GDP$_{t-1}$	1.5416** (0.015)	1.8054** (0.046)	0.4929 (0.455)	1.4698*** (0.000)	1.5994*** (0.003)	1.2499* (0.079)
Domestic Credit Growth$_{t-1}$	-0.4891 (0.296)	-0.5540 (0.313)	-0.2143 (0.584)	-0.0363 (0.787)	-0.0682 (0.649)	0.0262 (0.909)
Overall Balance$_{t-1}$		-1.1845 (0.548)	1.7608 (0.258)		-0.5820 (0.537)	0.2025 (0.885)
Foreign Currency Denominated Public Debt to Total Public Debt$_{t-1}$			0.3872*** (0.000)			0.0972 (0.336)
No. of Observations	22	22	21	22	22	21
Chi-square (F-stat)	12.30	13.06	41.06	67.57	75.41	63.14
Prob > Chi-square (Prob > F)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R-squared	0.5263	0.5382	0.7400	0.7852	0.7919	0.8048

*, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively. The numbers in parentheses are p-values.
The coefficients are estimated using OLS estimation with robust standard error.

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Table 3.9: The Output Costs of Sudden Stops
Dependent Variables: Output growth loss and output level loss of sudden stops during the period 1990-2003

	Output Growth Losses			Output Level Losses		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	9.5039 (0.235)	6.2887 (0.419)	-12.7107 (0.532)	9.3599 (0.362)	3.8698 (0.652)	-24.9940 (0.369)
Current Account to GDP$_{t-1}$	0.1972 (0.847)	-1.1834 (0.447)	-1.4244 (0.184)	0.3088 (0.842)	-2.0486 (0.279)	-2.1773 (0.179)
Real Exchange Rate Overvaluation$_{t-1}$	0.0106*** (0.000)	0.0099*** (0.000)	0.0076 (0.219)	0.0159*** (0.000)	0.0146*** (0.000)	0.0180* (0.065)
Openness$_{t-1}$	-0.0817 (0.202)	-0.0815 (0.172)	-0.0528 (0.369)	-0.0364 (0.550)	-0.0361 (0.528)	-0.0120 (0.827)
Executive Constraint$_{t-1}$	-0.1444*** (0.000)	-0.1672*** (0.001)	1.0608 (0.729)	-0.1739*** (0.002)	-0.2128*** (0.001)	3.2360 (0.438)
Short-term Debt to GDP$_{t-1}$	0.3808 (0.434)	0.3104 (0.266)	0.2952 (0.104)	0.4679 (0.454)	0.3476 (0.227)	0.2524 (0.325)
Domestic Credit Growth$_{t-1}$	-0.0029 (0.988)	-0.2621 (0.243)	-0.2178 (0.321)	0.5579 (0.142)	0.1154 (0.763)	0.1196 (0.795)
Overall Balance$_{t-1}$		1.7234 (0.127)	1.4554* (0.054)		2.9427** (0.028)	2.9108** (0.013)
Foreign Currency Denominated Public Debt to Total Public Debt$_{t-1}$			0.1915** (0.017)			0.1522* (0.074)
No. of Observations	22	22	20	22	22	20
Chi-square (F-stat)	55.47	83.46	71.72	60.01	59.96	75.68
Prob > Chi-square (Prob > F)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R-squared	0.4118	0.5492	0.7093	0.4342	0.6230	0.6790

*, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively. The numbers in parentheses are p-values.
The coefficients are estimated using OLS estimation with robust standard error.

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Table 3.10: The Output Costs of Banking Crises

Dependent Variables: Output growth loss and output level loss of banking crises during the period 1990-2003

Dependent Variable	Output Growth Losses			Output Level Losses		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.4590 (0.977)	5.6769 (0.788)	-4.2429 (0.904)	-5.4407 (0.624)	-13.6188 (0.916)	-19.5457 (0.455)
Current Account to GDP$_{t-1}$	1.1998 (0.378)	1.0457 (0.413)	1.6733 (0.440)	1.0926 (0.110)	1.3343 (0.111)	1.3814 (0.291)
Real Exchange Rate Overvaluation$_{t-1}$	0.0091 (0.266)	0.0075 (0.425)	0.0087 (0.468)	0.0087 (0.157)	0.0112 (0.103)	0.0106 (0.209)
Openness$_{t-1}$	-0.0430 (0.490)	-0.0466 (0.477)	-0.0100 (0.933)	-0.0437 (0.416)	-0.0380 (0.533)	-0.0213 (0.840)
Executive Constraint$_{t-1}$	0.8566 (0.775)	0.2906 (0.935)	1.7121 (0.774)	1.6109 (0.480)	2.4980 (0.343)	3.0408 (0.469)
Short-term Debt to GDP$_{t-1}$	1.7651** (0.028)	1.5988** (0.042)	1.4060 (0.151)	1.2223** (0.024)	1.4830** (0.015)	1.2761* (0.060)
Domestic Credit Growth$_{t-1}$	-0.4879** (0.020)	-0.4628** (0.024)	-0.4320* (0.066)	-0.2137 (0.124)	-0.2530* (0.069)	-0.1970 (0.169)
Overall Balance$_{t-1}$		0.6171 (0.526)	1.0089 (0.393)		-0.9672 (0.271)	-0.6287 (0.444)
Foreign Currency Denominated Public Debt to Total Public Debt$_{t-1}$			0.0721 (0.576)			0.0745 (0.546)
No. of Observations	18	18	17	18	18	17
Chi-square (F-stat)	6.87	4.41	3.18	3.78	4.21	4.77
Prob > Chi-square (Prob > F)	0.0031	0.0175	0.0612	0.0272	0.0204	0.0202
R-squared	0.6908	0.7007	0.7059	0.5682	0.6167	0.6397

*, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively. The numbers in parentheses are p-values. The coefficients are estimated using OLS estimation with robust standard error.

Appendix Table A3.1: Empirical Studies on the Determinants of Output Costs of Crises

Study	Measures of Output Costs	Sample	Variables	Findings
1. Currency Crises				
Hutchison and Noy (2002)	Real GDP growth rate.	24 emerging market economies; 1975-1997.	Change in budget surplus to real GDP, credit growth, real GDP growth, external growth rate, real exchange rate overvaluation, openness, major currency crisis onset dummy.	Currency crises in emerging market economies, on average, are contractionary. Currency crises reduce GDP growth by about 5-8 percent over a two year period. Real exchange rate overvaluation is an important factor slowing output growth.
Milesi-Ferretti and Razin (1999).	Average GDP growth three year following a currency crisis (as deviation from OECD growth)	105 low and middle income countries; 1970-1996.	Average growth, current account balance, real exchange rate overvaluation, change in terms of trade, trade openness, investment, GDP per capita, the ratio of external debt to GDP, official transfer, and U.S. real interest rates.	Growth tends to decline the year of the crisis. Countries with more trade openness appear to grow faster after a currency crisis. Real exchange rate overvaluation is not a good predictor of economic performance despite playing an important role in explaining the probability of currency crises.
Gupta, Mishra, and Sahay (2003).	The sum of the difference between the average growth rate pre-crisis (3 years before a crisis) and post-crisis (2 years after a crisis) years.	91 developing countries; 1970-1998.	Capital flow, capital account control, change in external long-term debt burden, the ratio of external debt to reserves, banking crisis dummy, exchange rate overvaluation, export growth rate, trade openness, devaluation by other countries, loss in reserves, GDP, business cycle condition dummy, per capita income, U.S. real interest rate, growth rate in industrial countries, growth rate in G-7 countries, change in crude oil price, change in M2, change in real interest rate between the crisis and pre-crisis year, fiscal balance, change in fiscal balance.	Currency crises have not been contractionary in the 1990s than in the previous period. Output contraction is greater in large and more developed countries than in small and less developed countries. Countries that trade less with the rest of the world, relatively open capital account, and were preceded by large capital inflows are more likely to be associated contraction during crises. The contraction is more severe if trade competitors devalued, oil prices rise, and governments adopt tight monetary policy and expansionary fiscal policy following the crisis.

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Appendix Table A3.1: (cont.)

Study	Measures of Output Costs	Sample	Variables	Findings
2. Banking Crises				
Hoggart, Reis, and Saporta (2002)	The cumulative of the difference between the average of three-year pre-crisis growth trend and actual GDP growth during the crisis period and the cumulative of the difference between the ten-year pre-crisis period level trend and actual GDP level.	47 countries; 1977-1998.	High income country experienced a banking crisis dummy, low income country experienced a currency crisis dummy, change in the annual average of growth in real GDP in the two years before the crisis period, annual average real GDP growth in the two years before the crisis period, annual average consumption price inflation, annual average growth in credit relative to GDP, annual average fiscal balance relative to GDP.	Banking crises in high-income countries, currency crises in low-income countries, and change in the annual average of growth in real GDP in the two years before the crisis period contribute to the difference in output losses in their sample.
Angkinand (2005)	The sum of the difference between the GDP growth rate trend and actual GDP during the crisis period and the sum of the difference between the GDP level trend and the actual GDP level over the crisis period.	49 emerging market and industrial countries; 1975-2002.	Real GDP per capita, real GDP growth rate, current account balance, domestic credit growth, M2/reserves, inflation, explicit insurance, twin crisis dummy, institutional variables.	Real GDP growth rate, inflation, explicit deposit insurance, twin crisis dummy and institutional variables such as rule of law, corruption, and bureaucratic quality are found to be significant determinants of output costs of banking crises. Deposit insurance substantially reduces the magnitude of output losses by preventing bank runs once crises occur.
Honohan and Klingebiel (2003)	The cumulative deviation of output growth from its averaged three-year pre-crisis growth trend during crisis period until the actual GDP growth reached its trend.	34 developing and developed countries; 1970-2000.	Real interest rate, stock prices, liquidity support, forbearance type A and type B, government guarantee, recapitalization, public debt relief for borrowers.	Liquidity support is the only crisis management policy that is found to be associated with higher output costs. Macroeconomic variables such as real interest rate, stock prices are found to be significant determinants of output costs of banking crises.

