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on

An Analysis of Sovereign Debt Crisis: A Study of Some Emerging Economies During 1980-2013

DOCTOR OF PHILOSOPHY

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An Analysis of Sovereign Debt Crisis: A Study of Some Emerging Economies During 1980-2013

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DECLARATON

I, **Sri Hari Nayudu. A,** hereby declare that this thesis entitled **"An Analysis of Sovereign Debt Crisis: A Study of Some Emerging Economies During 1980-2013"** submitted by me under the guidance and supervision of Prof. Bandi Kamaiah, Dr. Phanindra Goyari of University of Hyderabad and Dr. K. Chandrasekhar of Center for Economic and Social Studies (CESS), Hyderabad is a bonafide research work which is also free from plagiarism. I also declare that it has not been submitted previously in part or in full to this University or any other University or Institution for the award of any degree or diploma.

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--- Sri Hari Nayudu. A

TO MY PARENTS

SRIPATHI NAIDU & JAYAMMA

TO MY UNCLE AND AUNT

KRISHNAMURTHY & VARALAKHMI

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List of Abbreviations

BSDM	Balance Sheet Decomposition Measures
CACs	Collective Action Clauses
CBR	Case-Based Reasoning models
CDF	Cumulative Distribution Function
CDS	Credit Default Swaps
CUSUM	Cumulative Sums Procedures
DOLS	Dynamic Ordinary Least Squares
EME	Emerging Market Economies
EWS	Early Warning Systems
Fed	Federal Reserve
FIIs	Foreign institutional investors
FOMC	Federal Open Market Committee
FSIA	Foreign Sovereign Immunities Act
G7	Group of seven countries
G77	Group of seventy seven countries
HIPC	The heavily indebted poor countries
IDRA	International Debt Restructuring Agency
IFS	International Financial Statistics
IMF	International Monetary Fund
LDC's	Least Developed Nations
LLC test	Levin-Lin-Chu Test
LPM	Linear Probability Model
MDA	Multiple Discriminant Analysis
NN	Neural networks
S&P	Standard and Poor
SCDS	Sovereign credit default swap
SDR	Special Drawing Rights
SDRM	Sovereign debt restructuring mechanism
UN	United Nations
VIX	Volatility Index (VIX)
WEO	World Economic Outlook

Abstract

The interest in sovereign debt and sovereign debt crisis got special attention in the recent times, due to the challenges it posed both to the emerging economies and advanced economies. Apart from the havoc created by huge capital flows in exchange rate movements in emerging economies, the monetary policies pursued by advanced economies are posing challenges to emerging economies by destabilizing international debt markets. These policies have an implication on the cost of borrowing of emerging economies. Since, there is no consensus on the determinants of the sovereign bond yields, the impact of advanced countries' monetary policies on sovereign bond yields and their determinants are analyzed empirically. In the present study, the sovereign bond yields of twelve emerging economies are analyzed and an attempt is made to identify the determinants of sovereign bond yields over the period 1980–2013 using the panel regressions and panel cointegration techniques. Next, the study also attempts to examine the prediction of the sovereign debt crisis through early warning systems. Here, an effort is made to predict, whether the emerging economies are prone to sovereign debt crisis or not by using a logit model methodology. This study predicts 85% of all the sovereign debt crisis episodes with15% missed crisis episodes and 10% false alarms. The present study found that Argentina, Panama and Ecuador are expected to face the sovereign debt crisis. Remaining countries (viz., Brazil, Dominican Republic, India, Paraguay, Peru, Philippines, Turkey, Nigeria and Venezuela) are not in the crisis prone region.

Chapter-1

Sovereign Debt Crisis and Emerging Economies

1.1 Introduction

It was commonly believed that the sovereign will never fall into default. However, the debt defaults of large number of sovereign countries over the last century have reminded us the importance of the risk management even for sovereign countries. Sovereign debt-servicing difficulties and, in some cases, outright defaults, have become more common in recent years (Manasse, Roubini, & Schimmelpfennig, 2003). According to Standard and Poor's (2013), there are around 100 events of sovereign defaults from 1975 to 2013. The largest in the history is the Argentine debt crisis of 2001, where the country defaulted on its $82 billion debt payments.

Historically, sovereign states have borrowed money for hundreds of years. Sovereign debt was one of the first financial assets ever traded, and it continues to comprise a significant share of global financial assets (Tomz & Wright, 2013). The value and volume of sovereign debt market worldwide is very high. Goldsmith (1985) and Roxhurgh, Lund and Piotrowski (2011) estimated the market value of government debt as a percentage of total financial assets worldwide. Sovereign debt accounted 22% of the total financial assets in 1950, but declined to 11% by 1978. This decline is attributed to the reduction in international capital flows due to break down of Bretton woods system. Again after touching this lowest point, sovereign debt dramatically increased and it accounted for about 19% of the total financial assets worldwide in 2011. This is mainly due to dismantling of capital controls by sovereign countries and the heavy influx of “petro-dollars” into advanced economies, which were channeled into as sovereign debt in Latin American and East Asian countries.

Sovereign debt includes three important aspects. One, external debt outstanding on account of loans received by the sovereign under the ‘external

assistance' programme, and civilian component of domestic currency debt. Second, other government debt comprising borrowings from International Monetary Fund (IMF), defense debt component of domestic currency debt as well as foreign currency defense debt. Third, foreign institutional investor (FII) investment in government securities. Generally, countries take loans from private institutions, international institutions and international capital markets. But the cost of credit varies from country to country and over time. The countries with strong macroeconomic fundamentals can access the credit at low interest rates but countries with weak fundamentals can access credit only at high interest rates.

The problem in sovereign debt is that the information on the health of the economy is not completely accessible by the creditors and this creates a moral hazard situation (Basu, 2009). Sovereign debt borrowing is associated with recurrent debt crises, as there is no bankruptcy law exists at international level defaulting country and its lenders usually renegotiate over the reduction of the defaulted debt to resolve a debt crisis. Recent evidence shows that post default debt renegotiations, on an average, results in a forty percent loss for creditors (Yue, 2010).

Sovereign debt and sovereign debt crisis got special attention in the recent times, due to the challenges it posed both to the emerging economies and advanced economies. Especially, emerging economies started facing various challenges. As the advanced economies are caught up in a liquidity trap situation due to "zero bound interest rates", these economies resorted to unconventional monetary policies. The effects of these policies have to be looked from two dimensions. One, the effectiveness in achieving the desired objectives at domestic economy and second, spillover effects on outside world, especially, on emerging economies. Apart from the havoc created by huge capital flows in exchange rate movements in emerging economies, the advanced countries monetary policies are posing challenges to emerging economies by destabilizing international debt markets.

These policies have an implication on the cost of borrowing of emerging economies. Hence, the impact of advanced countries monetary policies on sovereign bond yields and their determinants need to be analyzed empirically. In the present study, the sovereign bond yields of twelve emerging economies are analyzed and an attempt is made to identify the determinants of sovereign bond yields over the period 1980–2013 using panel regressions and panel cointegration techniques. There is no consensus on the determinants of the sovereign bond yields. Some studies found that fiscal variables determine the bond yields for advanced economies, but some found the contrary.

Under the above conditions, Manasse et al (2003) argue that macroeconomic misalignments which are leading to debt crises, however, are still not well understood and this makes the need to predict these crisis episodes inevitable. Predicting sovereign debt crisis through early warning systems is becoming more popular in the recent times. In the present study, an effort is made to predict, whether the emerging economies are prone to sovereign debt crisis or not, by using a logit model methodology.

When it comes to emerging economies different parlance are used in practice. The standard and most accepted definition of emerging economies is the classification by IMF. It classifies all the economies into advanced and emerging and developing countries. From the emerging and developing countries list, the sample countries are identified and selected based on the sovereign debt crisis episodes from 1980 to 2013.

Sovereign debt crisis is defined based on a four-point criteria, which is adopted from the literature. A sovereign is said to be in crisis, when at least one of the following criterion is met. One, if a sovereign goes for restructuring and/or rescheduling on either external or domestic debt repayments or impose a whole moratorium on debt repayments. Two, if a sovereign obtains a large financial assistance package from the IMF above its country quota. Third, if a sovereign accumulates arrears on external obligations toward commercial creditors in excess of 5 percent of commercial debt outstanding or has a rescheduling or restructuring agreement with commercial creditors. Fourth, if

the sovereign missed debt repayments of interest or principal on external obligations vis-à-vis official and commercial creditors in an amount of more than 5 percent of the debt service ratio paid by year end. There are about 67 sovereign debt crisis episodes identified in 27 emerging countries from 1980 to 2013. But due to data non-availability and consistency issues, the final econometric analysis has been done only for 12 countries in the present study.

1.2 Justification and Motivation

Due to the thrust for development and to achieve faster economic growth, almost all the countries are going for heavy borrowings both domestically and internationally. In the process, many counties are piling up large amount of debts and large debt burdens, and may be subject to debt-servicing problems in the foreseeable future. Thus, sovereign debt-servicing difficulties (both of the liquidity and solvency problems) that were severe during the 1980s debt crisis, have become relatively frequent phenomena again in the last decade. The number of crisis episodes are increasing especially with respect to emerging economies. Thus, assessing and predicting debt sustainability and debt crisis itself, is of great importance for various policy purposes.

The participation of emerging economies in the international debt markets is rapidly increasing in recent years. Understanding the emerging economies' bond yields, under the backdrop of financial crisis and “zero bound” monetary policies in advanced economies, is of crucial importance for both policy makers and investors for three reasons. One, the increasing reliance of emerging economies on international debt markets, second, holding of debt issued to emerging economies by large number of investors globally and third, the financial crisis destabilized the international debt markets and sovereign bond yields became more volatile. Under these conditions, the cost of borrowing of emerging economies will have serious implications, which need to be examined empirically.

The present study tries to analyze the challenges faced by emerging economies and exposes the vulnerability of the emerging economies with respect to

international debt markets in the recent times and it tries to estimate the proximate determinants of sovereign bond yields. In the process, it tries to analyze, whether the global economic factors have any role to play in the determination of emerging market sovereign bond yields. Moreover, in the recent times, the recent literature focused mostly on "Euro zone crisis" and to my knowledge, there are no studies which include the recent crisis episodes in emerging economies.

Though the literature on sovereign debt markets is increasing exponentially in the recent times, there is no agreement on the origin of sovereign debt crisis, determinants of sovereign bond yields and the factors that determine the sovereign debt crisis. The present study attempts to assess whether the country is prone to crisis or not. If so, what are the variables which need to be paid attention to avert the crisis? In this way, this study tries to bridge the gaps in the literature and attempts to bring consensus in early warning systems literature with respect to debt crisis.

1.3 Objectives of the study

Given the above arguments and research gaps in the sovereign debt literature, this study tries to analyze the following specific objectives:

(i) To examine the international debt markets from the point of view of emerging economies,

(ii) To examine the issues and debates in sovereign debt markets and challenges in front of the emerging economies with respect to sovereign debt,

(iii) To identify the proximate determinants of sovereign bond yields in emerging economies and

(iv) To develop an "Early Warning System" to sovereign debt crisis for emerging economies.

1.4 Hypothesis

The present study is based on the following three hypotheses. (i) Over the years, due to financial crisis, zero bound monetary policies, the emerging economies are facing immense challenges in international debt markets. (ii) The sovereign bond yields are determined by the domestic macro, monetary policy variables, monetary variables of advanced economies and global factors. (iii) The early warning systems are useful in predicting sovereign debt crisis and macroeconomic, debt and global variables will capture the occurrence of and proneness to sovereign debt crisis.

1.5 Data and Variables

The analysis of stated objectives was carried out by using secondary data. Based on the literature and availability of the data, a required set of variables are identified and used in the estimation models. Initially, 27 countries were selected but due to data non-availability and highly insignificant results, a sample of 12 emerging countries are fully analyzed. The countries which are included in the final sample and are analyzed in the study are Argentina, Brazil, Dominican Republic, Ecuador, India, Panama, Paraguay, Peru, Philippines, Turkey, Nigeria and Venezuela.

The dataset contains 37 macroeconomic, external, financial indicators and global factors. Important variables used in the study are briefly described here. One, among *macroeconomic variables,* gross domestic product (GDP), growth rate of GDP, inflation and domestic interest rates are included. These variables are considered to capture mainly the economic growth aspects. Second, current account deficit, nominal exchange rate, real effective exchange rate, exports to GDP, ratio of import to GDP, trade openness, ratio of foreign direct investment to GDP and forex reserves are important variables under the category of *international trade and finance factors.* Third, among *global factors,* federal funds rate, gold price and international oil prices are included mainly to capture global effects.

The country level data were primarily collected from the world economic outlook (WEO), international financial statistics (IFS) and publications/websites of respective central banks. In the sovereign debt crisis analysis, the crisis definition is an important element. In the present study, crisis episodes and dates are identified with the data provided by Reinheart and Rogoff (2010), Manasse et al (2003), Ciarlone and Trebeschi (2006) and Jeddi (2013), S&P (2014) and World Bank's Global Development Finance database (GDF).

1.6 Methodology

An attempt is made to understand the impact of various global factors on the sovereign borrowing and to determine the proximate determinants of "Sovereign Bond Yields". The study used panel unit root tests, Pedroni (1999, 2004) panel cointegration and dynamic ordinary least squares (DOLS) techniques to analyze the sovereign bond yields. In the panel unit root tests, Levin-Lin- Chu (LLC) and Hadri lagrange multiplier stationarity tests are used which showed consistency for all variables.

Next, the logit model is used for the construction of an "*Early Warning System*" and to predict the occurrence of the sovereign debt crisis. The dependent variable is defined as a binary variable, no crisis period being considered as "0" and crisis period is defined as "1". Here, the aim is to predict the occurrence of the future sovereign debt crisis rather than identifying the past crisis episodes.

1.7 Organization of the thesis

The entire thesis is organized into five chapters. Chapter 3 and 4 form the main chapters of the thesis where main objectives are examined. The first chapter is the introduction chapter. This chapter deals with the introduction of the problem, significance and motivations of the study, objectives, hypothesis, data sources and methodology. Chapter 2 describes the literature on the debt markets and sovereign debt. The literature on the debt markets in general and

sovereign debt in particular has grown exponentially over time. Hence, the whole literature on the subject has been reviewed in the order of issues and problems dealt by the existing studies rather than in a chronological order. This chapter also presents the challenges that the emerging economies are facing in the backdrop of financial crisis and unconventional monetary policies followed by the advanced economies.

Chapter 3 is also an empirical chapter which tries to identify the proximate determinants of sovereign bond yields. Apart from reviewing the specific relevant literature, the chapter presents the methodologies used in the empirical analysis and finally presents the empirical estimations and findings. Chapter 4 is an empirical chapter which constructs an "Early Warning System" to sovereign debt crisis. The chapter presents the specific literature pertinent to early warning systems, logit model methodology which is applied in the study, empirical estimations and finally the findings of the model for sample countries.

Finally, chapter 5 provides the broad summary, limitations of the study and derives some policy implications.

Chapter-2

Issues and Debates in Sovereign Debt Crisis

2.1 Introduction

The sovereign debt becomes special and important compared to private debt due to weak legal enforcement mechanism, sovereign immunity and no collateral. In the case of individual debt, where the debt is issued on the condition upon some form of collateral and the value of debt generally be less than the value of collateral. The idea is that collateral prevents the default and even if the default happens, the creditors have legal right to confiscate the collateral, which have higher value than the debt.