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Appendix Table A3.1: (cont.)

Study	Measures of Output Costs	Sample	Variables	Findings
Banking Crises (cont.)				
Boyd, Kwak, and Smith (2004)	Discounted present value of total loss where total loss is the difference between trend GDP per capita growth and actual GDP per capita growth. The GDP trend is the average of growth rate.	23 countries; 1976-1998.	Systemic crisis dummy, bailout costs, the size of banking sector, liquidity support, recapitalization, forbearance.	Fiscal costs and output costs of banking crises are positively correlated and are influenced by some of the same crisis management policy variables, namely liquidity support and recapitalization.
Claessens, Klingebiel, and Laeven (2004)	The sum of the differences between the actual growth and the average of three-year pre-crisis growth trend.	40 emerging market and developed countries; 1977-2003.	Liquidity support, forbearance, explicit and implicit government guarantee, recapitalization, quality of institutions, corruption, judicial efficiency, credit growth.	Output losses are not reduced by excessive fiscal costs. Accommodating policies resulting in high fiscal costs slow down economic recovery. A better institution framework not only lowers fiscal costs of crisis resolution but also reduces the economic costs of banking crises.
3. currency Crises and Banking Crises				
Hutchison and Noy (2005)	Real GDP growth rate.	24 emerging market economies; 1975-1997.	Real GDP growth, change in budget balance to real GDP, credit growth, external growth rates, real exchange rate overvaluation, trade openness, currency crisis dummy, onset of banking crisis dummy, twin crisis dummy.	Both currency and banking crises are very costly and associated with output growth declines of about 5-8 percent and 8-10 percent respectively over 2-4 year period. Twin crises do not appear contribute additional negative impact on output growth beyond the combined effect of currency and banking crises.
Bordo, Eichengreen, Klingebiel, Martinez-Peria (2001)	The cumulative of the difference between the average of five-year pre-crisis growth trend and the actual GDP growth.	56 developed and developing countries; 1880-1997.	M2 to reserves, current account balance, fiscal balance, inflation, GDP per capita, capital controls, twin crisis dummy, liquidity support, capital support, government guarantee, pegged exchange rate regime, financial intermediation index.	Determinants of output costs have changed across periods. In the period of 1973-1997, output cost of currency crises is influenced by current balance deficit. Currency crises are more costly when they are accompanied by banking-sector problems. Liquidity support and pegged exchange rate regime are found to be the most important determinants of output costs of banking crises.

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Appendix Table A3.1: (cont.)

Study	Measures of Output Costs	Sample	Variables	Findings
4. Sudden Stops				
Hutchison, Noy, and Wang (2007)	The sum of the difference between the actual growth rate and the growth trend which is the average of three-year pre-crisis GDP growth rate.	77 non-OECD countries; 1982-2003.	Policy tightening dummy, policy loosening dummy, foreign liabilities, trade openness, inflation, banking crisis dummy, capital account liberalization index, de-facto exchange rate regime.	Monetary and fiscal tightening at the time of sudden stops significantly worsens output losses.
Edwards (2004)	Real GDP growth	157 countries; 1970-2001.	Growth gap, change in terms of trade, current account reversals, trade openness, financial openness, current account balance, external debt to GDP, international reserves, short-term external debt to external debt, incidence of reversals in region, domestic credit growth.	Current account reversals have a negative effect on real GDP growth. This negative effect depends on the degree of trade openness. A country with more trade openness is less likely to experience lower growth relative to trend. On the other hand, the degree of financial openness does not appear to be related to the intensity with which reversals affect real economic performance.
Bordo, Cavallo, and Meissner (2007)	Real GDP per capita growth	20 emerging market economies; 1880-1913.	Current account balance, trade openness, gold coverage ratio, hard currency debt to total debt, hard currency debt to GDP, total debt to GDP, real GDP per capita, money growth, UK consol rate.	Sudden stops and inflation have a strong negative effect on real GDP, while investment and trade openness have a positive effect on real GDP. The impact of sudden stops on growth is larger when sudden stops are accompanied by banking crises. Population growth is also found to be negatively associated with real GDP growth.

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CHAPTER FOUR

Fiscal Costs of Banking Crises and Crisis Management Policies

4.1 Introduction

In the last few decades, many emerging market countries have experienced banking crises which caused disruption to financial institutions' operation and imposed substantial costs on the economy. Banking crises tend to result in higher output costs than those for other types of crises. The empirical results from the previous chapter estimated that, on average, output costs of recent banking crises, currency crises, and sudden stops are 15.63, 9.85, and 13.42 percent respectively. It is not evident that output costs of banking crises have become larger than those in the past. In fact, Bordo et al. (2001) show that the average GDP loss of banking crises during 1973-1997 is smaller than that in the earlier periods. However, there is evidence that a number of banking crisis episodes have significantly increased, especially in the last decade. Since 1980, there have been 163 episodes of banking crises in which 106 episodes occurred in the 1990s and the early 2000s[10].

Banking crises can impose not only output costs but also fiscal costs on the economy. The latter arise from using public funds in the resolution of the financial system difficulty. Fiscal costs can be as small as less than one percent of GDP in the case of nonsystemic or small banking crises. However, in the case of systemic or more

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[10] Statistics on banking crisis episodes are based on Caprio and Klingebiel (2003)

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severe banking crises, fiscal costs can be very expensive and in some cases have accounted for more than 50 percent of GDP.

The existing literature on fiscal costs focuses on the role of crisis management policies in determining the size of fiscal costs. Their findings favor using strict rather than accommodating policies to resolve crises. Honahan and Klingebiel (2003), IMF (2003), and Claessens et al. (2004) find no evidence that accommodating policies such as explicit and implicit guarantees, liquidity support, and forbearance adopted by government during crises reduce fiscal costs. In fact, these policies, especially liquidity support, tend to be associated with higher fiscal costs.

Crisis management policies are established with the purpose of restoring investor and depositor's confidence in the financial system and facilitating the economic recovery. However, these policies often result in moral hazard incentives, thus encouraging banks and financial institutions to engage in excessive risk taking activities. Furthermore, allowing insolvent banks and financial institutions to continue their operation facilitates the financing to loss-making borrowers and allow banks' owners to engage in looting (Akerlof and Romer, 1993). As a result, these resolution policies can lead to an increase in the severity and fiscal costs of banking crises rather than reducing them. There has been a question whether incurring fiscal costs help reduce the adverse effect of banking crises on the economy, in other word whether there is a trade-off between fiscal costs and output costs. However, empirical results by Honahan and Klingebiel (2003) and Claessens et al. (2004) show that such a trade-off rarely exists. They find that output costs are not reduced by higher fiscal costs. In fact,

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accommodating policy, namely liquidity support appears to increase both fiscal costs and output costs of banking crises. However, some studies such as Hoggart et al. (2005) investigate the effect of explicit deposit insurance schemes which is *ex ante* crisis management policy on fiscal costs and output costs and find weak evidence that explicit deposit insurance generates a trade-off between fiscal costs and output costs.

The purpose of this chapter is to investigate the effectiveness of crisis management policies on fiscal costs and output costs of banking crises in emerging market economies. The analysis uses cross-sectional data for 24 banking crisis episodes[11] in 19 emerging market economies during the period of 1980-2003. Unlike other studies, this dissertation finds that some crisis management policies are in fact successful in reducing fiscal costs of banking crises in emerging market economies. Implicit government guarantees and forbearance are associated with lower fiscal costs, while liquidity support tends to increase fiscal costs substantially. Moreover, this dissertation finds that crisis management policy that is likely to decrease fiscal costs tends to decrease output costs as well. The results on crisis management policy choice in which not all accommodating policies contribute to higher fiscal costs are in contrast with other empirical studies. This is because this dissertation focuses on emerging market economies which tend to have different characteristics than developed countries, and therefore the effectiveness of these resolution policies tends to be different. Furthermore, this dissertation takes account of different initial macroeconomic and financial sector conditions. This dissertation finds that the

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[11] A number of banking crisis episodes is based on the availability of data on crisis management policy.

magnitude of fiscal costs is significantly affected by real exchange rate appreciation. The results underline the importance of initial conditions when considering the effectiveness of crisis management policies.

This chapter proceeds as follows. Section 4.2 discusses the nature of fiscal costs of banking crises. Section 4.3 reviews the literature on the determinants of fiscal costs. Section 4.4 presents empirical methodology and data used in this chapter. Section 4.5 reports the empirical results of the determinants of fiscal costs and discusses the effect of crisis management policies on fiscal costs and output costs. Section 4.6 concludes the chapter and discusses policy implications

4.2 Fiscal Costs of Banking Crises: Overview

Banking crises are different from other types of crises because they incur not only output losses but also fiscal costs of bailing out a financial system. Fiscal costs or resolution costs reflect fiscal outlays involving in financial system restructuring, recapitalization and bailout costs made to depositors and creditors due to government's implicit or explicit guarantees. A government incurs fiscal costs with the aim of restoring investor's confidence in a financial system to minimize the effect of crises on the economy and allowing financial institutions to function during rehabilitation and restructuring phase. However, these fiscal costs can bring about deadweight losses through increasing taxation due to a transfer of financial sector's liabilities to the public sector.