In international debt markets, the lender issues a debt in many forms from bonds to cash generally at some financial centers like New York or London. Any legal issue, which arises, will fall under the jurisdiction of the place of issue of debt. But when it comes to sovereign debt, the lender cannot take up a lawsuit against the sovereign in any court, due to sovereign immunity and attach or confiscate properties that the sovereign own. Moreover, there is no existence of collateral in the first instance and there is no legal frame work which the creditors follow suite to confiscate sovereign properties outside that country. Another issue is that there will not be any seniority structure when it comes to sovereign debt (Bolton and Jeanne, 2009).

In this context, one question comes up. First of all, why do countries issue debt and why can't they resort to printing of notes, which is completely under their control? They cannot for the simple reason that it is artificial and cause inflation.

The issues and debates in sovereign debt literature fall into the following broad categories - historical perspectives, theoretical issues, models of sovereign default, empirical issues of the determinants of debt crisis, empirical studies of the predictive power of sovereign debt crisis, empirical studies of the determination of sovereign bond yields and legal aspects of sovereign debt. A brief discussion on these issues is given below.

2.2 Historical perspectives

The sovereign debt crisis is not a new phenomenon in economic history of the world. The first recorded sovereign default episode dates back to the 4th century B.C, when ten Greek municipalities defaulted to Delos temple on theirs loans (Sturzenegger and Zettelmeyer, 2005). The Reinhart et al (2003) is the seminal study which documents almost all of the sovereign debt crisis episodes in the last ten centuries. According to Reinhart et al (2003), France and Spain has a history of repeated defaults in 16th to 18th century. Portugal, Germany, Austria and Greece defaulted many times during 19th century. In the 20th century, apart from European countries, African and Latin American countries faced severe debt crisis and default episodes. The 21st century began with one of the largest sovereign defaults in the history by Argentina, which accounted to $82 billion dollars (Hatchondo et al, 2007).

Tomz and Wright (2007) identified 106 sovereign country defaults over the period 1820-2004. Kraay and Nehru (2006), another seminal study, identified and analyzed 94 default episodes from 1970-2001. The number of defaults identified by different studies differ to some extent due to lack of universally accepted definition for "sovereign default". In general, the basic case of default is when a debtor nation fails to honor the scheduled payment (either interest or principal). Here, the debtor might have opted not to pay or requested for the rescheduling.

But some studies like Kraay and Nehru (2006) consider the sovereign country as being in default, even if, it receives any assistance from the International Monetary Fund (IMF) or any other multilateral financial institutions for stabilizing balance of payments problems. The underlying idea is that, when a country is facing balance of payments crisis, it will not be in a position to meet its debt obligations in the absence of those support. However, this is viewed in the literature as a more cautious approach, since, the creditors are not suffering in any form. Other important studies with default databases are Detragiache and Spilimbergo (2001), Rose (2005), Pescatori and Sy (2007), Benjamin and Wright (2009), Borensztein and Panizza (2009) and Cohen and Valadier (2011).

Throughout history, not every country has defaulted and at the same time, there are many countries which are "serial defaulters". Many advanced countries and some emerging countries come under former category and many Latin American countries fall under the latter category. Reinhart et al. (2003) comes with the idea of "debt intolerance" to explain this phenomena. According to this theory, serial defaulter countries default even when the debt is at low level due to mismanagement of the debt, which they have borrowed. Hence, the default is more of a structural and habitual psychology of these nations, which borrow to default. But Cohen and Valadier (2011) contradict and argue empirically that no nation is a willful defaulter and desire to default.

2.2.1 Duration and time elements of the crisis

The duration of the crisis has got considerable attention in the literature. Each crisis is different in its origin and determinants. Hence, the exit from the crisis also varies from episode to episode. Now, we need to be clear on, what is or what should be considered as exit from crisis? The default episode is said to have come to fruition, when the full debt payments are repaid or agreed to repay in a specific time frame work or when debt is rescheduled, when the country reenters into financial markets and accesses it.

When it comes to timing of the crisis, as Sturzenegger and Zettelmeyer (2007) and Villemot (2012) argue, defaults befall in clusters and the defaults follow the world business cycle or international financial markets and move in tandem with them. The study further argues that the "lending boom" is created by many African countries independences and oil boom in the Arab world. The huge influx of money is pumped into Latin American and other developing countries between the periods of 1950 to 1980 in the boom period.

The post 1980 has witnessed the "default boom" starting with Mexican default of 1982. But Perkins (2004) argues that some nations conspire against other nations to fail and eventually default by issuing high debt to subprime countries and for unproductive purposes to capture these markets. It is also emerged in the literature that occurrence of default requires much more substantive exogenous and endogenous factors than just global shock or spillover effect, which may show some impact in currency markets.

Capital movements: Lucus (1990) argues that in the perfect international capital markets, the capital moves from abundant countries to scarce countries. Here, the capital moves from developed countries, where the marginal return on capital is low, to poor countries, where the marginal return on capital is high.

2.3 Theoretical issues

Theoretical literature on debt markets in general and sovereign debt in particular has grown exponentially over time. The fundamental questions in sovereign debt literature are, "why countries take debt" and "why countries repay their debts?" A significant part of the sovereign debt literature focuses on these questions and extend the analysis to questions like, "why countries default?", "how the creditors and defaulted countries renegotiate their debts?" and "sovereign debt pricing". The following sections will deal with these questions in a more elaborative way[1]. There are certain theories developed to understand the above questions.

2.3.1 Tax smoothing theory

The tax smoothing theory propounds that government expenditures fluctuate a lot due to various needs of the country. But, government cannot have a fluctuating tax policy, since it will create chaos in the economy and hamper government revenues. Hence, governments end up with deficits or surpluses. To fill the gaps, debt is issued at times of deficit and it will be repaid in the surplus periods. In this manner, government will smoothen the tax revenue and its expenditure. Some empirical evidence is found with respect to developed countries but this may not be true for other countries where, governments operate in a continuous deficits (Alesina and Perotti, 1995).

2.3.2 Debt as inter-generational and intra-generational conflict issue

If the governments in power are self-centric and not worried about inter-generational welfare, it may issue huge amount of debt, which eventually have

[1] Eaton & Fernadez (1995) gives more elaborate review on theoretical aspects of sovereign debt.

to be repaid by the future governments by taxing the future generations. This is similar to the famous "Ricardian equivalence theorem". In the same manner, if the governments have different policy agendas, the successive governments are welcomed with huge debt burdens within the generation era so that next government has very limited scope on fiscal adjustments.

2.3.3 Complete sovereign debt model: Eaton and Gersovitz (1981)

The first complete and standard theoretical model on sovereign debt is developed by the Eaton and Gersovitz (1981). In this model, sovereign is modeled as a representative agent with an exogenous stream of endowment and has a particular level of consumption pattern. The model assumes that entire endowment is used for consumption with no other leakages and agent will maintain that particular level of consumption in all periods. Any gap between the income and consumption is financed by debt. Sovereign issue bonds in a competitive debt market and raise the money internationally.

In this standard model, now, the agent will face a maximization problem. After, the first period, sovereign faces the choice between repayment and default. If it repays, its reputation as a good borrower remains or enhances and will be able to access debt in the second period too. If it defaults, it is permanently excluded from financial markets. Agent will find it difficult to maintain the same level of consumption now and hence, default will have welfare cost. Now, the default decision of the agent basically depends on, whether the welfare cost is more than or less than the consumption pattern. Each period, the sovereign compares the costs and benefits of repayment and decides about default.

Now, the lenders will analyze this threshold where the consumption smoothing and welfare cost default is equal and put an "endogenous credit ceiling" on the sovereign borrowing or decrease the credit supply itself.

Critics: Mainly two criticisms came from Kletzer (1994) and Bulow and Rogoff (1989b)[2]. Kletzer (1994) criticizes the time consistency of the permanent exclusion from financial markets after default. In this kind of situation, both creditors and debtors are worse off compared to a situation in which lending resumes. A lending equilibrium sustained by the threat of a permanent embargo on future lending is not renegotiation proof, in the sense that after a default both parties potentially benefit from reaching a new agreement involving positive lending. But if such an agreement is anticipated, then this undermines the expected punishment that was sustaining positive lending in the first place (Panizza, et al., 2009; Kletzer, 1994).

Bulow and Rogoff (1989b) question the implicit assumption that sovereign has only one avenue for borrowing to smooth consumption in response to output shocks. If other options like storing of output, buying insurance, investing a portion of wealth abroad with the motive to use in exigencies, are available then this will reduce the dependency on debt markets and pose problems for the implementation of "financial exclusion". Under these conditions, in the Eaton and Gersovitz (1981) model, financial exclusion as the main preventive measure for defaults will not be valid.

Introduction of direct punishments: Sachs and Cohen (1982) and Bulow and Rogoff (1989a) and others try to extend the model by introducing the direct punishments by the creditors in case of default.

Collateral damage: Cole and Kehoe (1998) contradict the impact of punishments and propose "collateral damage" theory. The idea is that both debtors and creditors will incur losses due to default so, they try to prevent it. The problems in implementation of complete financial exclusion and imposition of sanctions are explained in more detail at section 2.4.

Structure of the economy: Sandleris (2005), Luis and Kapur (2006), Kapur et al (2007) analyze the defaults on the basis of underlying structure of the economy. Gopinath (2006), Jean and Rochet (2006), Yeyati and Panizza

[2] Sturzenegger and Zettelmeyer (2007) review the theoretical issues and answers related to reputational debt.

(2006) and others developed further models based on the Eaton and Gersovitz (1981). Here the issues like pro and counter cyclicality and output shocks are introduced into the model.

2.3.4 Self-fulfilling debt crises

Self-fulfilling debt crisis is defined as the crisis that is erupted suddenly by self-fulfilling pessimistic views about the ability or willingness of the sovereign debtor to honor its debt obligations. This kind of crisis originates despite the debtor nations fundamentals are being strong enough to meet the credit obligations. In other words, even though sovereign is solvent, the lenders will form pessimistic expectations about the future of the country and deny the new loans or charge high risk premium, which actually fuel a new crisis situation and push a solvent debtor into a self-fulfilling crisis.

The opposite may also happen to the debtor, where the lender may somehow form highly optimistic expectations and offer the credit at low rates. In self-fulfilling episodes, lenders will be highly optimistic at times and there may be times where they are highly suspicious for unknown reasons. The market expectations are guided by some variables which are not related to economics and the literature called them as “sunspots”.

2.3.5 Snowball effect

Calvo (1988) is the first study to analyze self-fulfilling crisis with respect to government debt. The study establish “multiple equilibria” in interest rates for some economic fundamentals. Underlying idea is that lenders reveal their expectations through interest rates. If they ask for normal interest rates, then it means that the country is viewed with sound fundamentals. Here, normal interest rates means the prevailing market interest rates. If lenders demand for risk premium, then high interest payments accumulate and mount up to the point where debts reach unsustainable level just with fear of default. Even the

debtors may default in some cases. This interest rate accumulation eventually, leading to debt unsustainability, is called the "snowball effect".

Cohen and Portes (2006) and Chamon (2007) worked on the way outs to reduce the snowball effect. The first study argues that if lenders and debtors are capable enough to arrive at an efficient debt restructuring in the post default then, there will be zero social cost generated. Later study argues that if rules of the game, the way borrowing takes place, are changed, then multiple equilibria itself is not possible.

2.3.6 Self-fulfilling liquidity type crises

Cole and Kehoe (1996, 2000) argue that self-fulfilling crisis can occur due to liquidity issues. In a given setup, it is an n-time game, where the government borrows from international debt market players and decides whether to repay or default at the end of each period. The debt issued also have a one period maturity. The government cannot repay the whole debt at once so, the debt will be refinanced and then roll over to the next period. Under these circumstances, if the country gets some shocks or faces a situation where it cannot access the debt markets then sovereign will face "liquidity crisis" and it will default with high probability. This is also a kind of self-filling crisis, because, if investor's sentiment becomes pessimistic about the country for whatever reason, then investors will stop refinancing and rolling over the debt and they push the country towards default.

This model is true with only very small maturity periods. As average debt maturity time increases, the governments will find some alternatives and prevent the default. In that case, the self-fulfilling liquidity crisis will disappears. Cole and Kehoe (2000) also confirms this. Chamon (2007) argues that the failure to bring coordination among the lenders may make the "debt run" relevance in sovereign debt crisis.

2.4 Empirical issues: Sovereign debt issue, repayment and default

2.4.1 Characteristics of sovereign debt

Due to advancements in technology, innovations in financial markets and needs of the creditors, the characteristics of sovereign debt have dramatically changed over time. Several concerns are there in the total amount of debt issuing, type of lenders, type of debt instruments and the currency in which debt is issued.

Type of lenders: Unlike in the past, the international debt markets have opened up many new avenues for borrowers. Apart from the banks and governments, now the sovereign borrowers can issue different kinds of bonds and also approach private investment and insurance firms. In the post Bretton Woods system, by looking at the experiences of the Latin American countries, the emerging economies adopted an inward looking approach, where, debt is raised domestically wherever is possible and also issued in domestic currency (Reinhart et al, 2003). As a result, domestic debt markets in the emerging economies have fully developed but secondary debt markets in these economies is yet to develop fully.

Type of debt instruments: Historically, bonds dominated the debt market over centuries and it is still one of the main instruments of debt issuance. In the post-world war II, many changes occurred in debt markets. The establishment of United Nations, International Monetary Fund, World Bank led to a new form of debt facility, concessional loans, to poorer countries. These loans essentially involve, low interest rates or some percentage of grants and usually, will have longer maturity period along with smaller repayment installments.

The heavily indebted poor countries (HIPC) initiative, which was started by G7 countries based on the proposal from the World Bank and International Monetary Fund in 1996, is one of such programs where the poor countries receive loans at concessional rates.

Next, credit requirements of the debtor's sky rocketed due to huge development projects. In many of the occasions, the amount required is so big that an individual lender alone cannot lend and to diversify risk a consortium of banks will issue the debt as "syndicated loan".

Credit default swaps (CDS) are another innovation in the debt markets. CDS are agreements between the parties to transfer the credit risk of a particular debt obligation. The sovereign credit default swap (SCDS) is one variety of this class, where sovereign debt is the "reference entity". But as of now, SCDS is not very popular and the share of SCDS in the total sovereign debt market is very minimal.

2.4.2 Debt composition

Debt composition is mainly consists of different debt instruments used, maturity periods and denomination of the currency, in which the sovereign debt is borrowed. Countries borrow from different avenues by using different debt instruments. Debt can be issued in any currency but the debt issued in domestic currency and foreign currency will have different effects on the sovereigns. Domestic currency debt is easy to repay and settle, if defaulted. The negative consequence of domestic debt is inflation. When it comes to debt issued in foreign currency, a country faces exchange rate risk.