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Data on fiscal costs is difficult to obtain because there is no common way to estimate the costs. According to Honohan and Klingebiel (2003), estimates of fiscal costs are typically based on some of the following criteria. First, defaults on liquidity loans by the monetary authority to an insolvent bank. Second, a cost of bond or equity used to purchase loan portfolio of an insolvent bank in order to restore its capital. Third, capitalized value of subsidized lending to an insolvent bank or to its borrowers. Fourth, a cost of payment to depositors and other claimants including foreign creditors. It is noteworthy that fiscal costs do not include costs borne by depositors and borrowers in the form of wider interest rate spreads which is a result of banks trying to compensate for bad loans that were left on their balance sheets. Furthermore, fiscal costs do not include costs arising from indirect methods of bailing out banks. An example of this type of cost is granting borrowers some monopoly privilege by a government or other means to improve their profits, and thus repay their loans[12].

Table 4.1 presents estimates of fiscal costs of selected banking crises since the late 1970s reported by Caprio and Klingebiel (2003). The average fiscal cost of banking crises is 15.7 percent of GDP. However, some crises, for example Argentina in 1980 and Indonesia in 1997, have resulted in fiscal costs of more than 50 percent of GDP. Honohan and Klingebiel (2003) estimate the cumulative fiscal costs of developing countries as a group and conclude that these countries have endured fiscal costs of over US $ one trillion. These costs will directly affect their fiscal budgets and ultimately taxpayers.

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[12] The exclusion of fiscal costs are from Honohan and Klingebiel (2003) and Caprio and Klingebiel (2003).

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Fiscal costs tend to be higher in emerging market economies than in developed countries. On average, fiscal costs in emerging market economies and developed countries are 18.6 and 12.8 percent of GDP respectively. One plausible explanation of higher fiscal costs in emerging market economies is that the banking system is relatively more important in emerging market economies than in developed countries. According to the data on composition of finance provided by Eichengreen and Luengnaruemitchai (2004), the share of domestic credit provided by the banking sector relative to other sources of finance is higher in emerging market economies (50.74 percent of total) than in developed countries (45.92 percent of total). Furthermore, within emerging market economies, Asian countries which tend to rely more on banks also incur higher fiscal costs than the rest of emerging market economies. The average fiscal costs for the Asian crisis are 20.51 percent of GDP compared with 20.07 and 12.78 percent of GDP for Latin America and other emerging market economies respectively. In addition to the importance of a banking system, Hoggart et al. (2002) suggest that the difference of fiscal costs between emerging markets and developed countries may be a result of higher non-performing loans and lower quality of banking regulatory systems in emerging markets than developed countries.

A significant part of the costs of banking crises cannot be explained by macroeconomic indicators. This is because the costs of banking crises, especially fiscal costs, are greatly influenced by how governments respond to the crises, i.e. crisis management or resolution policies. Resolution policies are adopted with the purpose of reducing the adverse effects of banking crises on the economy or preventing a bank run

from becoming a systemic banking crisis. However, poor resolution policies can lead to an increase in the severity of banking crises rather than reduce it. Many empirical studies on fiscal costs have attempted to investigate whether resolution policies help reduce output costs of banking crises, in other words whether there is a trade-off between fiscal costs and output costs. Their results do not show any evidence supporting this view. Honohan and Klingebiel (2003) find that liquidity support to financial institutions tends to increase both fiscal costs and output costs of banking crises. Claessens et al. (2004) and Boyd et al. (2004) investigate the effect of fiscal costs on output costs and conclude that fiscal costs are positively correlated with output costs of banking crises.

Nevertheless, there is evidence that some crisis management policies can reduce output costs of banking crises. Hoggart et al. (2005) investigate the roles of deposit insurance and find weak evidence that a country faces a trade-off between output costs and fiscal costs when designing safety nets. Their results show that the coefficient on unlimited deposit insurance in fiscal costs and output costs regressions, though not statistically significant, are positive and negative respectively, suggesting that a country with unlimited explicit deposit insurance tends to have lower output costs but at the expense of higher fiscal outlays. Moreover, Hutchison and McDill (1998) and Angkinand (2005) investigate the roles of deposit insurance on output costs and find that deposit insurance reduces the magnitude of output losses by preventing a run on banks once crises had occurred.

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4.3 Literature Reviews on the Determinants of Fiscal Costs

Most of the empirical literature on fiscal costs has focused heavily on whether fiscal costs can be attributed to crisis management policies and what type of resolution policy measures are most successful in reducing the economic costs. Less attention has been paid to other contributing factors. However, drawing on the literature on banking crises provides an idea of how fiscal costs are influenced. In general, fiscal costs of banking crises can be influenced by crisis management policies, initial macroeconomic and financial sector conditions, and the quality of institutions.

4.3.1 Crisis Management Policies

The first and major attempt to investigate the role of crisis management policies and fiscal costs of banking crises was made by Honohan and Klingebiel (2000). Their subsequent work (Honohan and Klingebiel, 2003) focuses more on the choice between an accommodating and strict crisis management policy. Both studies show that certain crisis management policies, namely unlimited deposit guarantees, open-ended liquidity support, repeated recapitalization, debtor bail-outs, and regulatory forbearance tend to significantly increase fiscal costs. These resolution policies have been adopted by governments in each phase of banking crises with different purposes. During the first or containment phase when a banking crisis is still unfolding, a government tends to implement policies aimed at delaying crisis recognition and maintaining public confidence in order to reduce the effect of the crisis on the economy. In this phase, liquidity support and blanket guarantee policies have generally been used. Liquidity

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support is often adopted because, at the first stage of a banking crisis, there is liquidity pressure which requires a government to extend liquidity support to allow illiquid banks to maintain their cash obligations and to continue its operation. Furthermore, in order to prevent loss of confidence which could trigger a bank run and a more harmful crisis, an explicit guarantee to depositors and creditors by a government will be enforced. In the second phase of managing crises or rehabilitation and restructuring phase, a government implements a number of policies in order to restore the capital position of banks and financial institutions and to resolve their non-performing assets. Forbearance, repeated recapitalization, asset management companies, and public debt relief are the examples of resolution policies that are often adopted in this phase. Forbearance and repeated recapitalization policies allow banks and financial institutions that are technically insolvent to continue its operation with the intention of avoiding widespread suspensions and bank closures and restoring solvency. Asset management companies and public debt relief program are established with the purpose of allowing banks and financial institutions to focus on their core business activity by letting governments or other agency manage their non-performing loans.

Empirical studies on fiscal costs and resolution policy have focused particularly on liquidity support, government guarantees, and forbearance because these three policies are commonly adopted by governments and are indicative of whether an accommodating or strict resolution policy is being used. A government that adopts unlimited deposit guarantees, open-ended liquidity support, and large-scale forbearance is considered to have an accommodating approach to banking crises, while

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a government that adopts limited or no deposit guarantee, limited liquidity support, and no forbearance is considered to have a strict approach. Honohan and Klingebiel (2003) and Claessens et al. (2004) find that accommodating policies, especially liquidity support, increase fiscal costs considerably. Moreover, these accommodative policies do not appear to reduce output losses or result in faster economic recovery.

Most of crisis management policies considered in empirical studies is *ex post* measure which is introduced once a crisis occurs. However, some studies consider the effect of *ex ante* policy such as deposit insurance schemes and find that they tend to reduce output losses. Deposit insurance is a financial safety net established to maintain depositors' confidence in a financial system in the time of financial distress and prevent a depositor run. The effect of deposit insurance on the economy and a financial system is unclear. On one hand, deposit insurance helps reduce or prevent a run by depositors. On the other hand, deposit insurance can increase the likelihood of crises through generating incentives for banks and financial institutions to engage in excessive risk taking activities. Hoggart et al. (2005) investigate the effect of different types of deposit insurance schemes on fiscal costs and output losses. Although their results indicate that deposit insurance schemes are not a significant determinant of fiscal costs and output losses in most regressions, they find weak evidence that unlimited deposit insurance schemes appear to reduce output losses, while limited deposit insurance schemes tends to do the opposite. They explain that unlimited deposit insurance schemes reduce incentives for depositors to run when a banking system is fragile, and thus reducing the likelihood of a severe banking crisis. However,

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there is a trade-off as well. A country with unlimited deposit insurance schemes incurs

higher fiscal costs and is more likely to experience a crisis due to the moral hazard

problem. A country with limited deposit insurance schemes, on the other hand, tends to

have higher output losses because more losses are allowed to fall on depositors, but it

is less likely to experience a crisis and incur lower fiscal costs than a country with

unlimited coverage. Angkinand (2005) examines the roles of deposit insurance on

output costs and fiscal costs and finds that deposit insurance reduces the magnitude of

output losses by preventing a run on banks once crises had occurred. She shows that

the benefits of deposit insurance schemes through reducing output losses tend to

outweigh the adverse effect of moral hazard. She also finds that having deposit

insurance schemes in place appears to reduce fiscal costs of crises. However, the result

is not statistically significant at conventional levels.

4.3.2 Initial Conditions

In addition to resolution policies, fiscal costs of banking crises are also

influenced by initial macroeconomic and financial sector conditions. Demirgüç-Kunt

and Detragiache (1997) show that fiscal costs can be explained by several

macroeconomic and financial variables such as the real interest rate, inflation, GDP

growth, terms of trade changes and the share of credit to the private sector. Honohan

and Klingebiel (2003) examine a variety of micro and macroeconomic indicators that

are likely to affect fiscal costs including the real interest rate, real GDP growth, change

in stock market prices, fiscal balance, current account balance, short-term external

debt, a change in terms of trade, some government intrusion indicators, and indicators of the regulatory and management environment affecting bank management. However, only the real interest rate and change in equity prices are consistently found to be significant. High real interest rates reflect tight monetary policy prior to a crisis and falling equity prices tend to increase fiscal costs. Moreover, Hoggart et al. (2002) and IMF (2003) find that a country that experienced a twin crisis appears to have higher fiscal costs than a country that experienced a banking crisis alone.

Some studies on fiscal costs focus on weaknesses in a financial system as a source of vulnerability to various shocks and increasing costs of banking crises. They argue that fiscal costs are likely to be greater the larger size of a financial system, the greater credit risk exposure, the faster credit expansion prior to the crisis, and the higher the share of the state in a banking system (IMF, 2003). These initial conditions of a financial system can be measured by the ratio of bank credit to GDP, the ratio of private sector credit to deposits, and an increase in the ratio of credit to GDP respectively. Nevertheless, the significance of these financial variables varies across empirical studies.

4.3.3 Quality of Institutions

Demirgüç-Kunt and Detragiache (1997) was the first study that considers the role of institutions on fiscal costs of banking crises. They find that an effective legal system proxied by law and order is likely to reduce fiscal costs. The major contribution to the role of institutions on fiscal costs has been made by Claessens et al. (2004). They

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investigate a relationship between fiscal costs and output losses and how this relationship depends on resolution policies and institutional characteristics. They use three indicators, namely quality of institutions, corruption, and judicial efficiency to capture a country's institutional and legal environment. The first institutional indicator is developed by Kaufman, Kraay, and Zoido-Lobatan (1999), while the last two indicators are from La Porta et al. (1998). Their results underline the role of institutions in reducing fiscal costs and accelerating an economic recovery. Higher fiscal costs due to adopting resolution policies are not associated with lower output losses and faster recovery. Better institutions, on the other hand, help reduce fiscal costs and output losses and speed up the recovery. They suggest that a country should adopt strict rather than accommodating policies to resolve a crisis. Moreover, they point out that managing banking crises in emerging market economies tends to be much different and more difficult than that in developed countries because of their weaker institutions.

In summary, the empirical literature on fiscal costs of banking crises focuses on the role of crisis management policies in influencing fiscal costs and how they work in reducing economic losses. Empirical results provide strong evidence that ex post policies increase both fiscal costs and output losses. Some studies include macroeconomic variables in the model to ensure that the exclusion of these variables does not bias the result of resolution policy variables rather than attempt to explain fiscal costs by these variables. However, some of these variables have proven to be an important determinant of fiscal costs. A few studies also investigate the role of

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institutions in determining fiscal costs and output costs and find that quality of
institutions does matter.

4.4 Empirical Methodology and Data

4.4.1 Methodology

To examine the implications of different types of crisis management policies on
fiscal costs and output costs, ordinary least square (OLS) is employed. This method
has generally been used in empirical literature on fiscal costs (Demirgüç-Kunt and
Detragiache, 1997, Honohan and Klingebiel, 2003, Claessens et al., 2004, and Hoggart
et al., 2004) to estimate the effect of policies and macroeconomic variables on fiscal
costs and output costs of banking crises. Methodology and data employed in this
chapter are the same for both fiscal cost and output cost regressions. This allows direct
comparison of the results. This dissertation also takes account of the role of initial
macroeconomic and financial sector conditions because the effectiveness of crisis
management policies depends on initial conditions and shocks. The model can be
expressed as follows:

$$Cost_i = \alpha + \beta_k X_{k,i} + \varepsilon_i$$

where $Cost_i$ is estimated fiscal costs or output costs of crisis i, β_k is the
coefficient of kth explanatory variable, X is a vector of explanatory variable, ε_i is the
normally distributed error term.

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4.4.2 Data

Fiscal Costs of Banking Crises

Data on fiscal costs are from Caprio and Klingebiel (2003). Fiscal cost is the estimated net present value of the budgetary costs of the crisis based on official or expert assessments, expressed as a percentage of GDP. The fiscal cost includes both fiscal and quasi-fiscal outlays for financial system restructuring, including the recapitalization cost for banks, bailout costs related to covering depositors and creditors and debt relief schemes for bank borrowers (Honohan and Klingebiel, 2003). The sample consists of 24 banking crisis episodes in 19 emerging market economies[13] during the period 1980-2003.

Output costs of Banking Crises

Output costs are estimated using both GDP growth and GDP level methods. The GDP growth method is used by IMF (1998), Aziz et al. (2000), Honohan and Klingebiel (2003), and Claessens et al. (2004). The GDP growth losses are estimated by adding up the difference between the actual GDP growth rate and the potential GDP growth trend in the years following the crisis until the time when the actual GDP growth returned to its trend. The potential GDP growth trend is defined as the average of GDP growths in the three years prior to a crisis.

The GDP level method is used by Bordo et al. (2001), Hoggarth et al. (2002), Mulder and Rocha (2001), and Angkinand (2005). The GDP level losses are calculated

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[13] Argentina, Brazil, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, the Philippines, Poland, Russia, Thailand, Turkey, and Venezuela.

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by summing up the difference between the actual GDP level and the potential GDP trend over the crisis period. For the potential GDP level trend, the HP filter is applied to GDP levels from the beginning of the sample period up to each crisis year. Then GDP level trend is assumed to grow at a constant rate of the average three-year pre-crisis growth rates of the HP filter estimates. In the case that the average three-year pre-crises growth rates is a negative value, the GDP level trend is then assumed to be constant from the crisis year onward. This prevents the potential output level trend from declining over time.

Crisis Management Policy Variables

Datasets on the crisis management policies are provided by Honohan and Klingebiel (2000), Honohan and Klingebiel (2003), Claessens et al. (2004), and Demirgüç-Kunt et al. (2005). Dummy variables are used to characterize the main components of a crisis management policy. A policy variable that takes on a value of 1 indicates when a more relaxed measure or accommodating policy is chosen. This dissertation focuses on the following six crisis management policy variables that are frequently adopted by governments and used in empirical studies.

Explicit Government Guarantee

An explicit guarantee dummy variable takes a value of 1 if a government issued an explicit blanket guarantee to depositors and creditors during a crisis and 0 otherwise.

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Implicit Government Guarantee

An implicit government guarantee is considered to be in place if deposits of state-owned institutions account for more than 75 percent of total banking deposits and a government has not issued an explicit guarantee. In this case, the variable is given a value of 1 and 0 otherwise.

Liquidity Support

This variable indicates whether a government provided open-ended and extensive liquidity support to banks and financial institutions regardless of their financial position. The variable takes a value of 1 if liquidity support was provided for longer than 12 months and the overall support is greater than total banking capital.

Forbearance Type A and Type B

Forbearance type A is a situation when insolvent banks are allowed to continue their operation without any restrictions for at least a 12 months period. Forbearance type B indicates whether other bank regulations, particularly loan classification and loan loss provisioning, are suspended or not fully enforced for at least a 12 months period. The forbearance type A and type B variable take a value of 1 if a government adopted forbearance type A and type B policies respectively and 0 otherwise.

Explicit Deposit Insurance

Explicit deposit insurance dummy takes a value of 1 if a government adopted explicit deposit insurance schemes prior to or in the first year of a banking crisis and 0 otherwise.

Macroeconomic and Financial Variables

Initial macroeconomic and financial sector conditions are important factors that make fiscal costs of banking crises different across countries. Although not many macroeconomic and financial variables are included in empirical studies on fiscal costs because only a few of them are found to be significant and fiscal costs are rather influenced by crisis management policies, there are still much more variables to explore.

This dissertation uses real exchange rate appreciation and openness to capture initial macroeconomic conditions. These two variables have never been used in empirical studies on fiscal costs. The former may reflect an initial exchange rate shock. A high degree of real exchange rate appreciation means a country will experience a large swing of real exchange rate following a devaluation, thus increasing the size of currency mismatches of banks' balance sheets and the amount of potential bailout by a government. Openness, on the other hand, helps reduce the size of real exchange rate swing after a devaluation, thus reducing the size of potential bailout that may worsen fiscal balance (Calvo et al., 2002).

Some studies suggest that the size of fiscal costs depends on the size of the financial system (IMF, 2003 and Boyd et al., 2004). Furthermore, emerging market economies where a banking system is important tend to have high fiscal costs. Therefore, the ratio of bank credit to GDP and the ratio of private credit provided by deposit money banks to GDP are used to capture the size of a financial system and financial intermediation respectively. The latter indicates the degree to which banks

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perform the financial intermediation function for the private sector which can be used as a proxy of relative importance of a banking system in a country. All macroeconomic variables are lagged one year in to order to capture initial conditions prior to crises and avoid endogeneity problems. Data on these macroeconomic and financial variables are from International Financial Statistics, World Development Indicators, and Beck et al. (2000). A complete list of data descriptions and sources are reported in Table 4.2.