Surprisingly, Eichengreen, Hausmann (1999) found very little evidence on the relationship between debts issued in foreign currency and inflation and currency volatility. Eichengreen, Hausmann and Panizza (2005), found that developing countries debt is almost fully issued in foreign currencies, whereas for advanced countries 70 to 90% of the debt is issued in foreign currencies. Dias, Richmond and Wright (2011) found that countries borrow debt in a large set of different currencies but almost 90% of the debt is issued in five major world currencies, namely, Dollar, Yen, Euro, Special Drawing Rights (SDR) and Deutschmark. Among these five currencies, undoubtedly, Dollar dominates the international debt markets with almost 70% of total debt is issued U.S. dollars.

2.4.3 Sovereign debt maturity

The theoretical models like Eaton and Gersovitz (1981) analyse the debt with maturity of only "one period". But in reality, sovereign debt is issued at a range of maturities. Cole and Kehoe (1999; 2000) and Chang and Velasco (2000) found that as the percentage of short term debt increases in total debt, the countries will be more vulnerable and prone to "liquidity crisis". Rodrik and Velasco (1999) found that the majority of the debt crisis occurred in 1990s were due to short term debt maturities and liquidity problem. Arellano and Ramanarayanan (2012) found a corollary result with respect to maturity and crisis relation. The study analysed four emerging market economies and found that debt maturities tend to shorten during sovereign debt crisis. The duration of maturity shorted by about one to two years due to crisis.

Based on the data from Dias, Richmond and wright (2011, 2012), Tomz and wright (2013) computed different maturity measures for a large set of low and middle income countries for the year 2000. The study found that the "contractual maturity", defined as the data of the last principal repayment, varied from ten to forty years. Broner, Lorenzoni and Schmukler (2010) also found similar range of maturity periods for a large set of countries.

2.4.4 Sovereign default: costs and benefits

Defaults will be costly for both creditors as well as debtors but not in the same manner. According to Cruces and Trebesch (2011), Benjamin and Wright (2009) and Moody's (2008), on an average, the creditors will lose about 40% of the debt in the post default renegotiation process.

The costs that the debtor incur, are more difficult to understand and complex to calculate. The costs depends on the circumstances and motives at the time of default. When a sovereign government decides to default, it recognizes that such an action may have adverse consequences for the domestic economy, specifically for the domestic financial sector. On the other hand, default may advance consumption due to reduced repayments to foreign lenders. The optimal decision of the government balances costs of default against its

benefits. The government should also take into consideration about the impending defaults and increased cost of credit due to the loss of credibility in the event of default. Default affects the domestic economy and both domestic and foreign creditors of the government suffer losses on their holdings of government debt.

The empirical studies found that sovereign defaults directly affect growth. Borensztein and Panizza (2009) found that, on an average, sovereign default will reduce growth in the range of 1 percent to 1.2 percent annually. In similar lines, Chuan and Sturzenegger (2005) measured that sovereign default will reduce the economic growth of the country around 0.6 percentage points annually. It will have more impact, around 2.2 percentage points, on domestic economy when it is accompanied with banking or currency crisis (Sturzenegger and Zettelmeyer, 2005; De Paoli et al, 2006).

Now, what are the factors which prevent sovereigns to default, knowing that there is no legal enforcement? It is found that, reputation, sanctions, exclusion from financial markets, political and financial factors have been identified as the main enforcement mechanisms of debt repayment.

"Reputations" and "sanctions" were the focal points in the sovereign debt literature in explaining the defaults. In their pioneering work on reputation models, Eaton and Gersovitz (1981) argue that a country's incentive to make repayments is to preserve its reputation as a good borrower. In their model, the country uses international capital markets to share its income risk, but default causes a permanent stigma and exclusion from the markets[3].

In the second approach, the country's debt repayment motive comes from the creditors' threat of direct sanctions. In particular, Bulow and Rogoff (1989) argue that direct default punishment is necessary to support international debt when cash-in-advance contract is available. Sachs and Cohen (1982) and Cole and Kehoe (2000) also assume direct default cost in analyzing the sovereign debt crises.

[3] Grossman and Van Huyck (1987), Atkeson (1991), Cole and Kehoe (1998), Kletzer and Wright (2000), and Wright (2002), expand other aspects of reputation mechanism in debt repayment.

There are different types of sanctions that the creditors can resort to prevent possible default or as a punishment in the post default. The sanctions include diplomatic pressures, trade embargo, legal actions, freezing of foreign assets and finally the extreme option of military action.

Here, the assumption is that creditor is powerful, if not, his government is, which enters into foray, take up the cause, impose sanctions, and bring justice to the lender. Again, in reality, if the lender is a private firm or bank, the state intervention is rarely expected and lender will have very less power to impose sanctions.

The degree of impact of trade embargo depends on the extent to which the default country depends on imports and exports and as mentioned above, the power of the lender or his country to impose sanctions. The intensity of sanctions will increase as the openness of the economy increases. Rose (2005) and Borensztein and Panizza (2009) found significant evidence of trade sanctions on the debt renegotiation.

When it comes to financial exclusion, in principle, the defaulted country will automatically be excluded from financial markets. This may happen for two reasons. One, the creditors may unanimously exclude the defaulter to teach a lesson. Second, the old lenders may not show interest in lending to the defaulter and other players may fear of no repayment in the future and exclude the defaulter.

But in reality, as some studies argue, it may be difficult to implement exclusion for practical reasons. Basically, when the sovereign defaults, till what time the market excludes it is the question. The answer is, till the country exits from the crisis. The exit from the crisis is generally considered, when the defaulter is able to access the credit markets. But, markets do not allow till the exit is announced. Second, given the mammoth size of the global debt market, it is hardly possible to form coordination among all the lenders.

Gelos er al (2011) and Alessandro et al (2011) found that the exclusion does happen in the immediate default period but as time passes, exclusion will not be as rigid as in the beginning of default. In most of the default cases, especially after 1990, the defaulters reentering into the financial markets after

4 to 6 years without much difficulty. Moreover, the default stigma was not found after reentering. Once the country reenters into the market, whether the country is able to access credit at normal rates or whether market plays a witch hunt on the default history countries by charging high interest rates is one of the concern.

Yes, the defaulted countries are able to access the market but at higher cost of credit around one percent (Dell' Arriccia et al, 2006) and it will take around two to three years' time for this effect to erode completely (Borensztein and Panizza, 2009).

There is no conclusive evidence on the role of political factors in the sovereign default decision and it is difficult to incorporate the representative political factors which can explain default. However, different kind of political factors which are a kind of random shocks to the system, like revolutions, regime shifts or calamities and other similar events are discussed under the topic of "odious debt".

2.5 Odious debt

A kind of debt that attracted the recent literature but mostly theoretical is the odious debt. The basic idea is, in this highly volatile world and unstable governments, where the life span of the political regimes is so small and the new governments or regimes who take over the power do not honor the debts incurred by the old regimes. Rasmussen (2007) reviews odious debt in detail.

According to Olivares and Caminal (2009), most sovereign assets held outside a sovereign debtor's own jurisdiction are protected by sovereign immunity or other legislation. Protected assets include diplomatic missions such as embassies, payments to and from multilateral organizations such as IMF, central bank reserves, military assets. IMF's proposal to create a "statutory framework for sovereign defaults" did not materialize due to opposition from both LDC's as well as advanced nations. The UN is preparing a "voluntary

guidelines on sovereign debts and defaults" but it is still in nascent stage (Abbas et al, 2014).

However, all these papers assume that a country either fully repays its debt or defaults completely, incurring the default penalties but ignores the manner in which a debt crisis is resolved. Thus renegotiation plays an important role in the country's default decision. In this light, the literature focused on the debt renegotiation is presented below.

2.6 Sovereign debt renegotiation

The literature on sovereign debt renegotiation analyzes the impact of debt renegotiation on international lending and borrowing. Bulow and Rogoff (1989) present a theoretical model of sovereign debt renegotiation in which direct sanctions are lifted through a constant bargaining. Fernandez and Rosenthal (1990) study debt renegotiation by assuming that borrowing nation gains enhanced future access to capital markets when the renegotiated debt is repaid in full. Yue (2010), Bi (2008) and Benjamin and Wright (2009) develops a model of endogenous default where the lenders and the sovereign debtor enter into a Nash bargaining after a default. Recent literature focuses on the implications of several proposals about the reforms of sovereign debt renegotiation process, like collective action clauses (CACs) and sovereign debt restructuring mechanism[4].

In the case of Argentinean debt crisis of 2001-05, 60 percent of the defaulted debt was held by domestic residents. The banking system became insolvent. Output fell by 3.4 percent in 1999. After the default, it fell by 4.4 percent in 2001 and 10.9 percent in 2002, but, of course, not all the output costs in these default episodes arose from the default decision.

[4] Eichengreen, Kletzer and Mody (2003), Weinschelbaum and Wynne (2003) and Bolton and Jeanne (2004)

2.7 Sovereign debt pricing

The question of sovereign debt pricing is analyzed by Gibson and Sundaresan (2001) and presents a model of sovereign debt valuation with endogenous default risk and restructuring risk in a static borrowing framework. Arellano (2008), and Aguiar and Gopinath (2004) explore the connection between endogenous default, interest rates and income fluctuations in a dynamic model. However, their models are less successful in explaining the high default frequency and large interest rate volatility in Argentina.

Growth linked debt bonds: Shiller (1993) presents an analysis of the benefits of having developed financial markets for bonds with payments linked to the level of GDP as a way to hedge against macroeconomic risks in a closed economy setup. The same idea is extended to the open economy literature by Williamson (2005). The study analyzes the benefits of having access to "growth indexed bonds" that could be traded in international financial markets as a way to reduce the probability of sharp reversals in capital flows.

2.8 The issue of "debt overhang"

The idea of "debt overhang" is proposed by Sachs (1989), which essentially points out the negative consequences of excessive external debt accumulation by states in isolation, leaving the dangers of debt crisis and defaults. When the country borrows, it has two options, one, use it productively, which generates future revenues for repayment. Second, use it for consumption or in an unproductive manner, which does not generate any future revenues. In the case of unproductive usage, government will have three options -repayment through new borrowing, repayment through reduced government expenditure and finally default.

The new borrowings to repay old debts will further escalate the debt stock, which forms the basis for debt crisis. If government expenditure is reduced it will seriously affect the growth and welfare of the country. In a way, by very nature, debt has a crowding out effect on public investment, because if the

resources are transferred to creditors. In this context, Krugman (1988) came up with the “debt laffer curve”.

2.8.1 Debt laffer curve

Krugman (1988) analyzed the relation between debt repayments to tax on the economy. Debt laffer curve explains the relationship between face value of outstanding debt and market value of debt in the form of expected repayments. It is found that at low levels of debt, both face value and market value are at the same level. When face value is increased, market value increases but on par with the face value, since now some element of uncertainty of repayment popes in. But once the face value of debt crossed some threshold limit, which may vary from country to country, the market value will start decreasing. This means, as the debt burden is added, country's sensitivity towards debt repayment reduces.

The Villemont (2014) explains that this theory is instrumental in starting the Heavily Indebted Poor Countries (HIPC) initiative in 1996, which reduced the external debt of heavily indebted countries in a significant proportion. The empirical tests by Cohen (1993) confirms the investment crowding out due to debt overhang effect. The study found that around 0.3% crowding out of investment due to the debt repayments to foreign creditors. Imbs and Ranciere (2005) also found evidence for the debt laffer curve.

Pattillo et al (2011) and Ruiz-Arranz et al (2005) are some of the studies which tried to identify the debt threshold and how debt dynamics will operate and effect the growth above this threshold level. Threshold level is found at around 35 to 40 percent level. But, there is no effect of debt on growth both at low levels of debt and at high levels of debt.

Presbitero (2008) goes much beyond debt- growth nexus and incorporate quality of institutions into the model. It basically argues that no meaningful economic analysis can be analyzed in countries with weak institutions.

Depetris et al. (2005) argue that it is a futile exercise to analyze debt –growth relation since they suffer from serious endogeneity problems.

2.9 Legal aspects of sovereign debt

As we have discussed in the introduction, the "sovereign" enjoys certain special privileges in dealing with debt. Here, we are looking at these aspects from the point of view of their origin and usage.

2.9.1 Principles protecting sovereign debtors- sovereign immunity: Sovereign debtors are historically been protected under "the principle sovereign immunity". According to this law, sovereigns cannot be prosecuted in foreign courts without their consents. This principle is derived from the equality of sovereign nations under the international law. Legal persons of same stature cannot have their disputes settled in the courts of one of them (Brownlie, 2003). The immunity is waived when the sovereign enter into a contractual agreement, in which, it voluntarily submits to the authority of a foreign court in the event of dispute (Panizza et al, 2009).

The absolute immunity doctrine till recently was applied even to commercial transactions between foreign states and private individuals from another state. But in the post-world war II, absolute sovereign immunity is questioned. Then comes the "restrictive theory of sovereign immunity". The Foreign Sovereign Immunities Act (FSIA) which is passed in 1976 by the USA is the basis for the above theory. This act allows private parties to sue a foreign government in U.S. courts if the complaint relates to commercial activity. The United Kingdom adopted similar legislation in 1978 and many other countries have followed suite (Buchheit 1986, 1995; Brownlie 2003).

The new legislation calls for clear definitions for the two questions: one, what is a commercial transitions? Second, who is a sovereign within the terms of a foreign sovereign immunity law?

According to the new law, the sovereign is broadly defined as all the agencies and instrumentalities of a sovereign. Next, though no special definition is not given for commercial transaction, the repeated court rulings confirm that issuing of sovereign bonds comes under commercial transaction.

2.9.2 Attachment proceedings: Even though, the power of "immunity law" comes down, but it still shields the sovereigns against "attachment proceedings". That means, diplomatic missions, central bank assets, including international reserves are typically immune from attachment.

2.9.3 The "act of state", which essentially, states that the courts should not judge the validity of a foreign sovereign's acts committed on its territory.

2.9.4 International comity: According to the USA Supreme Court in 1895, the international comity is defined as the recognition which one nation allows within its territory to the legislative, executive or judicial acts of another nation.

Due to all above changes, the legal protections of sovereign from court action by creditors were significantly reduced by 1980s. There was an explosive, court cases filed against many sovereigns in the courts, mainly in the USA, but not all are successful. New form of firms came, with sole motive of buying the defaulted debt at a discount and by taking up legal battle, they try to extract the money from the debtors. These new firms are known as "distressed debt funds" or "vulture funds".

2.10 Policy proposals: Debt resolving mechanisms

There are many efforts to reduce the costs of the crisis from the early 1970s till date. In this context, many proposals are put forward from time to time but unfortunately many of them never materialized at all in practice. The proposals primarily try to identify the inherent inefficiencies in debt issue and repayment agreements and propose the ideal mechanisms to follow in the future (Rogoff and Zettelmeyer, 2002).

2.10.1 International Debt Commission: This Commission was proposed by the G-77 developing countries at Arusha meeting in 1979. The proposed commission consisted of experts in the debt related issues and economics of development. The primary functions of the commission were as followed: one, to examine the debt and development of the troubled country. Second, to make recommendations for possible way outs by way of debt reorganization and if needed by providing additional finance through bilateral and multilateral organizations. Third, to convene a meeting of all concerned parties and find the ways to implement the suggested plans in a win- win situation. The Debt commission never came into existence due to strong resistance from the advanced economies with fear of losing money in the form of debt reductions (Rogoff and Zettelmeyer, 2002).