4.5 Empirical Results

Regression results of determinants of fiscal costs are presented in Table 4.5. The findings provide interesting information regarding crisis management policy choice. Fiscal costs can be mainly explained by crisis management policies and initial conditions of a country. Explanatory variables employed in this dissertation can explain between 78 percent and 95 percent of the variation in fiscal costs in emerging market economies. This is outstanding compared to other studies[14]. One of the main findings is the role of real exchange rate appreciation in determining fiscal costs. Coefficients on real exchange rate appreciation are positive and significant at the 1 percent level in all regressions suggesting that a country with real exchange rate appreciation is more likely to have high fiscal costs. As mentioned earlier, a high degree of real exchange rate appreciation will increase the risk of drastic changes of real exchange rates following a devaluation, thus increasing the risk of currency mismatches of banks' balance sheets and the size of potential bailout by a government.

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[14] Honohan and Klingebiel (2003), IMF (2003), Claessens et al. (2004), and Hoggarth et al. (2005) find that their models can explain 60%-80%, 40%-56%, 17%-58%, and 8%-18% of the variation in fiscal costs respectively.

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Coefficients on openness are ambiguous. However, they are not statistically significant at conventional levels. For financial sector variables, there is evidence that fiscal costs are significantly determined by initial financial conditions. Coefficients on domestic credit and private credit to GDP are positive in all regressions but significant only when the explicit deposit insurance variable is controlled for. This suggests that when explicit deposit insurance schemes are in place, it is the size and relative importance of the banking sector in a country that determine the amount of government bailouts of depositors. Without deposit insurance schemes, these two financial variables are not significant even if other crisis management policies are controlled for.

Regarding crisis management policy variables, liquidity support is consistently found to be a significant determinant of fiscal costs. The positive coefficient on liquidity support indicates that open-ended or extensive liquidity support provided by a government to banks and financial institutions is associated with higher fiscal costs. The result is consistent with Honohan and Klingebiel (2003), IMF (2003), and Claessens et al. (2004) who find that accommodating policies especially liquidity support tend to add substantially to fiscal costs. The adverse effect of liquidity support is evident in the Asian crisis in 1997, particularly for Indonesia which incurred the highest fiscal costs of 55 percent of GDP. According to Bordo et al. (2001), the government of Indonesia issued an estimated US $ 16 billion of liquidity support to banks and financial institutions which account for 24 percent of GDP.

The results in Table 4.5, however, show that not all accommodating policies contribute to higher fiscal costs. Implicit government guarantees and forbearance

appear to reduce the size of fiscal costs. The results are confirmed by the fact that the top ten emerging market countries that have incurred the highest fiscal costs except for Argentina did not have implicit government guarantee and, in some cases, forbearance in place (Table 4.4). Negative coefficients on forbearance are consistent with Keefer (2004) who suggests that greater insolvency due to forbearance policy does not imply higher fiscal costs since governments can choose not to bailout these insolvent banks and their creditors.

The magnitude of fiscal costs depends significantly on crisis management policies. Liquidity support and implicit government guarantees have the largest effect on fiscal costs. Countries that governments provide liquidity support during crises are likely to have higher fiscal costs than those that do not have liquidity support by 16 to 27 percent of GDP while countries that have implicit government guarantees in place tend to have lower fiscal costs by almost the same magnitudes. It is noteworthy that the estimated coefficients on liquidity support and implicit government guarantees become larger when deposit insurance variables are included in the regressions. This suggests that the extent of the impact of these crisis management policies on fiscal costs also depends on *ex ante* policies. Real exchange rate appreciation which is consistently found to be a significant determinant of fiscal costs contributes only marginally to the magnitude of fiscal costs. A ten percent increase in real exchange rate appreciation increases the magnitude of fiscal costs by about 0.1 to 0.2 percent of GDP.

The main findings on crisis management policies are in contrast Honohan and Klingebiel (2003), IMF (2003), and Claessens et al. (2004) who find that

accommodating policies tend to increase fiscal costs. One explanation of the difference is that these studies do not distinguish between crises in developed countries and emerging market economies. As pointed out by Claessens et al. (2004), managing banking crises in emerging market economies tends to be much different and more difficult than that in developed countries. Therefore, adding both groups of countries together may provide misleading conclusions. However, focusing only on emerging market economies also has a disadvantage because the numbers of observations will be reduced. Given that the sample size of fiscal costs is already small, these results should be interpreted with caution.

Another explanation of the difference is that the effectiveness of crisis management policies depends on initial macroeconomic conditions. Controlling for different initial conditions may result in different conclusions regarding policy choices. Unlike other studies, this dissertation takes into account the role of real exchange rate appreciation which has been an important source of vulnerability in emerging market economies. Real exchange rate appreciation can increase vulnerability of the banking sector through a loss of competitiveness of the economy. A loss of competitiveness due to real exchange rate appreciation can weaken exports and economic performance which can lead to business failures and a decline of loan quality, thus increasing vulnerability of the banking sector. In this case, having implicit guarantees in place before crises might help prevent a bank run, and thus reducing the bailout costs.

Table 4.6 presents regression results of the effect of crisis management policies on output costs of banking crises. None of the crisis management policies are

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significant in both output growth and output level regressions except for liquidity support and explicit deposit insurance. Similar to fiscal costs, the magnitude of output costs is largely influenced by crisis management policies. Positive coefficients on liquidity support of 31.6367 (Table 4.6, Column 6) are significant, suggesting that countries that governments provide liquidity support to banks and financial institutions during crises tend to have higher output costs by about 31.64 percent than those that do not have liquidity support in place. On the other hand, negative coefficients on deposit insurance suggests that adopting explicit deposit insurance tends to reduce the output costs of banking crises. The estimated coefficient on explicit deposit insurance of 22.6218 indicates that a country that has deposit insurance schemes in place will have a lower output costs by 22.62 percent of GDP than those that do not have the schemes in place. In terms of a trade-off between fiscal costs and output costs of crises, there is no clear evidence whether crisis management policies that tend to increase (decrease) fiscal costs are likely to decrease (increase) output costs. In fact, countries that have liquidity support in place appear to have higher output losses. Moreover, the signs of all crisis management policies except for liquidity support and forbearance type A are negative, though not statistically significant, indicating that adopting these policies might help reduce output losses. This finding is consistent with Bordo et al. (2001), Honohan and Klingebiel (2003), and Boyd et al. (2004) who find a negative relationship between output losses and crisis management policies, namely government guarantees and forbearance.

Regarding initial macroeconomic and financial sector conditions, countries with real exchange rate appreciation and greater importance of bank intermediation tend to have higher output losses. The ratio of domestic credit to GDP or the size of the banking sector is also tested but its coefficient is not statistically significant, suggesting that the size of the banking sector is less important than banks' function as financial intermediaries to determine output losses.

Table 4.7 presents the results of controlling for different condition during crises. Column 1 and 2 compare the effect of real exchange rate appreciation with subsequent depreciation[15] on fiscal costs. The results show that the coefficient on depreciation is also positive and statistically significant at the 1 percent level. The magnitudes of coefficients on prior real exchange rate appreciation and subsequent depreciation are very similar. Moreover, the sign and significance of the coefficients on crisis management policy variables are not significantly affected by using different measures. Column 3-6 present the results of using output costs of crises as a controlled variable for the size of crises. The positive coefficients on both output cost measures suggest that the bigger size of crises is associated with higher fiscal costs. This implies that there is no trade-off between fiscal and output costs. Additionally, the sign and significance of the coefficients on crisis management policy variables remain the same. Correlations among these variables are reported in Table 4.3, Panel B and C.

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[15] Depreciation is defined as the change of nominal exchange rate. A positive value indicates depreciation of nominal exchange rate, while a negative value indicates appreciation.

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4.6 Conclusion

Crisis management policies are important because choosing the right policies can prevent systemic crises and reduce fiscal costs while choosing poor policies can lead to an increase in the severity of banking crises and fiscal costs. The previous empirical literature on fiscal costs puts forward the use of strict rather than accommodating crisis resolution policies. However, this crisis management policy recommendation may not be practical in emerging market economies. Managing crises in emerging market economies tends to be different than that in developed countries because of their different characteristics and quality of institutions (Claessens et al., 2004). As a result, lessons from developed countries cannot simply be transferred to emerging markets.

The findings illustrate that some accommodating policies such as implicit government guarantees and forbearance type B are in fact successful in reducing fiscal costs in emerging market economies. The detriments of moral hazard by the use of accommodating policies can be outweighed by the benefits of preventing bank runs in this case. Moreover, the magnitude of fiscal costs is found to be significantly determined by the degree of real exchange rate appreciation. The results also suggest that the most damaging resolution policy is liquidity support which is also found to be the most consistently significant explanatory variable in addition to real exchange rate appreciation.

Regarding the effect of crisis management policies on output costs, there is weak evidence that deposit insurance, which is a prevention policy rather than

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intervention or resolution policy, appears to reduce output costs. Crisis management policy that is likely to increase fiscal costs also tends to increase output costs, for example liquidity support policy, and crisis management policy that is likely to decrease fiscal costs appear to decrease output costs as well. This suggests that a trade-off between fiscal costs and output costs is unlikely.

The findings of this chapter suggest the validity of using selected accommodating policies to resolve crises in emerging market economies. The effect of crisis management policies on fiscal costs and output costs depends significantly on initial conditions and shocks. Furthermore, focusing on a particular group of countries may provide different conclusions regarding policy choices due to differences in characteristics and institutions. It is worth mentioning that implicit government guarantee and explicit deposit insurance that are found to reduce fiscal costs and output costs respectively are similar in a sense that they are prevention policies. Since some intervention policies may not work too well, this dissertation tilts the balance in favor of using prevention rather than intervention or resolution crisis management policies.

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Table 4.1: Fiscal Costs of Selected Banking Crises

Country	Period	Durations	Fiscal Costs (% of GDP)
High Income OECD Countries			
Finland	1991-1994	4	11.2
Japan	1991-ongoing	-	24.0
Norway	1987-1993	7	8.0
Spain	1977-1985	9	17.0
Sweden	1991	1	4.0
Average		**5.3**	**12.8**
Emerging Market Countries			
Argentina	1980-1982	3	55.1
	1995	1	2.0
Brazil	1994-1996	3	13.2
Chile	1981-1983	3	42.0
China	1998-1999	2	47.0
Colombia	1982-1987	6	5.0
Czech Republic	1989-1991	3	12.0
Hungary	1991-1995	6	10.0
Indonesia	1994	1	2.0
	1997-2002	6	55.0
Isreal	1977-1983	7	30.0
Korea	1997-2002	6	28.0
Malaysia	1985-1988	4	5.0
	1997-2002	6	16.4
Mexico	1994-1997	4	19.3
Philippines	1981-1987	8	3.0
	1998-2002	5	7.0
Poland	1992-1995	4	3.5
Thailand	1983-1987	5	0.7
	1997-2002	6	34.8
Turkey	1982-1985	4	2.5
	1994	1	1.1
	2000-ongoing	-	30.5
Venezuela	1994-1997	4	22.0
Average		**4.3**	**18.6**
Average all countries		**4.8**	**15.7**

Source: Caprio and Klingebiel (2003)

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Table 4.2: Data Descriptions

Variable	Description and Source
Fiscal cost of banking crises	The fiscal cost includes both fiscal and quasi-fiscal outlays for financial system restructuring, including the recapitalization cost for banks, bailout costs related to covering depositors and creditors and debt relief schemes for bank borrowers. Source: Caprio and Klingebiel (2003).
Output cost of banking crises	The output costs are estimated using both GDP growth and GDP level method. The GDP growth losses are estimated by adding up the difference between the actual GDP growth rate and the potential GDP growth trend in the years following the crisis until the time when the actual GDP growth returned to its trend. The potential GDP growth trend is defined as the average of GDP growths in the three years prior to a crisis. The GDP level losses are calculated by summing up the difference between the actual GDP level and the potential GDP trend over the crisis period. For the potential GDP level trend, the HP filter is applied to GDP levels from the beginning of the sample period up to each crisis year. Then GDP level trend is assumed to grow at a constant rate of the average three-year pre-crisis growth rates of the HP filter estimates. In the case that the average three-year pre-crises growth rates is a negative value, the GDP level trend is then assumed to be constant from the crisis year onward. Source: the real GDP data is from IFS and the banking crisis dates and data are from Caprio and Klingebiel (2003).
Explicit government guarantee	A dummy is equal to 1 if a government issued an explicit guarantee during a crisis and 0 otherwise. Source: Honohan and Klingebiel (2000) and Claessens et al. (2004).
Implicit government guarantee	A dummy is equal to 1 if deposits of state-owned institutions account for more than 75 percent of total banking deposits and a government has not issued an explicit guarantee and 0 otherwise. Source: Honohan and Klingebiel (2000) and Claessens et al. (2004).
Liquidity support	This variable indicates whether a government provided open-ended and extensive liquidity support to banks and financial institutions. The variable takes a value of 1 if liquidity support was provided for longer than 12 months and the overall support is greater than total banking capital. Source: Honohan and Klingebiel (2000) and Claessens et al. (2004).
Forbearance type A	A dummy is equal to 1 if insolvent banks are allowed to continue their operation without any restrictions for at least a 12 months period and 0 otherwise. Source: Honohan and Klingebiel (2000) and Claessens et al. (2004).
Forbearance type B	A dummy is equal to 1 if other bank regulations particularly loan classification and loan loss provisioning are suspended or not fully enforced for at least a 12 months period and 0 otherwise. Source: Honohan and Klingebiel (2000) and Claessens et al. (2004).
Explicit deposit insurance	Explicit deposit insurance dummy takes a value of 1 if a government adopted explicit deposit insurance schemes prior to or in the first year of a banking crisis and 0 otherwise. Source: Demirgüç-Kunt et al. (2005).
Real exchange rate appreciation	The deviation of the real exchange rate from its long-term trend. Hodrick-Prescott (HP) filter is applied to the annual real exchange rate in order to obtain a smooth estimate of long-term real exchange rate trend. Source: IFS for the real exchange rate data.
Trade openness	The sum of exports and imports, in percent of GDP. Source: World Development Indicators (WDI).
Domestic credit	Domestic credit provided by banking sector, in percent of GDP. Source: WDI.
Private credit to GDP	The ratio of private credit provided by deposit money banks, in percent of GDP. Source: Beck et al. (2000).

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Table 4.3: Descriptive Statistics and Correlations among Crisis Management Policies

Panel A: Descriptive Statistics	Obs	Mean	Std. Dev.	Min	Max
Fiscal cost of banking crises	24	18.208	17.5356	.7	55.1
GDP growth losses of banking crises	23	21.72605	21.9529	0	92.28231
GDP level losses of banking crises	23	18.87499	23.08694	0	85.53683
Explicit government guarantee	22	.3636364	.492366	0	1
Implicit government guarantee	21	.1904702	.4023739	0	1
Liquidity support	22	.5454545	.5096472	0	1
Forbearance type A	22	.0909091	.2942449	0	1
Forbearance type B	22	.5	.5117663	0	1
Explicit deposit insurance	20	.8	.4103913	0	1
Real exchange rate appreciation$_{(t-1)}$	22	132.7578	428.6225	-38.6349	1924.408
Trade openness$_{(t-1)}$	22	53.64343	32.1399	18.12188	157.9414
Domestic credit $_{(t-1)}$	22	72.41626	51.64841	19.46456	193.8114
Private credit to GDP$_{(t-1)}$	21	40.99241	33.88336	8.6679	137.4398

Panel B: Correlations among Crisis Management Policies

	Explicit government guarantee	Implicit government guarantee	Liquidity support	Forbearance type A	Forbearance type B	Explicit deposit insurance
Explicit government guarantee	1					
Implicit government guarantee	-0.394	1				
Liquidity support	0.209	0.179	1			
Forbearance type A	-0.262	-0.177	-0.055	1		
Forbearance type B	0.368	-0.231	0.328	0.018	1	
Explicit deposit insurance	-0.409	0.267	0.083	0.177	-0.544	1

Panel C: Correlation among Macroeconomic Variables

	Fiscal costs	Output growth losses	Output level losses	Real exchange rate appreciation	Depreciation	Private credit	Domestic credit
Fiscal costs	1						
Output growth losses	0.646	1					
Output level losses	0.342	0.755	1				
Real exchange rate appreciation	0.515	0.318	0.165	1			
Depreciation	0.637	0.406	0.208	0.908	1		
Private credit	0.297	0.585	0.187	0.062	0.075	1	
Domestic credit	0.093	0.257	-0.025	-0.134	-0.105	0.770	1

Table 4.4: Crisis Management Policy Measures

Country	Period	Fiscal Costs (% of GDP)	Explicit Government Guarantee	Implicit Government Guarantee	Liquidity Support	Forbearance A	Forbearance B	Explicit Deposit Insurance
Argentina	1980-1982	55.1	No	Yes	No	No	No	Yes
	1995	2.0	No	No	No	No	No	Yes
Brazil	1994-1996	13.2	No	No	No	Yes	No	Yes
Chile	1981-1983	42.0	No	No	Yes	No	No	Yes
China	1998-1999	47.0	n/a	n/a	n/a	n/a	n/a	No
Colombia	1982-1987	5.0	No	Yes	Yes	No	No	Yes
Czech Republic	1989-1991	12.0	Yes	No	No	No	No	Yes
Hungary	1991-1995	10.0	No	Yes	Yes	No	No	Yes
Indonesia	1994	2.0	No	No	No	No	Yes	Yes
	1997-2002	55.0	Yes	No	Yes	No	Yes	No
Isreal	1977-1983	30.0	n/a	n/a	n/a	n/a	n/a	No
Korea	1997-2002	28.0	Yes	No	Yes	No	Yes	Yes
Malaysia	1985-1988	5.0	No	No	Yes	No	Yes	Yes
	1997-2002	16.4	Yes	No	No	No	Yes	No
Mexico	1994-1997	19.3	Yes	No	Yes	No	Yes	Yes
Philippines	1981-1987	3.0	No	No	Yes	Yes	Yes	Yes
	1998-2002	7.0	No	No	No	No	No	Yes
Poland	1992-1995	3.5	No	Yes	Yes	No	Yes	Yes
Thailand	1983-1987	0.7	No	No	No	No	Yes	No
	1997-2002	34.8	Yes	No	Yes	No	Yes	No
Turkey	1982-1985	2.5	No	No	No	No	No	Yes
	1994	1.1	Yes	n/a	No	No	No	Yes
	2000-ongoing	30.5	Yes	No	Yes	No	No	Yes
Venezuela	1994-1997	22.0	No	No	Yes	No	Yes	Yes

Sources: Honohan and Klingebiel (2000), Claessens et al. (2004), and Demirgüç-Kunt et al. (2005).