The Oechsli (1981) found the applicability of the provisions in the "Bankruptcy Reform Act of 1978" to resolve the debt crisis and proposed a three way mechanism consists of a creditor and debtor committee, an independent examiner and a formal initiation procedure. The IMF is expected to be the independent monitoring party.

2.10.2 Market based mechanisms and international debt facility: There are two such major policy initiatives, which basically proposed to solve the debt crisis of the 1980s. One, market based mechanisms for debt reduction. The "debt overhang" argument was the main reason behind market based debt restructuring or reduction plans[5]. Here, the country with high debt levels will take up an initiative in reducing the debt levels by purchasing back some debt at discounted prices, bank loan swapping for domestic currency, which may be reinvested in domestic equity (this is something called "debt- equity swaps"), exchanging debt for "exit bonds" which charge lower interest and have low principle. Market based plans became popular in the late 1980s and were adopted by many countries like, Bolivia, Brazil, Chile, Argentina, Mexico etc. (Cline, 1995).

[5] The market based debt reduction is an initiative taken by the debtor country itself but restructuring a defaulting country's debt is taken care by Brady plan, 1989. The Brady Plan (1989) solved the sovereign debt crises of the 1980s by converting bank claims into Brady bonds.

Some problems were identified with these plans. One, some studies like Bulow and Rogoff (1988b), Dooley (1988 and 1989) and Bulow and Rogoff (1991) argued that the gains originated from market based restructuring mostly benefited creditors only but not debtors. Second, the uncoordinated creditors pursued their self-interest policies which benefit them the most. In the process, free rider problems like unilateral debt forgiveness or secret negotiations diluted or reduced the efficient outcomes of these plans. Third, creation of an official "International Debt Facility".[6] The idea underlying here is that the facility would buy the debt, which is at defaulting mode, at discounted prices and give relief to the debtors.

2.11 International Monetary Fund (IMF) proposals

There are several proposals put forward by the IMF from time to time but very few were actually implemented. One such notable proposal was by Debevoise (1984), which proposed to give legal protection to debtors by using the Article VIII, Section2 of the IMF Articles. According to this, no member should do any international payments or transfers without the approval of the fund. Cohen (1989) argued for the creation of "International Debt Restructuring Agency" (IDRA) through a multilateral convention. This will function, in practice, as the joint subsidiary of the IMF and World Bank.

Next, the first deputy director of IMF, Anne Krueger (2001) proposed a new comprehensive "sovereign debt restructuring mechanism" hope to bring drastic changes in debt practices across the globe. These proposals have some roots in the proposals made by Sachs (1995), who portrayed the role of the IMF as an "international bankruptcy court". Basically, these proposals tried to introduce a bankruptcy type "sovereign debt restructuring mechanism" (SDRM) for defaulting countries, which essentially, focused on making the debt renegotiation process faster and smoother. These would have also mitigated creditor coordination failures.

[6] Corden (1989) and Kenen (1990) gives an extensive analyses on the "International Debt Facility".

Dooley (2000) and Shleifer (2003) cautions that these proposals of reducing sovereign default costs may be counterproductive by way of increasing costs of borrowing, reducing market access and hence presumably lowering welfare ex ante. In this context, Panizza et al (2009) asks, whether costly crises are simply the inevitable byproducts of the enforcement problem.

The enforcement problem does not make the crisis costly as long as the creditors have the full information about the debtor. Here, all the default deterrent and punishment mechanisms will be at debtor's disposal and these will be used wisely at the "Non- excusable debt crisis" situations. "Excusable and non-excusable debt crisis" indicates the default at good times and bad times respectively.

But in reality, the information will not be complete and defaults do happen creating huge costs. So, how to minimize the costs through policy and institutional reforms is a much larger question.

Unfortunately, the IMF's proposal to create a "statutory framework for sovereign defaults" did not materialize completely due to oppositions from both less developed countries (LDCs) as well as advanced nations. The UN is preparing a "voluntary guidelines on sovereign debts and defaults" but it is still in nascent stage.

There is still weak legal mechanism that exists with respect to sovereign debt, which actually can be enforceable against debtors in cases of default. Due to the bitter lessons learnt over time dealing with the sovereign debt, the creditors have now added some new clauses to the agreements. Bradley and Gulati (2012), Choi, Gulati and Posner (2012) and Tomz and Wright (2013) document some of the latest developments.

2.12 Collective action clauses (CACs) and sovereign debt restructuring mechanism (SDRM)

Collective action clauses in sovereign bond contracts are majority renegotiation clauses, under which the changes endorsed by a specified majority of bond holders are binding on all bondholders. Sovereign Debt Restructuring Mechanism is a statutory code proposed by IMF[7]. Collective action clauses (CACs) and the sovereign debt restructuring mechanism (SDRM) are both intended to address collective action problems and enable orderly debt restructuring through a qualified majority voting by creditors.

2.12.1 Collective action clause

Under the collective action clause, the majority of stake holders can collectively negotiate with the defaulting debtor and reach an agreement, which can be imposed on all the creditors. The majority voting feature helps shift decision making on a debt restructuring to creditors as a group to reflect their collective will, rather than from creditors to the debtor. The key difference, however, between CACs and the SDRM is that voting under the CACs is achieved on a series by series basis while the SDRM contemplated aggregated voting across all debt instruments covered in a restructuring.

CACs enable a competent majority of bondholders (generally 75 percent of the outstanding principal) to bind all bondholders within the same issue to the financial terms of a restructuring, either before or after a default. The problems involved in this kind agreements are mentioned below.

One, a single creditor may not agree with collective action and might "hold out" and in some cases, one or some creditors try to claim the whole assets or money that the borrower is ready to offer. Second, even if all the creditors agree for a collective action, they may still pursue their individual efforts to

[7] See Roubini and Setser (2004) for more details.

get their debts back. In that sense, the collective action cannot ban the individual efforts outside the agreement.

2.12.2 Proposed features of sovereign debt restructuring mechanism by IMF[8]

The sovereign debt restructuring mechanism (SDRM) needs 75 percent of the outstanding principal of verified claims ratify a restructuring agreement on an aggregated basis, thereby binding all affected creditors. Under the SDRM, based on the request or appeal by the active member and after the approval of members who control 75 percent of the aggregated outstanding principal, a temporary suspension would become effective for all legal actions brought by creditors. Some features are mentioned below.

Activation and scope of claims: The SDRM would be activated only at the request of an active fund member, who must exemplify that the debt to be restructured is beyond sustainable level. This is applicable to all external claims, not just international sovereign bonds.

Creditor committees: In order to encourage active and early creditor participation, a representative creditors' committee is advisable to form and this committee, would be given a role under the SDRM to address both creditor- debtor and inter-creditor issues. But, the costs associated with the organization of the committee should bare by the debtor.

Priority financing: In the process of negotiations, if the need arises for inducing new financing, a specified financing transaction could be constituted. The contributions for this transactions can be decided by the creditor committees. This new financing may be excluded from the restructuring, if approved by 75 percent of the outstanding principal of verified claims.

Termination: The termination of SDRM is automatic upon the certification of all restructuring agreements. In exigencies and non-coherent situations, it can

[8]International Monetary Fund (2013), "Sovereign Debt Restructuring —Recent Developments and Implications for the Funds Legal and Policy Framework".

be terminated by issuing a notice by the activating member. Lastly, it can be terminated, if at least 40 percent of verified claims wish to terminate, after completing the registration and verification process.

Independent dispute resolution forum: The IMF's Managing Director would constitute a specialized panel of judges or a group of private practitioners who would in turn select the judges, who will be part of the SDRM, when activated.

The forum would be established mainly to verify claims, adopt rules concerning the voting process, declare restructuring agreements, append legal proceedings, and adjudicate disputes.

2.12.3 Other clauses:

Some of the other clauses include (a) engagement clause, (b) aggregation clause and (c) pari passu clause. The engagement clause facilitates the creditors to form a representative groups to negotiate with defaulted sovereigns. The aggregation clause facilitates all creditors of the defaulted sovereign, irrespective of the nature and maturity of their credit to sovereign, to come together and negotiate the debt restructuring. The pari passu clause puts an obligation to the sovereigns to treat all creditors equally. This clause, which was not in existence prior to 1981, is now added in most of the new debt contracts.

2.13 Twin crisis phenomenon

The one issue surrounding the sovereign debt crisis, which needs more greater enquiry is the so called "twin crisis". There is an abundant literature and consensus on the occurrence of banking and currency crisis.

But, nexus between banking and debt crisis and on the other hand, currency and debt crisis is yet to be established sturdily. Reinhart (2002) found the

causality and co-integration between the sovereign defaults and currency crisis but there are mixed results on the reverse causality from currency crisis to sovereign default.

The high volatility in the currency markets may create a liquidity crisis for the sovereign, even though otherwise there is no solvency problem. The risk will be more in cases where, the percentage of debt issued in foreign currency reaches peak levels.

The eruption of debt crisis at once will create panic in currency markets and disrupt banking operations, due the strong link between currencies and banking crisis, this many turn into "triple crisis" and debt crisis of solvency type. Because, as Laeven and Valencia (2012) study found that banking crisis will have large and prolonged output losses, which intern effect the growth rates, government revenues, government debt levels and finally repayment capacity depending on the degree of banking intensity in the economy. On the other hand, Borensztein and Panizza (2009) found that defaults increased the probability of occurrence of banking crisis by 11 percent.

Laeven and Valencia (2012) also spotted the occurrence of majority of the debt crisis within three years of banking or currency crisis or both. Dreher, Herz and Karb (2004) and Bauer, Herz and Karb (2007) try to find the determinants of debt and currency crisis separately and then tested correlation between the two models. The studies found significant contagion effects in similar lines with Laeven and Valencia (2012).

2.14 Samaritan dilemma

After a through theoretical, empirical and legal aspects of sovereign debt, now it is important to have a look at different side of the debate. This is more of a physiological approach to debt, charity and human behavior, which is the element the above approaches gave a miss. To put it simple, it tries to explain, how a country or an individual person behaves under different economic situations to maximize his or her welfare.

The “Samaritan’s dilemma” explains that a country or person will act in one of two ways to maximize his consumption or welfare: using the charity to improve their situation, or coming to rely on charity as a means of survival. The original idea of Samaritan’s dilemma propagated by Buchanan (1972), where he argued that this dilemma reflects characteristics of modern welfare state. The number of people living on transfers have increased dramatically. As Lindbeck, Nyberg, Weibull (1999) argue that the benefits in the modern welfare state are the prime reason for undermining the incentives to work. Elinor Ostrom (2013) and others worked on the Samaritan dilemma and extended the individual behavior to sovereign nations. The dilemma is mainly used in the debates between the merits and demerits of debt vs. charity.

2.15 Summary

This chapter provided the review of literature on the sovereign debt and sovereign debt crisis. Various theoretical and empirical issues are analyzed with the motive to trace the growth of literature over the period of time. **U**nder the theoretical issues, tax smoothing theory, inter-generational and intra-generational debt issues, complete sovereign debt model, Eaton and Gersovitz (1981) and self-fulfilling crises are discussed. Under the empirical issues, sovereign debt issue, repayment, default characteristics of sovereign debt, debt composition and sovereign debt maturity are analyzed. Finally, the legal aspects of sovereign debt and ‘debt vs. charity issue’ are also briefly discussed.

Chapter-3

Determinants of Sovereign Bond Yields in Emerging Economies

3.1 Introduction

Historically, sovereign market bonds have been the major source of financing to emerging economies for various developmental activities. However, sovereign bonds are influenced by various global and domestic shocks and market sentiments. Hence, countries had to borrow under very volatile conditions. There was a time, people talked about "decoupling", but, in a globalized world, as long as countries take part in international debt markets, the cost of borrowing will be effected by the global shocks and hence, its growth.

According to Calvo (2002, 2005), with international financial integration, emerging market economies have become more vulnerable to exogenous shocks coming from global capital markets, which is referred to as the "globalization hazard". In the backdrop of global financial crisis, as the advanced economies caught up in a liquidity trap situation due to "zero bound interest rates" and due to unconventional monetary policies, the emerging economies started facing various new challenges.

The effects of these policies are basically in the form of huge capital flow movements and spillover effects on asset, currency and debt markets. Apart from the havoc created by huge capital flows in exchange rate movements in emerging economies, the monetary policies pursued by advanced economies posing challenges to emerging economies by destabilizing international debt markets. In the international debt markets, the vulnerability of emerging economies are translated into the higher borrowing costs, shorter maturity periods and there is also less liquidity in the market as a whole. In this context, there is a need to identify the factors which determine the sovereign borrowing and their bond yields.

Given the above issues surrounding the sovereign bonds, the study tries to identify the determinants of sovereign bond yields in the emerging economies in the recent times. The impact of US monetary policies and other global factors on sovereign bond yields and their determinants need to be analyzed empirically. The sovereign bond yields of twelve emerging economies are analyzed and tried to identify the determinants of sovereign bond yields over the period 1980–2013 using panel unit roots and panel cointegration techniques.

This chapter is organized into different sections in the following way. First, in section-3.2, the issues and debates surrounding the sovereign bond markets and cost of borrowing are explained. Then in section-3.3, the spill-over and volatility effects faced by the emerging economies are explained. In section-3.4 and section-3.5, data and variables and methodology are explained. Section-3.6 explains the empirical estimations and the summary of the chapter follows.

3.2 Sovereign bond markets and cost of borrowing

Sovereign bond market is one such place, where governments issue bonds and raise funds. Sovereign bonds have been traded on international capital markets for centuries. These bonds can be off either local currency denominated or denominated in a foreign currency. The cost of borrowing of the sovereign is strongly related to countries credit risk. The bond "yield" and "yield spread" and collateral debt swap (CDS) and CDS spreads are used to measure the credit risk of an economy. But yields are the best tool to capture the absolute change (Tomz 2007, Cruces and Trebesch 2012).

The "yield" is generally defined as the ratio of the nominal interest rate to the market price of the bond. In general, the "price" that the sovereign pays reflects the market expectations and risk towards a sovereign. Similarly, in the case of domestic bonds, the credit risk of the country plays a significant effect in determining yields in the long run.

In the emerging economies, in particular, long-term government bond yields have become increasingly more dependent on global conditions. The availability of global savings has made the price of these securities (and hence yields) increasingly dependent on global investors' preferences, while country specific risk factors have been playing a more limited role (Kumar and Okimoto, 2009). This means that factors such as global risk appetite, savings, interest rates and investment have become more important in pricing of longer debt maturities with the result that cross-country correlation of long term government bond yields has improved over the last two decades. On the other hand, national deficits, debts and other country specific factors would still be expected to play a role.

Researchers have tried to examine why yields vary across countries and over time. First of all, we need to remember that all bonds are not the same in nature. In the sense that sovereign bonds differ in type of issue, interest charged, currency denomination of the issue, maturity periods, repayment options and exit options. So, the yield, which is calculated for given sovereign is an average value. There are various factors found responsible for the differences in yields and these are discussed briefly in the following.

Defaulted history: The studies found that countries with defaulted history will pay higher yields than non-defaulted countries. The risky countries issue bonds at discount rate so that their bond prices should rise and the yields should come down over time automatically.