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Table 4.5: Fiscal Costs of Banking Crises and Crisis Management Policies

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	8.5288	3.6323	4.8502	19.0968**	-4.9410	3.9785
	(0.173)	(0.489)	(0.292)	(0.041)	(0.410)	(0.420)
Real Exchange rate Appreciation $_{t-1}$	0.0138***	0.0156***	0.0151***	0.0114***	0.0186***	0.0165***
	(0.001)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
Openness $_{t-1}$	0.0226	0.0381	0.0304	0.0193	-0.0217	-0.0117
	(0.771)	(0.552)	(0.600)	(0.746)	(0.399)	(0.749)
Domestic Credit $_{t-1}$		0.0586			0.1796***	
		(0.375)			(0.008)	
Private Credit to GDP $_{t-1}$			0.1013			0.1739***
			(0.172)			(0.005)
Explicit Government Guarantee	11.4648	7.8932	7.3243	4.2181	-6.0743	-0.5903
	(0.115)	(0.388)	(0.355)	(0.573)	(0.301)	(0.926)
Implicit Government Guarantee	-16.4609*	-17.4696	-16.7691	-20.8874**	-28.2314***	-22.0459**
	(0.073)	(0.115)	(0.103)	(0.037)	(0.009)	(0.032)
Liquidity Support	16.3799**	18.6852*	18.4542**	22.1886**	27.4298***	21.5427**
	(0.034)	(0.051)	(0.032)	(0.024)	(0.002)	(0.024)
Forbearance Type A	-3.6961	-6.9538	-3.5043	-5.0376	-22.6593**	-8.9435
	(0.678)	(0.476)	(0.701)	(0.661)	(0.015)	(0.476)
Forbearance Type B	-11.5004*	-12.3279**	-13.7832**	-13.3057*	-5.8770	-10.2136
	(0.056)	(0.046)	(0.041)	(0.069)	(0.262)	(0.117)
Explicit Deposit Insurance				-11.1071	4.6612	2.1169
				(0.127)	(0.316)	(0.667)
No. of Observations	19	19	19	17	17	17
Chi-square (F-stat)	20.00	24.71	20.62	48.25	1177.60	487.32
Prob > Chi-square	0.0000	0.0000	0.0000	0.000	0.0000	0.0000
R-squared	0.7821	0.8097	0.8131	0.8466	0.9448	0.8832

Dependent variable is fiscal costs of banking crises (% of GDP).

The coefficients are estimated using OLS estimation with robust standard error.

*, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively.

The numbers in parentheses are p-values.

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Table 4.6: Output Costs of Banking Crises and Crisis Management Policies

	Output Growth Losses			Output Level Losses		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-3.6294 (0.620)	-8.9405 (0.543)	29.2332 (0.150)	-7.8855 (0.228)	-0.9611 (0.930)	18.3349 (0.156)
Real Exchange rate Appreciation $_{t-1}$	0.0103* (0.070)	0.0140** (0.023)	0.0008 (0.909)	0.0074* (0.058)	0.0052 (0.150)	-0.0015 (0.741)
Openness $_{t-1}$	-0.0181 (0.811)	-0.0807 (0.378)	-0.0042 (0.966)	-0.0012 (0.988)	-0.0513 (0.425)	-0.0126 (0.878)
Private Credit to GDP $_{t-1}$	0.3307** (0.011)	0.4480** (0.020)		0.1860* (0.098)	0.2264* (0.064)	
Explicit Government Guarantee	-2.2002 (0.852)	-12.9009 (0.231)	-0.4841 (0.978)	-8.7610 (0.437)	-18.7332 (0.111)	-12.4568 (0.329)
Implicit Government Guarantee	-14.8944 (0.246)	-19.7581 (0.142)	-15.3523 (0.362)	-2.5356 (0.848)	-10.2608 (0.377)	-8.0337 (0.466)
Liquidity Support	18.9369 (0.112)	20.7990 (0.139)	21.9221 (0.189)	23.3011* (0.056)	31.0690** (0.020)	31.6367** (0.021)
Forbearance Type A	5.5165 (0.715)	-2.8897 (0.838)	6.8701 (0.605)	21.0778 (0.337)	15.7309 (0.468)	20.6643 (0.301)
Forbearance Type B	-7.8361 (0.385)	-0.2512 (0.982)	-7.0232 (0.627)	-1.8038 (0.844)	-0.0863 (0.994)	-3.5094 (0.765)
Explicit Deposit Insurance		7.4008 (0.632)	-25.7915* (0.094)		-5.8438 (0.604)	-22.6218** (0.036)
No. of Observations	18	16	16	18	16	16
Chi-square (F-stat)	7.57	42.20	22.37	9.50	169.83	7.65
Prob > Chi-square	0.0032	0.0001	0.0003	0.0014	0.0000	0.0072
R-squared	0.6744	0.8060	0.5692	0.6225	0.7672	0.7096

Dependent variables are output growth losses and output level losses of banking crises (% of GDP).
The coefficients are estimated using OLS estimation with robust standard error.
*, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively.
The numbers in parentheses are p-values.

Table 4.7: Fiscal Costs and Macroeconomic Conditions

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	8.5288	9.1927	7.3295	10.0487	8.1939	11.5777
	(0.173)	(0.144)	(0.257)	(0.146)	(0.230)	(0.117)
Real Exchange rate Appreciation $_{t-1}$	0.0138***					
	(0.001)					
Openness $_{t-1}$	0.0226	0.0385	0.0548	0.0456	-0.0045	-0.0197
	(0.771)	(0.588)	(0.277)	(0.411)	(0.947)	(0.810)
Depreciation		0.0129***	0.0118***	0.0125***		
		(0.001)	(0.000)	(0.001)		
Output Growth Losses			0.3142*		0.3789*	
			(0.067)		(0.078)	
Output Level Losses				0.2404		0.2975
				(0.390)		(0.331)
Explicit Government Guarantee	11.4648	8.8585	5.8104	9.3806	11.3073	16.0514*
	(0.115)	(0.215)	(0.302)	(0.131)	(0.132)	(0.064)
Implicit Government Guarantee	-16.4609*	-15.6203*	-16.8246**	-19.4250**	-16.6295**	-19.7988**
	(0.073)	(0.084)	(0.012)	(0.034)	(0.022)	(0.031)
Liquidity Support	16.3799**	14.3671*	11.3581**	10.2426*	12.2871*	11.0209*
	(0.034)	(0.057)	(0.028)	(0.084)	(0.066)	(0.092)
Forbearance Type A	-3.6961	-4.1989	-5.6684	-9.1215	-7.0950	-11.4226
	(0.678)	(0.622)	(0.626)	(0.520)	(0.575)	(0.458)
Forbearance Type B	-11.5004*	-10.9335*	-13.4915**	-13.6022**	-11.4121*	-11.4226*
	(0.056)	(0.052)	(0.023)	(0.035)	(0.051)	(0.086)
No. of Observations	19	19	18	18	18	18
Chi-square (F-stat)	20.00	19.34	181.86	33.17	7.54	3.65
Prob > Chi-square	0.0000	0.0000	0.0000	0.0000	0.0025	0.0320
R-squared	0.7821	0.7865	0.8516	0.8165	0.7346	0.6841

Dependent variable is fiscal costs of banking crises (% of GDP).
The coefficients are estimated using OLS estimation with robust standard error.
*, **, *** indicate the significance level of 10 percent, 5 percent, and 1 percent respectively.
The numbers in parentheses are p-values.

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Appendix Table A4.1: Empirical Studies on Fiscal Costs of Banking Crises

Study	Primary Focus	Sample	Variables	Findings
Honohan and Klingebiel (2003)	Examine whether crisis resolution policies can influence the fiscal costs.	34 developing and developed countries; 1970-2000.	Real interest rate, stock prices, liquidity support, forbearance type A and type B, government guarantee, recapitalization, public debt relief for borrowers.	Unlimited deposit guarantees, open-ended liquidity support, repeated recapitalization, debtor bail-outs, and regulatory forbearance tend to significantly increase fiscal costs. Liquidity support is the only crisis management policy that is found to be associated with higher output costs. Macroeconomic variables such as real interest rate, stock prices are found to be determinants of output costs of banking crises.
Claessens, Klingebiel, and Laeven (2004)	Investigate how fiscal costs associated with resolving a banking crisis relate to output losses and how this relationship depends on policy choices, and institutions	40 emerging market and developed countries; 1977-2003.	Liquidity support, forbearance, explicit and implicit government guarantee, recapitalization, quality of institutions, corruption, judicial efficiency, credit growth.	Higher fiscal costs due to adopting resolution policies are not associated with lower output losses and faster recovery. Better institutions, on the other hand, help reduce fiscal costs and output losses and speed up the recovery. A country should adopt strict rather than accommodating policies to resolve a crisis.
Hoggart, Jackson, and Nier (2005)	Investigate the impact of the design of safety nets on the likelihood of banking crises and examine a trade-off between fiscal costs and output costs of banking crises.	29 developed and developing countries; 1994-2001.	Explicit deposit insurance (limited and unlimited coverage), liquidity support, government guarantee, credit to GDP, currency crisis dummy, GNP per capita, GDP growth, current account balance, interest rate.	Deposit insurance schemes are not a significant determinant of fiscal costs and output losses in most regressions. They find weak evidence that unlimited deposit insurance schemes appear to reduce output losses, while limited deposit insurance schemes tend to do the opposite. A country with unlimited deposit insurance schemes incurs higher fiscal costs and is more likely to experience a crisis due to moral hazard problem. A country with limited deposit insurance schemes, on the other hand, tends to have higher output losses but it is less likely to experience a crisis and incur lower fiscal costs than a country with unlimited coverage.