The gold standard: The question arises, how the economic, political and institutional factors affect the cost of borrowing. Bordo and Rockoff (1996) analyzed the influence of the gold standard on borrowing costs among a group of ten economies. It is found that countries with gold standard paid less, around 30 to 40 basis points, then countries without gold standard. Obstfeld and Taylor (2003) also came with the similar results by studying twenty countries. The gold standard will increase the confidence of the investor or lender, as it will have a backup of gold to a certain percentage and the economy will also be running in a much prudent manner.

The colonial delight: The colonies and former colonies found to be treated better in London, one of the major financial centers of the world. As Ferguson and Schularick (2006) found that British colonies could able to borrow at far lower rates compared to non-colonies at London. The reasons may be that the lenders saw the transaction as domestic rather than foreign.

Fiscal management: Ardagna (2009) analyses the behavior of government and corporate bond yields in times of large changes in the fiscal position for the OECD countries from the period 1960 to 2002. The study found that ten year nominal yields on government bonds increased by more than 180 basis points during years in which the primary fiscal deficit widened by more than one and half percent of GDP in one year or else 1 percent of GDP per year in two consecutive years.

Kinoshita (2006) developed a theoretical model to study the nexus between sovereign bond yields and government debt. The study tested the model on a panel of 19 advanced economies and found that a one percent increase in the debt-gdp ratio increases the real long term sovereign bond yield around two to five basis points. The results are in conformity with the earlier studies by Laubach (2009) and Engen and Hubbard (2004), which found the impact to be around three to five percent. Hauner and Kumar (2009) try to resolve the ‘‘conundrum’’ of low government bond yields and high fiscal imbalances observed in G-7 advanced economies in the aftermath of the crisis. Poghosyan (2012), Kumar (2010) found that fiscal variables determine the bond yields for advanced economies.

But Faini (2006) and Knot and De Haan (1995) found the contrary. Faini (2006) studies the case of 10 Euro area countries for the period 1979–2002. The study finds that public debt has no significant impact on long-term government bond yields in individual country regressions, but its impact becomes significant for the 10 Euro area countries as a whole. Knot and De Haan (1995) arrive at a similar conclusion using a sample of five European countries. So, there is no consensus on the determinants of the sovereign bond yields.

Monetary policies: International effects of unconventional monetary policy on foreign asset prices contributes to a rapidly growing empirical literature that evaluates the financial transmission of unconventional policy measures. Much of this research focuses on the question of whether purchases of large quantities of treasury coupon securities by the fed impacted the level of longer-term treasury yields. Employing a variety of approaches, Gagnon et al. (2011), Krishnamurthy, Vissing and Jorgensen (2011), Hamilton and Wu (2012), and Bauer and Rudebusch (2013) present compelling evidence that the unconventional policy measures employed by the FOMC since the end of 2008 have significantly lowered longer-term treasury yields and also significant spillover effects on emerging economies. According to Uribe and Yue (2006), the price level and real output in a typical emerging economy respond to Federal Reserve monetary policy shocks by more than the price level and real output in the U.S. itself.

Gilchrist et al (2014) study the impact of U.S. conventional monetary policy on foreign government bonds with those of the unconventional measures employed after the target federal funds rate hit the zero lower bound (ZLB). The study makes a relative comparison of the spillover effects during conventional monetary policy period compared to unconventional monetary period. The study includes both advanced and emerging economies. The short run impact is captured as the change in the two year nominal treasury yield around policy announcement. To see the long run impact, change in ten year nominal treasury yield is decomposed into observed and surprise component of shock. The study found a profound effect of both conventional and unconventional monetary policy stand on advanced and emerging economies both in short run and long run.

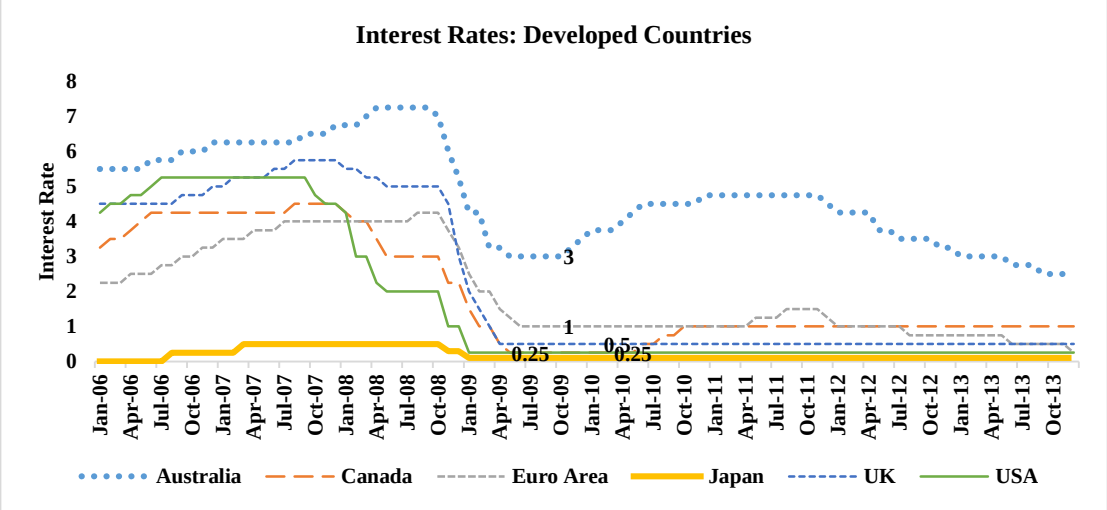
Bauer and Neely (2013) find substantial effects of both portfolio balance and signaling channels in international bond yields. Bauer and Rudebusch (2011), however, claim that the signaling channel accounts for 30 to 65 percent of the total impact, rather than 30 percent suggested by their interpretation of Gagnon et al.'s (2011) analysis.

Anomalies and exceptions: Even though "issue of bonds" in international capital markets dominates the sovereign borrowing, the choice and availability of other credit avenues do play a role, when it comes to sovereign borrowing costs. These other avenues, like borrowing from commercial banks, directly from other sovereign governments and multilateral organizations like IMF and World Bank does have a role. Some countries may also get an aid or grants, which does not have borrowing costs.

3.3 Spill over and volatility effects faced by emerging economies

In modern economies, disruptions in the flow of credit are detrimental to economic activity and lead to unemployment, cancelled investment plans and even recession. Capital account liberalization and increasing globalization add an international dimension for capital flows (Lee, Xie & Yau, 2011). International linkages have become more prominent in the post financial crisis period in discussions around interest rates, exchange rates, pricing of financial instruments, such as bonds, equities and trade channels, although trade channels continue to dominate the impact (Forbes and Chinn, 2004).

Figure 3.1. The interest rates of developed countries during "financial crisis"



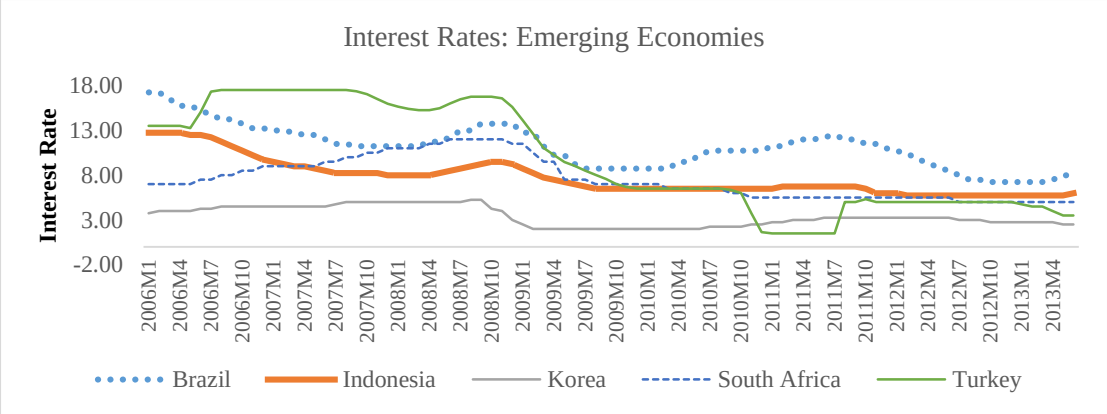
Source: Federal Reserve of New York and Other Central Banks

The recent global financial crisis has brought new challenges to emerging economies. In general, the prime objective of monetary policy is to maintain inflation. To achieve this, central banks use "interest rate" as the main

instrument. But in the back drop of financial crisis, the advanced economies are operating under "zero bound interest rates". The US Federal Reserve rate lowered to 0.25 percent by Feb, 2009 and other developed countries too followed suite and maintained low interest rates, Japan (0.1 percent), U.K (0.5 percent) in the post Feb, 2009 period (see Figure 3.1). The advanced economy monetary policies have a serious spillover effects on emerging economies in different respects.

The interest rates in developing countries (see Figure -3.2) during the financial crisis period was much higher than advanced economies. Interest rates were varying in the range of 2 percent to 5 percent. Due to interest rate differentials huge capital flight had taken place in the initial stages of financial crisis from advanced economies to emerging economies. This created an adverse situation for the developed countries. At the same time, emerging economies experienced an unprecedented exchange rates appreciations, equity market booms through foreign institutional investors (FIIs), the cost of borrowing was also lowered and bond yields were higher. The liquidity in the capital markets dipped low.

Figure 3.2. The interest rates of emerging countries during "financial crisis"

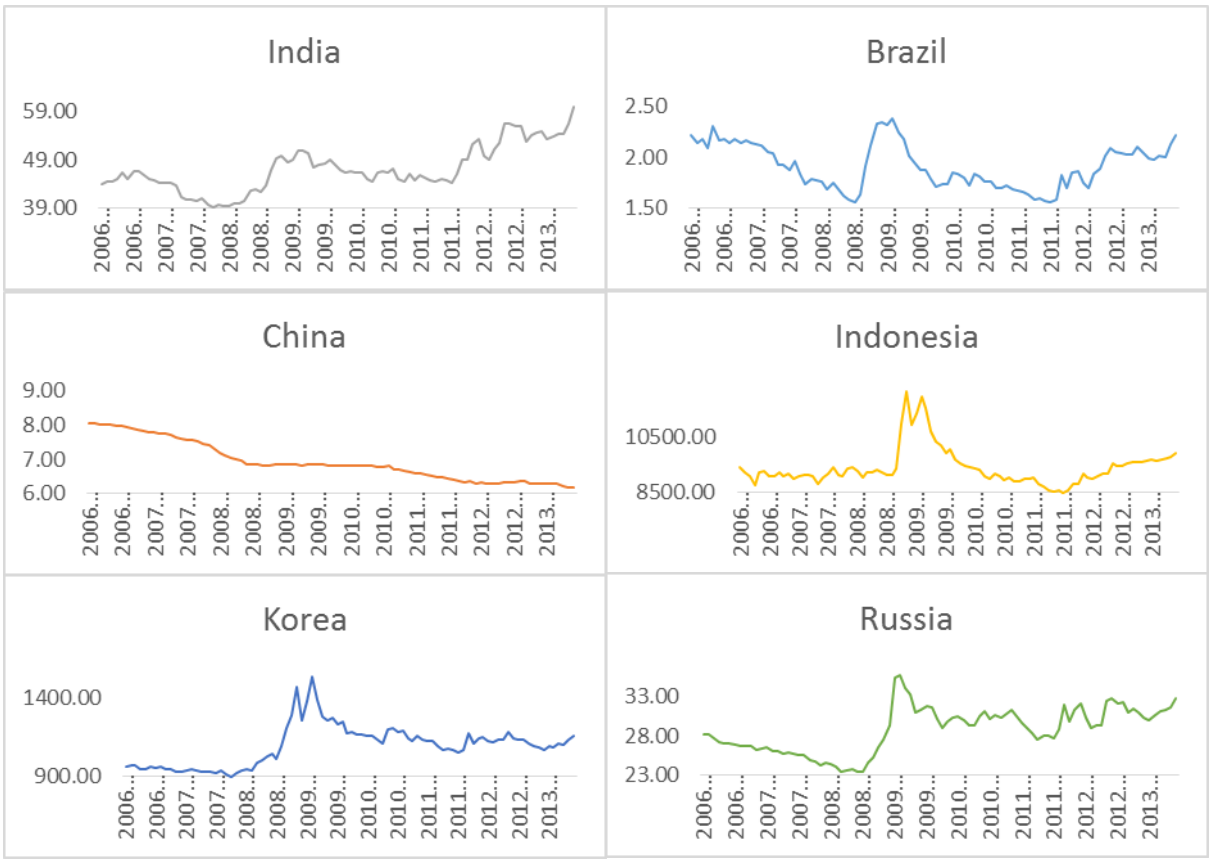


Source: Respective Central Banks of Countries

Advanced economies want to maintain long term yields at low level to push investments and achieve growth. To maintain the low long term yields in the long run, advanced economies resorted to unconventional policies like, large-scale asset purchase program (LSAP), providing liquidity to key credit

markets and lending to financial institutions. The effects of these policies have to be looked from two dimensions. One, the effectiveness in achieving desired objective at domestic economy and second, spill over effects on outside world, especially, emerging economies.

Figure 3.3. Exchange rate movements of emerging economies during financial crisis period 2006 -2013.

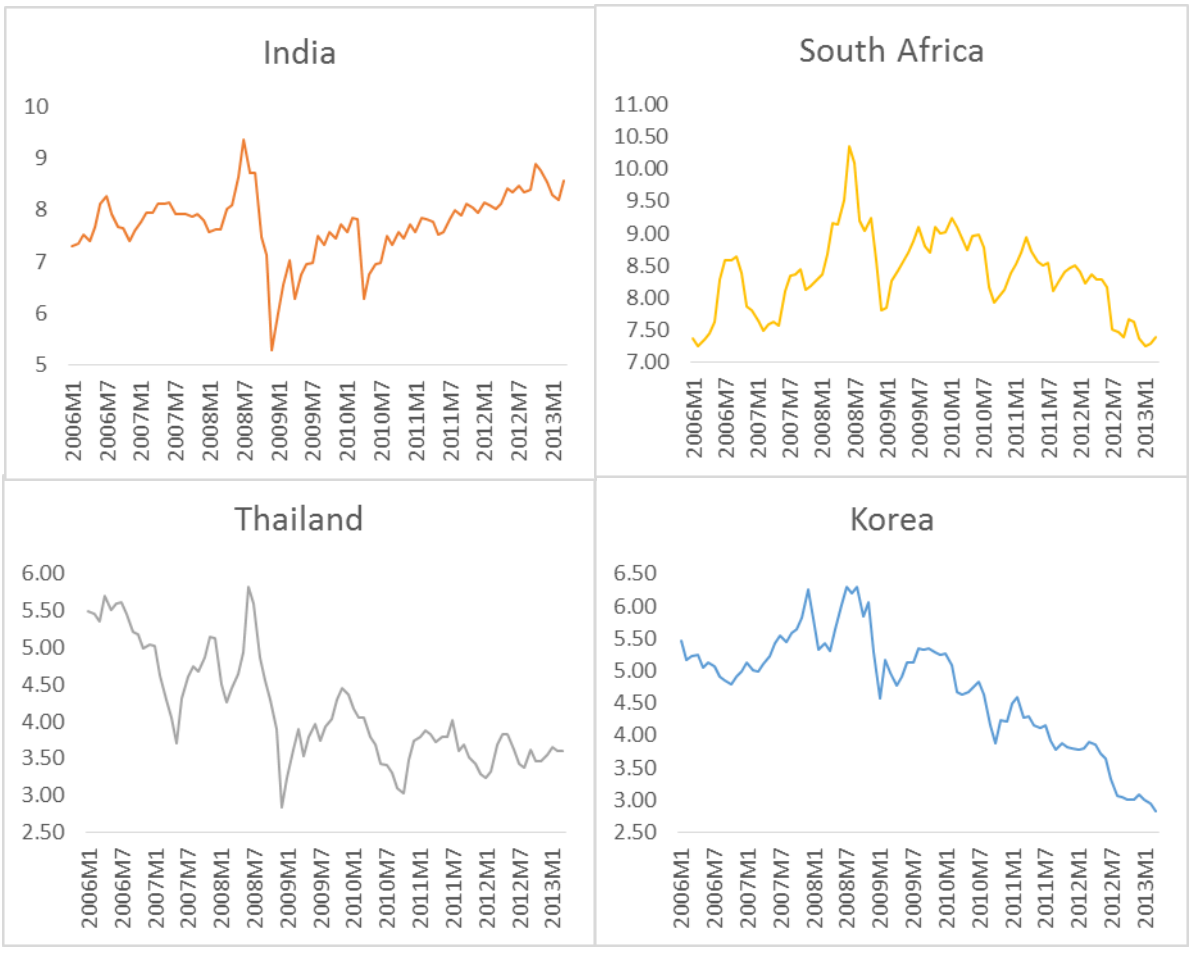


Source: Respective Central Banks of Countries

The exchange rates of emerging economies are becoming more volatile in this period. As we can see from Figure-3.3, the exchange rates in India, Brazil, Indonesia, South Korea and Russia got a high depreciation in the immediate post-July, 2008 and this is the time huge amount of capital pumped into the emerging economies. Again, after 2010, exchange rate position became reverse and got high appreciation. This is the time, the "capital flight" took place, due to "federal tapper" and some positive signals in the western economic recovery.

The "flight to safety and to quality" effect has often been a common pattern of crisis episodes. After the financial crisis periods, emerging markets bonds were in huge demand due to prevailing crisis situation in US and due to better prospects in the emerging economies. Investors shift from low yielding US bonds to high yielding emerging economy bonds. Conversely, due to the better returns in the US economy due to "tapering", the investors are selling emerging market bonds and shifted back to US bonds. As we can see from the Figure-3.4, the bond yields are highly volatile throughout the period in all the countries. Moreover, immediately after July, 2008, there was a sudden sky rocketed fall in the yields, which is the direct impact of global shock.

Figure 3.4. Bond yields of emerging economies during 2006- 2013



Source: Respective Central Banks of Countries

3.4 Data and variables

The changes in the US Federal Reserve rates are generally accompanied by parallel shifts in interest rates in the other G-7 countries and this will determine the world interest rates. The benchmark of 10 year bond yield is considered the best instrument to capture the financial markets movements. Hence, the US Federal Reserve rate and 10 year benchmark bond yields are the most significant variable to capture the international debt markets. As lower Fed funds rate is assumed to be associated with higher liquidity, it is expected to have a positive relationship with yield. But, Fed rate will have a negative effect on emerging markets bond yields. The data of Federal Reserve rate, nominal 10 year benchmark bond yield for USA and the nominal 10 year benchmark bond yields for 12 emerging economies have been collected from the websites/publications of the Federal Reserve and respective central banks.

It is expected that the emerging market bond yields are sensitive to the changes in the US bond yields. The US bond yields expected push the emerging market bond yields in a considerable manner. Emerging market bonds are also sensitive to domestic factors like gross national product (gni) and debt to gdp ratio (govd2gdp), real interest rate (rir). Therefore, gni, real interest rate and debt to gdp ratio are taken as variables in the model. The data on interest rates, on an annual frequency, were primarily obtained from the IFS database. Data on fiscal and macroeconomic variables are obtained largely from the IMF's World Economic Outlook Database (WEO).

Inflation is expected to be positively related to yields as investors need compensation for inflation and the prolonged higher inflation may also reflect a higher degree of economic uncertainty. The lower current account balance (percent of GDP) improves the ability of the country to repay its external debt and avoids the liquidity crisis. Lower CAD is expected to be associated with lower yields. External debt (percent of GDP) is another fiscal indicator, which is expected to be positively related to yields, reflecting that countries with higher debt are assumed to be riskier. Annual data set is obtained from the WEO database.

To capture global risk, volatility index (VIX) and oil prices (oilprice) are used. The Chicago Board Options Exchange Volatility Index (VIX)[1], which measures the implied volatility of S&P index options, is used as a proxy for global risk appetite[2]. VIX is expected to be positively related to yields. Oil price is also used as one of the global factors. Brent crude oil price data is take from US energy information administration. The study used 12 emerging countries based on data availability. The countries are: India, Mexico, Morocco, South Korea, Pakistan, Philippines, Russia, Seychelles, South Africa, Thailand, Turkey and Venezuela. The panel data set is a balanced panel and the time period is from 1980 to 2013.

Table 3.1. Data variables for the regression model
T

aVariable	**Descriptions**
bDyield	Nominal 10 year benchmark bond yield for respective country
lUsyield	Nominal 10 year benchmark bond yield for USA
Inf	Inflation, consumer prices (annual %)
Rir	Real interest rate (%)
Govd2gdp	Government debt (% of Gdp)
ed2gdp	External debt (gdp)
Er	Exchange rate (No. of domestic currency units per 1 US dollar)
Reer	Real effective exchange rate
Cad	Current account deficit
Gni	GNI (current US $)
Fedrate	Federal reserve interest rate
Oilprice	Crude oil price-brent (Dollars per barral)
Vix	Implied vilotality index

3.5 Methodology for regression

There are many methods used with respect to single country studies and panel studies. Some studies use single equation regression models, time series

[1]VIX is a measure of the market perception and expectation of stock market volatility over the next 30 days. It is a weighted average of prices for different options on the S&P 500 index. See http://www.cboe.com/micro/VIX/vixintro.aspx.

[2] In the literature, VIX has been traditionally opted as a measure of global risk appetite. See also for example, McGuire & Schrijvers (2003), International Monetary Fund (2004), Hartelius, et.al (2008), Gonzales-Rozada and Levy-Yeyati (2008), Bellas and others (2010), Baldacci and Kumar (2010), and Longstaff .et.al (2011).

models, and vector autoregressive models. The panel studies are more efficient than other methodologies. As Poghosyan (2012) argues for panel studies rather than single country studies, because, the short time series dimension of the data is particularly acute in studies using macroeconomic determinants of bond yields, which are typically accessible only in low frequencies (annual or quarterly). Poghosyan (2012) applied the pooled mean group (PMG) estimator of Pesaran et al. (1999), which is a panel data version of the error-correction model. The study uses a new the panel cointegration methodology developed by Pedroni (1999 and 2004).

Given the time series component present in the panel data, we need to determine first the order of integration of every data series. As cointegration is related with the long run equilibrium relationship between two or more variables, once we estimate panel unit root tests, we test for the existence of long run relationship between the variables using cointegration test developed by Pedroni (1999). If the data series are cointegrated, the long run relationship among the variables is estimated by the Dynamic Ordinary Least Square Method (DOLS) developed by Pedroni (2000).

Panel unit root tests: Before turning to the estimations, panel unit root tests are applied on domestic bond yields, and other variables. We have used six unit root tests - the Levin–Lin–Chu (2002), Harris–Tzavalis (1999), Breitung (2000, Breitung and Das 2005), Im–Pesaran–Shin (2003), and Fisher (Choi 2001) and Hadri (2000) panel unit root tests. The first five tests are based on the null hypothesis of all panels contain a unit root and alternative hypotheses of no unit root. While the Hadri test is based on the null hypothesis of all panels are trend stationary. The Im–Pesaran–Shin (2003), and Fisher (Choi 2001) and Hadri (2000)tests can be applied to both balanced and unbalanced panels, whereas remaining tests can be applied to only balanced panels.

Panel cointegration tests: Next, we test the existence of long run relationship between domestic bond yield and various macro, debt and global factors, using panel cointegration testsuggested by Pedroni (1999 and 2004). This test is developed by extending the residual based cointegration test of Engle and

Granger (1987) for panel data framework. Pedroni's test accommodate the cross section heterogeneity and allows deterministic time trend, slopes and individual fixed effects across panels.

There are seven panel cointegration estimates in Pedroni (1999) and each estimate is derived from the residuals of the cointegration regression once normalizing the panel statistics with correction terms. The procedures proposed by Pedroni (1999) uses estimated residual from the hypothesized long run regression in the following way:

$$y_{i,t} = \alpha_i + \delta_i t + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \ldots + \beta_{Mi} x_{Mi,t} + e_{i,t} \quad (1)$$

for $t = 1, \ldots..,T;\ i = 1, \ldots.,N;\ m = 1, \ldots., M,$

Where *T* is the number of observations over time, *N* number of cross-sectional units in the panel, and *M* number of regressors. Here, α_i is the country specific intercept or fixed effects parameter. This varies across individual cross-sectional units. In the same way, the slope coefficients and member specific time effects, $\delta_i t$ also varies across cross sectional units.

Pedroni (1999 &2004) put forward the heterogeneous panel and heterogeneous group mean panel test statistics to estimate panel cointegration. Pedroni (1999) defines two sets of statistics. The first set of three statistics $Z_{\hat{v},N,T}$, $Z_{\hat{\rho}N,T\ 1}$ and $Z_{tN,T}$ is based on pooling the residuals along the within dimension of the panel. The statistics are as follows

$$Z_{\hat{v},N,T} = T^2 N^{3/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t\ 1}^{2} \quad (2)$$

$$Z_{\hat{\rho}N,T\ 1} = T\sqrt{N} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t\ 1}^{2} \quad {}^{1} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \left(\hat{e}_{i,t\ 1} \Delta \hat{e}_{i,t} \quad \hat{\lambda}_i \right) (3)$$

$$Z_{tN,T} = \tilde{\sigma}_{N,T}^{-2} \sum_{I=1}^{N} \sum_{T=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t\ 1}^{2} \quad {}^{1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t\ 1}^{2} \left(\hat{e}_{i,t\ 1} \Delta \hat{e}_{i,t} \quad \hat{\lambda}_i \right) (4)$$

Where $\hat{e}_{i,t\ 1}$ is the residual vector of the OLS estimation of equation (1)

The next set of statistics is based on pooling the residuals along the between dimension of the panel. This allows for a heterogeneous autocorrelation parameter across members. The statistics are:

$$\tilde{Z}_{\hat{\rho}N,T\ 1} = \sum_{i=1}^{N}\sum_{t=1}^{T}\hat{e}_{i,t\ 1}^{2}\ {}^{1}\sum_{t=1}^{T}\left(\hat{e}_{i,t\ 1}\Delta\hat{e}_{i,t} \quad \hat{\lambda}_{i}\right) \quad (5)$$

$$\tilde{Z}_{tN,T\ 1} = \sum_{i=1}^{N}\sum_{t=1}^{T}\hat{e}_{i,t\ 1}^{2}\ {}^{1/2}\sum_{t=1}^{T}\left(\hat{e}_{i,t\ 1}\Delta\hat{e}_{i,t} \quad \hat{\lambda}_{i}\right) \quad (6)$$

These statistics estimate the group mean of the individual time series statistics. The asymptotic distribution of each of those five statistics is expressed in the following form:

$$\frac{X_{N,T} \quad \mu\sqrt{N}}{\sqrt{v}} \Rightarrow N(0,1) \quad (7)$$

Where $X_{N,T}$ is from of the test statistics, while μ and v are the mean and variance of each test respectively. They are explained in Table 2 of Pedroni (1999). Under the alternative hypothesis, Panel *v* statistics diverges to positive infinity. Therefore, this is a one sided test where large positive values reject the null of no cointegration. The remaining statistics diverge to negative infinity, which means that high negative values reject the null.

Dynamic ordinary least squares (DOLS) estimation:

Dynamic ordinary least squares (DOLS) estimation, which is constructed by Pedroni (1996, 2000, and 2001), is used to estimate the precise long run relationship between variables. Kao and Chiang (2000) suggests that the DOLS estimator may be more promising than OLS or fully modified estimators in estimating the cointegrated panel regressions.

3.6 Empirical estimations

Table-3.2 presents the descriptive statistics of the panel data set. The time period of the panel is 1980 to 2013 (with dimensions of n = 12 and T = 34). Given the nature of the variables, some of the variables have high standard

deviations and this may be due to the long time period and different sizes of the economies.

Table 3.2: Descriptive statistics of the variables

Variable	Obs	Mean	Std.Dev.	Min	Max
dyield	408	9.681325	10.61769	0	95
usyield	408	6.684533	3.115384	1.8	13.9108
Crisis	408	0.1911765	0.3937105	0	1
Cad	408	-1.417838	5.944939	-27.505	17.755
Er	408	94.26972	266.1257	0	1401.437
ed2gni	408	37.31356	32.4022	0	222.4289
Inf	408	19.54758	51.72374	-2.407303	874.6218
Rir	408	6.559261	13.61291	-35.31446	183.2
govd2gdp	408	34.20383	37.51609	0	199.787
Gni	408	268.6109	367.3421	0	2016.574
Ggni	408	4.00787	5.155548	-15.24504	29.17343
ggnipci	408	2.060188	4.446501	-15.28209	15.21696
gsav2gdp	407	22.23431	12.02324	-21.83963	60.30717
goldprice	408	556.5126	377.7114	271.04	1668.98
fedrate	408	5.263922	3.903714	0.1	16.39
oilprice	408	39.90965	30.39227	12.76	111.63
Reer	408	93.56032	44.99185	0	228.9811
Vix	408	14.25265	10.4625	0	32.69

3.6.1 Panel unit root tests:

Before turning to cointegration estimations, six panel unit root tests are applied to all the variables. The panel unit root tests showed mixed results. Given the nature of the panel with large T and small N, tests are given mixed results. The variables are considered as stationary or non-stationary, if more than three tests confirm it to be stationary or non-stationary. The full details of the panel unit root tests are given in Appendix-3.A.

The variables which are found to be stationary are: domestic as well as US10 year benchmark bond yields (dyield),inflation (inf), real interest rates (rir), exchange rate (er), real effective exchange rate (reer), current account deicit (cad), federal reserve rate (fedrate), oil price (oilprice), government debt to gdp (govd2gdp) and volitality index (Vix).But, external debt to gdp (ed2gdp), gross national income (gni) found to be non-stationary.

3.6.2 Panel cointegration estimations:

Given the panel unit root test results, the panel cointegration tests proposed by Pedroni (1999, 2001 and 2004) is estimated with the variables such as domestic yield (dyield), US10 year benchmark bond yields (usyield),government debt to gdp (govd2gdp), inflation (inf), real interest rates (rir), federal reserve rate (fedrate), oil price (oilprice)and volatility index (Vix). In Pedroni residual panel cointegration test, under the null hypothesis (Ho) of no cointegration and trend and deterministic intercept assumption, a total of seven test statistics are estimated. The first four tests, panel ν statistic, panel ρ statistic, panel t non-parametric PP statistic, panel t parametric ADF statistic, are known as the 'within dimension' panel statistics. While the last three, group ρ statistic, group PP statistic and group ADF statistic, are known as 'between dimensions' group tests. All these statistics are mostly extensions of the Phillips and Perron (1988) or Augmented Dickey Fuller (ADF) test or group mean panel tests (Lm et al., 2003).