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Appendix Table A4.1: (cont.)

Study	Primary Focus	Sample	Variables	Findings
Demirgüç-Kunt and Detragiache (1997)	Examine the probability of banking crises and the effect on fiscal costs.	65 developing, emerging market, and industrial countries; 1980-1994.	GDP growth, fiscal balance, terms of trade, exchange rate depreciation, real interest rate, inflation, M2/reserves, private debt, domestic credit growth, banks' cash and reserves/assets, deposit insurance, quality of legal system and contract enforcement.	Factors that make banking crises more likely tend to make them more costly. A larger share of credit to the private sector, credit growth, real interest rate, inflation, M2 to reserves, and deposit insurance are associated with higher fiscal costs. On the other hand, an effective legal system is likely to reduce the probability of crises and their costs.
Frydl (1999)	Examine the relationship between crisis length and their costs.	25 countries; 1977-1995.	Credit acceleration (the average of the difference between the ratio of domestic credit to GDP and a ten-year linear trend in the two year before the crisis). output gap (the average o the difference between real GDP and 10-year linear trend for the two year before the crisis), real interest rate change, length of crises.	No cross-sectional evidence that the length of a crisis is a significant contributor to its resolution costs. The results show more link between the length and costs of banking crises if the economic cost is used.
International Monetary Fund (2003)	Examine the impact of resolution policies and initial financial sector conditions on fiscal costs.	32 developed and developing countries; 1970-2003.	Liquidity support, forbearance, repeated recapitalization, net foreign assets, capital to total assets, NPLs to total loans, bank credit to GDP, bank credit to deposits, real interest rate, developing country dummy, currency crisis dummy.	The existence of a currency crisis accompanying the banking crisis and liquidity support, repeated recapitalization, and forbearance add significantly to fiscal costs. The size of a financial system do not tend to contribute to fiscal costs, while the credit variables and foreign liability position of the banking sector appear to add to fiscal costs.

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CHAPTER FIVE

Conclusions and Policy Implications

Crises often have major macroeconomic costs. Therefore, knowing how to minimize their impact through having sound policy responses to crises is an important objective. Crises have grown more frequent in the past few decades and their characteristics have been different from crises in the past. In the pre-1990 period, crises were characterized by fundamental weaknesses and fiscal problems such as high budget deficit and public debt level. However, crises in the 1990s have shown that vulnerability in the external and financial sectors could play an important role in triggering crises.

In the last decade, the international capital markets have become more integrated. The external sector has been an important source financing and, at the same time, a source of vulnerability. As Bordo et al. (2001) put it, the combination of capital mobility and the financial safety nets which encourage financial institutions and corporations to accumulate excessive foreign currency denominated debt are the source of the growing crisis incidence and the factor that makes recent crises different from the past. In the recent period, lending was less related to trade. The inconsistency between trade flows and capital flows weakened creditors' confidences, thus increasing the risk of capital flow reversals and crises.

Weaknesses in the fiscal, financial, and external sectors and weak institutions are also suggested as causes of crises. However, the analysis of the potential

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vulnerability to crises in emerging markets (Chapter 2) shows that crises in emerging markets have been triggered more by the external sector and financial sectors. Domestic credit growth and vulnerability in the external sector such as current account balances, real exchange rate appreciation and short-term external debt are found to be the major factors contributing to recent crises. It is interesting that the characteristic of emerging markets in which they tend to rely heavily on short-term external sources of fund is found to be a source of vulnerability to crises in the 1990s but not before. The findings suggest that this characteristic of emerging markets has become more disruptive and is one of the major factors that put emerging markets more at risk these days.

Emerging markets tend to have more crises than industrial countries and their crises tend to be more costly as well. The analysis of the effects of these underlying vulnerabilities on the real economy (Chapter 3) suggests that the financial characteristics of emerging markets are not only a source of growing crises incidence but also a source of more costly crises. The magnitude of output costs of crises in emerging markets, especially in the 1990s, is affected by the maturity and currency composition of their external debt. Furthermore, output costs of crises depend not only on the factors triggering crises but also the factors that are not associated with the probability of crises. In some cases, the magnitude of output costs can be most affected by the latter. Therefore, it is important for policy makers to understand not only what causes crises but also what make crises more costly.

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What we have learned from recent experience of crises in emerging markets is that emerging markets should avoid accumulating excessive amounts of foreign currency denominated debt, particularly short-term. Several crises in emerging markets have shown that the structure of debt of both the public and private sectors was a major source of vulnerability to crises. While the ratios of debt to GDP were high in many emerging markets, they were not a cause for solvency concerns (Hemming et al., 2003). The structure of their debt, on the other hand, was the important factors that made these countries susceptible to exchange rate and rollover risks. In the case of emerging markets where maintaining investors' confidence is crucial, the maturity and currency composition of debt can be critical to investor perceptions of liquidity and solvency problems, and thus can lead to crises.

Sound debt strategies and risk management practices by both public and private sectors are extremely important for emerging markets because they can reduce exchange rate and liquidity risks. Moreover, sound debt management helps to promote the efficiency of macroeconomic policies. Sound debt management is essential for sustainable fiscal policy. Fiscal policy is sustainable when, at the credible levels of primary balances, a government is both solvent and liquid. A country with poor debt management policy tends to experience liquidity and solvency problems through a build-up of short-term foreign currency denominated debt, and thus affecting sustainability of fiscal policy. Furthermore, a lack of sound debt management can transform liquidity problem into solvency problem through an increasing interest rate risks. The opposite is also true because rollover will become more difficult if a country

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is perceived to be insolvent. Therefore, in order to reduce vulnerability to crises, emerging markets need to choose the composition of debt where debt servicing costs move in line with their revenues (IMF, 2005b).

Sound debt management also strengthens the efficiency of monetary policy and enhances the stability of the financial system through the development of public and private bond markets. Debt management policy that supports the development of domestic bond markets allows the use of market-based instruments to conduct monetary policy which helps to improve the transmission mechanism of monetary policy and strengthen implementation of monetary policy (IMF, 2005b). For the financial system, the development of a domestic bond market can enhance financial stability and improve financial intermediation through greater competition and development of related financial infrastructure, products, and services (Nwankwo, 2007). Furthermore, the development of domestic bond markets can ensure consistency of monetary policy with fiscal policy because a government will be able to finance its budget deficit through domestic bond markets, thus reducing the need for monetary financing of deficit which could lead to high inflation.

Crises are difficult to anticipate, and thus can not be prevented entirely. Once crises occur, policy responses will be critical to their severity. Implementing the right policies can mitigate the impact of crises, while implementing poor policies can do the opposite. The choice of crisis management policies will depend on characteristics of economies, institutions, and causes of crises. Unlike other studies, this dissertation finds that the effectiveness of crisis management policies in emerging market

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economies tends to be different than that in developed countries. As a result, lessons from developed countries cannot simply be transferred to emerging markets. The existing literature on fiscal costs of banking crises suggests the use of strict rather than accommodating crisis management policies to resolve crises due to moral hazard incentives induced by these policies. However, the analysis of crisis management policies and fiscal costs of banking crises in chapter 4 suggests that, despite the moral hazard problem, some crisis management policies, namely implicit government guarantees and forbearance, were successful in reducing fiscal costs in emerging markets. Furthermore, real exchange rate appreciation and the size of crises are found to be associated with higher fiscal costs. The findings underline the importance of shocks when considering the effectiveness of crisis management policies.

Having implicit government guarantees in place before crises helps to prevent a run on banks. Similar to explicit deposit insurance, implicit government guarantees reduce the likelihood of crises becoming more severe (Hoggart et al., 2007). These crisis management policies raise concerns about moral hazard. However, a major loss of macroeconomic control and a further loss of confidence from not having these policies in place could be much worse (Fischer, 2001). As mentioned earlier, maintaining investors' confidence in the financial system is crucial for emerging markets. These policies, if implemented correctly, could be an effective tool in regaining confidence, and therefore reducing the severity of crises (Economic and Financial Committee, 2001).

It is also important to have measures to restructure and resolve the financial institutions after the first phase of crises. Tang et al. (2000) study banking crises in transition economies and suggest that financial restructuring should involve adequate recapitalization to prevent moral hazard and repeated recapitalization. Adopting strict crisis management policy such as liquidation is less fiscally costly but countries may end up with weak banking system. On the other hand, countries that pursue a combination of liquidation and restructuring tend to have moderate fiscal costs and more efficient banking systems.

Lessons from recent crises have shown that, in addition to crisis management policies, it is important to have a framework for crisis management in place before it is needed. Unlike other empirical studies, this dissertation provides empirical evidence supporting the role of selected crisis management policies in reducing fiscal costs of banking crises in emerging markets. The benefits of preventing bank runs by the use of some types of accommodating policies can outweigh the detriments of the moral hazard problem. Crises are difficult to predict and prevent. However, experience of the past can help us to mitigate the impact of crises and ensure that we are in a better position to deal with crises in the future.

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