The summary of the results of panel cointegrations analyses are presented below in Table 3.3. The results show that all seven statistics found to be significant, in the sense that rejecting the null hypothesis of no cointegration at the 1% significant level. Hence, we can confirm that there exists a long run relation between the domestic bond yields and other explanatory variables.

Table-3.3: Panel cointegration test estimations

Test	Statistic
Panel *v*-Statistic	-3.386*
Panel *ρ*-Statistic	4.141*
Panel *t*-Statistic: (non-parametric)	2.601*
Panel *t*-Statistic (*adf*): (parametric)	2.691*
Group *ρ*–Statistic	4.787*
Group *t*-Statistic: (non-parametric)	2.694*
Group *t*-Statistic (*adf*): (parametric)	2.697*

All test statistics are distributed N (0, 1), under a null of no cointegration, and diverge to negative infinity (save for panel v).

Note: The Pedroni (2004) statistics are one-sided tests with a critical value of -1.64 (*k* < -1.64 implies rejection of Ho), except the *v*-statistic that has a critical value of 1.64 (*k*> 1.64 implies rejection of Ho). * implies rejection of the null of no-co-integration at 1% significance level.

3.6.3 Dynamic ordinary least squares (DOLS) estimations

The dynamic ordinary least squares (DOLS) regression model is estimated to capture the long run coefficients of the cointegrating variables and the results are presented in table-3.4. It is found that the coefficients for all the variables are with proper sign and statistically significant at the 1 percent level. The coefficients of US10 year benchmark bond yields (usyield), government debt to gdp (govd2gdp), real interest rates (rir) and volitality index (Vix) are found to be positive and significant. The coefficients of the variables, Federal Reserve rate (fedrate), oil price (oilprice) are found to be negative but significant. The coefficient of inflation (inf) is negative but insignificant.

Table-3.4: Dynamic ordinary least squares (DOLS) estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
USYIELD	10.98882*	4.680811	2.347631	0.0209
GOVD2GDP	0.240077*	0.060421	3.973418	0.0001
FEDRATE	-7.224344**	3.750766	-1.926098	0.0571
INF	-0.011705	0.039026	-0.299930	0.7649
VIX	0.406465**	0.215137	1.889331	0.0619
OILPRICE	-0.130806*	0.052852	-2.474950	0.0151
RIR	0.519401*	0.097932	5.303693	0.0000

Note: * and ** implies level of significance at 1% and 5% respectively.

Our results are in conformity with the literature. In most of the earlier studies, the US bond yields and FED rate are implicitly assumed as a proxy for world interest rates. The Lewis and Rosborough (2013), which studies New Zealand, finds that the global factors explain around 62 % of variation in the interest rates. Moreover, the study found that, an increase of 10 basis points in the world interest rates will increase New Zealand's 10-year yield around 10 to 11 basis points. The current study found more strong impact then the above study. A one percent increase in the US bond yields will increase the bond yields of the emerging economies around 10 percent. This shows that the distortions in the US debt market can be very devastating for the emerging economies debt markets.

Baldacci and Kumar (2010) found that higher fiscal deficits and public debts

will push long term interest rates higher and which eventually determine the bond yields. Poghosyan (2014) found that a one percentage point increase in the debt to gdp ratio range increase the government bond yields somewhere between 2 to 5 points. When it comes to government debt to gdp (govd2gdp) current study found that a one percentage point increase in the government debt to GDP raises the domestic bond yields by about 2 percentage points.

The many previous studies like Peiris (2010) and Baldacci and Kumar (2010) found inflation and interest rates are important determinant factors of domestic bond yields. But our study could not validate this for inflation. The coefficient of inflation found to be negative and insignificant. The reason may be that now, high inflation is a norm than exception these days in emerging economies. But interest rates (rir) found to be positively related and significant with respect to domestic bond yields.

Volitility index (Vix), a proxy for global risk, found to be positive and significant at 10% level. This means that the countries with weak fundamentals (fiscal stress) will be subject to more volatile bond yields in the event of sudden upward shift in global risk appetite.

The coefficient of the oil price will depend on the nature of the country. If the country is an oil consuming country then the aggregate impact found to be negative. Buton the contrary, if it is an oil exporting country, then it will be positive. Since high oil price will increase the cost production of industries and companies and this will affect the growth prospects the firms and countries. So countries have to borrow at higher interest rates, which will increase the bond yields. In our case, oil price found to be negative and significant, despite of the composition of the countries, which includes major oil producing countries, namely, Russia, Mexico, Venezuela. The reason seems to be the low oil prices prevailing in the global markets since 2006.

Given this empirical evidence, it can be confirmed that there is a presence of a long run relationship between the domestic bond yields and US10 year benchmark bond yields (usyield), government debt to gdp (govd2gdp), Federal

Reserve rate (fedrate), oil price (oilprice), real interest rates (rir) and volatility index (Vix). These are the variables, which best determine the emerging markets bond yields.

3.7 Summary

In this chapter, we discussed about the determinants of sovereign bond yields in emerging economies. It is the fact that historically, sovereign market bonds are the major source of fund raising for governments. But, the process of issue of debt and repayment is highly influenced by the various global and domestic events and market sentiments. Moreover, the international financial integration further increased the volatility in the debt markets across the globe. Especially, due to globalization hazard, the emerging market economies have become more vulnerable to exogenous shocks arising from global capital markets. The international financial crisis and zero bound interest rates, further added woes of the emerging economies. The effects are mainly in the form of high capital movements and spillover effects on different markets. The vulnerabilities are translated into higher borrowing costs, shorter maturity periods and less liquidity in the market etc. At this juncture, there is a need to identify the determinants of the sovereign borrowing and their bond yields.

Given the above arguments, this chapter tried to identify the determinants of the sovereign bond yields of twelve emerging economies over the period 1980–2013 using panel regressions and panel cointegration techniques. A list of variables are identified from the literature and constructed a balanced panel dataset. First, six panel unit root tests, Levin–Lin–Chu (2002), Harris–Tzavalis (1999), Breitung (2000, Breitung and Das 2005), Im–Pesaran–Shin (2003), and Fisher (Choi 2001) and Hadri (2000), are applied and tested for stationarity. Then, the panel cointegration tests proposed by Pedroni (1999, 2001 and 2004) is estimated on domestic yield (dyield), US 10 year benchmark bond yields (usyield), government debt to gdp (govd2gdp), inflation (inf), real interest rates (rir), federal reserve rate (fedrate), oil price (oilprice) and volitality index (Vix).Out of the seven statistics that the test generate, all seven statistics found to be significant, which means that there

exists a long run relation between the domestic bond yields and other explanatory variables.

Next, the dynamic ordinary least squares (DOLS) regression model is estimated to capture the long run coefficients of the cointegrating variables. The coefficients of US10 year benchmark bond yields (usyield), government debt to gdp (govd2gdp), real interest rates (rir) and volitality index (Vix) are found to be positive and significant. The coefficients of the variables, Federal Reserve rate (fedrate), oil price (oilprice) are found to be negative but significant. The coefficient of inflation (inf) is negative but insignificant. Given this empirical evidence, it can be confirmed that there is a presence of a long run relationship between the domestic bond yields and US10 year benchmark bond yields (usyield), government debt to gdp (govd2gdp), Federal Reserve rate (fedrate), oil price (oilprice), real interest rates (rir) and volatility index (Vix). These are the variables, which determine emerging markets bond yields and hence, the emerging economies monetary and fiscal policies have to pay enough attention in controlling these variables to avoid any potential crisis situation.

Appendix-3.1:Panel unit root tests estimations

Variable	LLC		Harris-Tzavalis		Breitung		IPS		Fischer		Hadri		Result
Dyield	-3.6487	0.0001	-9.9081	0.0000	-3.80	0.0001	-2.9217	0.0017	-6.5381	0.0000	2.5797	0.0049	Stationary
Usyield	-3.6487	0.0001	-35.2943	0.0000	0.7362*	0.7692	-6.0755	0.0000	-6.7711	0.0000	11.5675	0.0000	Stationary
Inflation (Inf)	-7.3077	0.0000	-21.2165	0.0000	-3.2851	0.0005	-5.8707	0.0000	-7.1106	0.0000	0.1168*	0.4535	Stationary
Real Interest Rate(rir)	-4.8946	0.0000	-15.1127	0.0000	-4.1351	0.0000	-6.0196	0.0000	-7.6884	0.0000	0.9099*	0.1814	Stationary
Exchange Rate (er)	-3.3836	0.0004	-3.345	0.0004	5.0953*	1.0000	4.8594*	1.0000	-2.0259	0.0214	8.5005	0.0000	Stationary
Current Account Deficit (Cad)	-2.8931	0.0019	-11.3896	0.0000	-4.6024	0.0000	-3.5901	0.0002	-5.9934	0.0000	3.4178	0.0003	Stationary
Federal Reserve Rate (Fedrate)	-1.8749	0.0304	-30.3171	0.0000	0.619*	0.7320	-1.9916	0.0232	0.278*	0.6095	11.4925	0.0000	Stationary
Oilprice	-13.067	0.0000	-39.3039	0.0000	0.2053	0.5813	7.3469*	1.0000	9.6672*	1.0000	6.8784	0.0000	Stationary
Volatility Index (Vix)	-3.7457	0.0001	-35.2943	0.0000	-0.7997*	0.2119	-1.6951	0.0450	-6.3091	0.0000	8.5105	0.0000	Stationary
Real Effective Exchange Rate (Reer)	-4.6165	0.0000	-1.284	0.0996	0.5902*	0.7225	-2.2349	0.0127	-6.9928	0.0000	8.0981	0.0000	Stationary
Govt Debt to GDp (Govd2gdp)	-2.613	0.0045	-2.7348	0.0031	-3.2164	0.0006	-2.7337	0.0031	1.2289*	0.8904	3.3707	0.0004	Stationary
Gross National Income (Gni)	10.322*	1.0000	5.208*	1.0000	10.1948*	1.0000	13.8107*	1.0000	4.2168*	1.0000	10.0586	0.0000	Non-Stationary
External Debt to GNI (ed2gni)	1.8765*	0.9697	3.0797*	0.9990	-0.5021*	0.3078	2.754*	0.9971	-3.3296	0.0004	7.0598	0.0000	Non-Stationary

Source: Author's own estinations

Note: * indicates NOT significant at 1%, 5% or 10% level.

For LLC and other tests: Null= Panels Contains Unit Root,

For Hadri: Null= All Panels are stationary

Chapter-4

An Early Warning System for Sovereign Debt Crisis

4.1 Introduction

The sovereign debt borrowing is generally accompanied with recurrent debt crises. As there are no stringent international bankruptcy laws exists, a defaulting country and its lenders usually renegotiate over the reduction of the defaulted debt to resolve a debt crisis. Sovereign debt servicing difficulties and, at times, outright defaults, have become more common in recent years (Manasse et al, 2003). There are around 100 events of sovereign default from 1975 to 2013 (Standard and Poor's, 2012; Beers and Nadeau, 2014). The largest in the history is the Argentine debt crisis of 2001, where the country defaulted on its $82 billion debt payments.

Recent evidence shows that post-default debt renegotiation on average results in a 40% loss for creditors (Yue, 2010). As Manasse et al (2003) say the macroeconomic misalignments leading to debt crises, however, are still not well understood and this makes the need to predict these crisis episode inevitable. Predicting sovereign debt crisis through early warning systems is becoming popular in the recent times. In line with the above arguments, here, an effort is made, to predict whether the emerging economies are prone to sovereign debt crisis or not.

The objective of this chapter is to predict the proneness of sovereign debt crisis with respect to emerging economies by constructing an early warning system. Due to Edison (2000), the terms predicting a crisis, a country prone to crisis or entering into a "zone of vulnerability" are used interchangeably. The early warning system is developed by using a set of variables, including macroeconomic, external and debt variables, which results in sovereign debt crisis if they are not properly controlled.

This study contributes to the existing literature in three ways. First, it brings out an analysis on the nature of sovereign debt default episodes till 2013, so it covers almost all the crisis episodes from 1980 to very recent ones, including

the recent financial crisis period, on which no studies exist. Second, the study employs logit model which is a sophisticated and proven methodology. Third, it also uses a stringent sovereign debt definition and a large set of variables to capture crisis episodes.

The rest of the paper is organized in the following way: Section 4.2 gives an overview of the existing early warning systems developed over the time. Section 4.3 gives the theoretical literature on sovereign debt crisis. Section 4.4 analyses the empirical literature. Section 4.5 analyses the debate over "Crisis Definition" and proposes the crisis definition. Section 4.6 explains the data and variables. Section 4.7 will deal with the methodological issues then section 4.8 presents the empirical estimations and followed by interpretation and conclusions.

4.2 Early warning systems: An overview

The human psychology always tries to minimize "risk" and face "uncertainty". Over time, scientific community developed to quantify risk but predicting the uncertainty always remained uncertain. The early prediction basically helps to find out the vulnerabilities so that corrective measures can follow suite and minimize human and financial loss.

There are many models which have been developed over the last half a century with the sole purpose of predicting the outbursts or shocks, be it a corporate bankruptcy, banks, sovereign nations and calamities etc. These methods all have their particular strengths and weaknesses, and choosing between them for empirical application is not straight forward. Broadly the models are divided into three groups - statistical models, artificial intelligence models and theoretical models (Aziz and Dar, 2006; Yucel, 2011). A brief discussion on these models and their main features is given below.

4.2.1 Statistical models and their main features

Some of the models under the category of statistical models are given below.

Univaritate models: The first empirical model was developed by Altman (1968). This is a univariate model (Altman, 1993; Morris, 1998) traditionally focused on the financial ratio analysis. The underlying rationale in Altman model is, if there is a significant difference in financial ratios of the target firms and the normal firms, then they can be used as predictive variables.

Multiple discriminant analysis (MDA): It is a linear combination of specific discriminatory variables and classify the units under study into desired groups.

Limited dependent models: Linear probability model (LPM), Logit and Probit models are all binary dependent models which, express the probability of failure or success of a firm/unit under consideration as a dichotomous dependent variable and it is a function of a vector of explanatory variables. The difference is the cumulative distribution function (CDF) that the each model follows. The Logit model is one of the popular methods used till today.

Cumulative sums (CUSUM) procedures: The CUSUM procedures try to detect a shift in a distribution from one state to another. The overall performance of the object is assessed by a cumulative (dynamic) time-series performance score (a CUSUM score).

Partial adjustment processes: Partial adjustment models are a theoretic rationale of Koyck scheme to estimate distributed-lag models.

4.2.2 Artificial intelligence models

Under this category, mainly five models are important. One, 'recursively partitioned decision trees' is a form of supervised learning in which a program learns by generalizing from examples. Second, case-based reasoning (CBR) models, where the CBR solves a new classification problem with the help of similar previously solved cases. Third, neural networks (NN) perform classification tasks in a way intended to emulate brain processes. Fourth, genetic algorithms (GA) runs on the idea of genetic inheritance and Darwinian theory of natural evolution (survival of the fittest), GAs work as a stochastic search technique to find an optimal solution to a given problem from a large

number of solutions. Fifth, Rough sets' models try to classify objects using imprecise information.

4.2.3 Theoretical early warning models:

Some of the models under this category are given below.

Balance sheet decomposition measures (BSDM)/entropy theory: It tries to analyze changes in the structure of balance sheets, under the assumption that firms try to maintain equilibrium in their financial accounting.

Gambler's ruin theory: This approach studies the agent or firm as a gambler playing repeatedly with some probability of loss, continuing to operate until its net worth goes to zero (zero here is the crisis).

Cash management theory: This approach studies the short-term management of corporate cash balances.

Credit risk theories: Credit risk is the risk that any borrower/counterparty will default, for whatever reason. There are many models developed including JP Morgan's Credit Metrics, Moody's KMV model, CSFB's Credit Risk and KcKinsey's Credit Portfolio View etc.

Some of these models are extensively used in finance to analyze corporate bankruptcy and random events in capital markets. Over time, these models are applied in predicting currency crisis and sovereign debt crisis. But, of the all models presented, only few models are applicable to predict the sovereign debt crisis. The reasons may be mainly because of data non-availability at different frequencies, since governments do not disclose all the data publicly. The more elaborate analysis on application of early warning systems can be found in the below mentioned studies and surveys.

Kaminsky, Lizondo and Reinhart (1998) and Frankel and Rose (1996) are the seminal papers on early warning systems, which focuses on the currency crisis. A detailed survey of early warning systems can be found in Berg, Borensztein and Pattillo (2004). The literature on early warning systems mostly focused on currency crisis, banking crisis and sometimes occurrence of

both (considered as twin crisis in literature), but very few studies exists on sovereign debt crisis. A good review of literature on early warning systems of sovereign debt crisis can be found in Jedidi (2013).

4.3 Theoretical literature on sovereign debt crisis

Literature on debt markets in general and sovereign debt in particular has grown exponentially over time. The whole literature can be classified into two broad categories. First, theoretical models on sovereign default and the determinants of debt crisis. These are generally labeled as "early literature". Second, empirical studies on predicting sovereign debt crisis and its determinants. To achieve this goal, various studies have followed different innovative paths in terms of definition of the crisis, variables and the methodologies used.

A significant amount of the early sovereign debt literature mostly deal with the kind of questions like "Why countries take debt?", "Why countries repay their debt?", "Why countries default?", "How the creditors and defaulted countries renegotiate their debt?" and "sovereign debt pricing". The seminal papers like Eaton and Fernandez (1995) presents the complete review of early literature. Early literature is mostly theoretical and analyses the debt crisis as an interaction between rational agents (i.e., sovereign countries and their creditors) and their choices under different conditions and pay offs. It views the relation between debtor country and its creditors in a moral hazard framework.

Theoretical literature[1] deals with the issue of debt, repayment, default, and sanctions etc. "Reputation" and "sanctions" have been identified as two main enforcement mechanisms of debt repayment. In their pioneering work on reputation models, Eaton and Gersovitz (1981) argue that a country's incentive to make repayments is to preserve its reputation as a good borrower

[1]Roubini (2001), Hemming and Petrie (2002) and Hemming & Chalk (2000) cover debt sustainability and fiscal vulnerabilities of sovereign.

and the fear of permanent exclusion from the international capital markets[2]. In the second approach, the country's debt repayment motive comes from the creditors' threat of direct sanctions. In particular, Bulow and Rogoff (1989) argue that direct default punishment is necessary to support international debt when cash-in-advance contract is available. Sachs and Cohen (1982) and Cole and Kehoe (2000) also assume direct default cost in analyzing the sovereign debt crises. However, all these papers assume that a country either fully repays its debt, renegotiates or defaults completely, incurring the default penalties but ignores the manner in which a debt crisis can be predicted. In other words, early literature does "ex-post" analysis rather than "ex-ante".

Hence, recent literature took a detour from theoretical approach to empirical approach mainly to bring better predictive power to the sovereign debt analysis. This effort is greatly facilitated by the econometric advancements. As a result, new kind of questions are studied and analyzed. Mainly the questions like "how to predict the sovereign debt crisis beforehand?" and "how sovereign ratings will impact the debt markets?" and "what determines the sovereign bond spreads?" etc.

4.4 Empirical literature and early warning systems

The literature on empirical evaluation of sovereign debt crisis is quite small but now growing rapidly. This is mainly due to advancements in the econometric methodologies, which can be applied and extended to debt related issues. The studies used macroeconomic variables, financial variables, credit default swaps and credit ratings as a means to predict the probability of occurrence of crisis. Analyzing the crisis through macroeconomic variables is more powerful compared to other variables, since the changes in financial and other variables inherently influenced by macro changes. The studies like Manasee et al (2003), Ciarlone and Trebeschi (2004; 2006), Jedidi (2013) fall under this category.

[2] Grossman and Van Huyck (1987), Atkeson (1991), Cole and Kehoe (1998), Kletzer and Wright (2000), and Wright (2002), explore detailed aspects of reputation in enforcing debt repayment.

Macroeconomic variables approach takes a more pragmatic view about the debt borrowing of sovereigns. It recognizes the inevitability of sovereign countries to take debt to achieve rapid economic growth and development. Sovereigns may or may not use the debts borrowed in a productive manner, which in turn generate revenues for future debt repayments[3]. The situation, where the sovereign unable to pay its debts, given its future income, is considered as "insolvency". The short term adjustment problems are considered as "illiquidity. A sovereign country can face either one of these solvency or liquidity problems or it can face both. In either of the situations, the sovereign may exercise the range of options from debt rescheduling to complete default. Therefore, macroeconomic variables are used to capture the countries insolvency and illiquidity levels.

When the country is in short of forex reserves to meet its short term payments, or high volatility or regime shifts in exchange rate markets, global commodity and oil markets can push a country into illiquidity crisis. Macroeconomic variables like low to moderate inflation, current account balance, and low level of fiscal and revenue deficits are considered as representatives of healthy economy.

When it comes to methodologies used, Manasse et al (2003) use the logit model, which predicts 74% of all the sovereign debt crisis. The study also uses recursive tree model as an alternative method, but found that it generates more false alarms. Ciarlone and Trebeschi (2004) analyses macroeconomic variables with the help of a multinomial logit model and identifies about 80% of the crisis periods accurately. Jedidi (2013) uses a panel logit model but uses composite indices as explanatory variables. Principle component analysis is used to create these composite indexes from a large set of macroeconomic variables which are sub-divided into various tracks. The study predicted 74 percent of the crisis episodes correctly. Fioramanti (2006) uses artificial neural network (ANN), a non-parametric methodology, for predicting sovereign debt

[3] But apart from the unproductive spending, it may also be possible that the whole investment is washed away due to earth quake or drought, cyclone etc. In other words, natural disasters increase the country's debt tremendously. In the post calamity period, reconstruction period, a lot of debt is required and which needs to be paid back.

crisis. By comparing the results with random effect probit model, the study found that this nonparametric methodology, under certain conditions, outperform the other methods.

4.4.1 On optimal early warning systems

Fuertes and Kalotychou (2007) try to find an optimal early warning system methodology for sovereign debt crisis. The study compares different methodologies, k-means clustering, logit regression for macro data, logit regression for credit ratings and combined forecasts from all three methods. The ideal methodology is the one which predicts more number of actual defaults with minimum false alarms and few missed defaults. The combined forecasts found to be better methodology than the individual forecasts.

Another way to predict sovereign debt crisis is through the financial data like sovereign bond yields, credit default swaps (CDS) etc. Here, the underlying idea is that, in a perfectly competitive environment the "price change" captures and is considered the replica of economic shocks or transformation. Here, researchers faced the difficulty of segregating the domestic shock from international shocks.

4.4.2 Prediction through credit ratings

There is a mixed evidence on the predictive power of credit ratings regarding sovereign debt crises. The degradation of country's rating is considered as a signal for the underlying crisis or sometimes eventual default. Some argue that they Granger-cause sovereign bond spreads and capture the volatility in the market (Fuertes and Kalotychou, 2007; Cantor & Packer, 1996; Reinhart, 2001; Rojas-Suárez, 2001). By using the definition of S&P, Reinhart, Rogoff and savastano (2003) identify 36 crisis episodes across the emerging economies between 1970 and 2001[4].

[4]Standard and Poor's (S & P) defines sovereign risk as the probability that a country that issued a loan does not honor its obligations and doesn't respect the repayment of principal and interest at maturity.

But studies like Peter (2002) and Cantor and Packer 1996) argue that credit ratings provided by Moody's and S&P are not a good indicators for predicting defaults of the countries. These studies estimated and cross checked the default risks with rating agencies reports. It is found that default rates were underreported by these ratings.

Finally, now, it is believed that the monetary policies of advanced countries do have spillover effects on emerging economies. Under the tight monetary conditions the capital flows to emerging economies are expected to fall down. But now, the impact is visible due to the unconventional monetary policies and the emerging markets are stressed out on their debt servicing (Ragan, 2013).

4.5 The debate over "crisis definition"

The key element in debt crisis literature is, how we perceive and define the crisis episode. But, unfortunately, there is no consensus on the definition of "sovereign debt crisis". One possible reason might be that historically debt crisis originated due to multifaceted of elements and this makes things more complex. Beers and Bhatia (1999) and Beim and Calomiris (2001) identify and define the crisis episodes from previous studies, country specific case studies and anecdotal evidences. Manasse et al (2003) defined a country to be in a debt crisis if it is classified as being in default by Standard & Poor's or if it receives a large non-concessional IMF loan in excess of 100 percent of quota[5]. Ciarlone and Trebeschi (2006) defined debt crisis on three conditions. First, a country has officially declared a moratorium on public or external debt payments. Second, it has signed a debt restructuring or rescheduling agreement with official and/or commercial creditors. Third, a country has missed payment of interest and/or principal on external obligations vis-avis official and commercial creditors in an amount of more than 5 per cent of the debt service ratio paid by year end. Detragiache and Spilimbergo (2001) define a country to be in a debt crisis if the country has arrears on external

[5] Standard & Poor's rates sovereign issuers in default, if a government fails to meet principal or interest payment on external obligation on due date (including exchange offers, debt equity swaps, and buy back for cash) Manasee et al (2003).

obligations toward commercial creditors in excess of 5 percent of commercial debt outstanding or has a rescheduling or restructuring agreement with commercial creditors.

First, we need to define the event of sovereign debt crisis: What should be considered as sovereign debt crisis? In general, sovereign debt crisis is defined as the sovereign government's default on its debt. It can take different forms from outright default on domestic and external debt to rescheduling the short term debts, facing the problems in debt servicing, approaching the IMF for large amount of non-concessional loan (more than 100% of the courtiers quota) and putting moratorium on debt repayments.

A country may display one or more of these symptoms before onset of crisis but the absence of these symptoms does not rule out the sovereign debt crisis. Because, apart from the above economic factors there may exist many political and historical factors. The best example is the "Odious Debt" where the sovereign country defaults due to change in the political regime. The new political regime denies to honor the debts incurred by the old regime. South Africa, Nicaragua, Iran, Iraq and many more episodes are the prime examples of this kind (Bonilla, 2011; Kremer and Jayachandran, 2002).

The literature also focused on the inter-linkages between the debt crisis, currency crisis and banking crisis. The relation between currency crisis and banking crisis is well established (Kaminsky, Lizondo and Reinhart, 1998; Frankel and Rose, 1996; Berg, Borensztein and Pattillo, 2004). But the relation between debt crisis and currency and banking crisis got a mixed results. Sy (2003) found that debt and currency crisis are distinct. Berg and Patillo (2004) found that debt and currency crisis are related but distinct. Moreover, the study found that most debt crisis are associated with currency crisis, but the reverse is not true. For example, Pakistan's debt crisis episode of 1998 was not accompanied by or created a currency crisis. In the same way, in almost all the currency crisis episodes, we did not observe any follow up debt crisis.

Given the above facts, our debt crisis indicator is defined as a mix of above debt definitions from Manasse et al (2003), Ciarlone and Trebeschi (2006) and Jeddi (2013). Crisis episodes and dates are identified with the data provided by Reinheart and Rogoff (2010), S&P, World Bank's Global Development Finance database (GDF), the Paris Club, Data Bank (2014), Bank of Canada (2014), Cruces and Trebesch (2011); Beers and Chambers (2006); and Suter (1992).[6]

4.5.1 Final definition of sovereign debt crisis adopted in the study

A country is considered in "Sovereign Debt Crisis" when at least one of the following criterion is met. One, if a country goes for restructuring and/or rescheduling on either domestic or external debt repayments or impose a complete moratorium on debt repayments. Two, if a country obtains a large financial assistance package from the IMF above its country quota. Third, if a country accumulates arrears on external obligations toward commercial creditors in excess of 5 percent of commercial debt outstanding or has a rescheduling or restructuring agreement with commercial creditors. Fourth, if the country missed debt repayments of interest and/or principal on external obligations vis-avis official and commercial creditors in an amount of more than 5 percent of the debt service ratio paid by year-end.

This definition is stringent enough, not to miss any of the crisis episodes. It captures the whole range of debt crisis episodes from 1980 to 2013. A total of 67 crisis episodes are identified. The most number of crisis are reported in 1980s. The basic difference between 1980s crisis episodes and the recent ones are, the "duration of the crisis".

The maximum duration of the crisis now is around one year. May be this is because of better responsive polices and crisis management by the international institutions. Even though, the number of crisis episodes continue in the same manner but the intensity seems to decrease over these decades,

[6] Other large default databases include those of Detragiache and Spilimbergo (2001), Rose (2005), Benjamin and Wright (2009), Borensztein and Panizza (2009), Cohen and Valadier (2011) and Pescatori and Sy (2007).

however a common consensus is yet to emerge on the possible reasons responsible. When it comes to India, there is not a single study of this sort. The closest is by Singh (2010), which develops EWS to predict financial crisis with the help of ordered probit model.

Table-4.1: Emerging market economies and crisis episodes

Country	Number of Crisis	Crisis Episodes 1980-1990	Crisis Episodes 1990-2000	Crisis Episodes 2000-2013
Argentina	3	1983-1995	-	2000-2005, 2013
Belize	2	-	-	2006-2007, 2012
Brazil	2	1983-1993	1998-1999	-
Dominican	3	1982-1999	-	2002, 2005
Ecuador	3	1982-1995	1999-2000	2008-2009
Grenada	2	-	-	2004-2005, 2012
India	3		1991	2003, 2007-09
Indonesia	2	-	1997-2000	2002
Jamaica	3	-	1990	2010, 2013
Korea	3	1980-1981,1984	1997-1999	-
Mexico	2	1982-1992	1995-96	-
Morocco	2	1983-1992	1999	-
Nigeria	5	1982-1992, 1986-1988	1992	2001, 2004-2005
Pakistan	2	1981-1982	-	1998-2001
Panama	2	1983-1996, 1987-1994	-	-
Paraguay	2	1986-1992	-	2003-2004
Peru	3	1980, 1984-1997	-	2000
Philippines	2	1983-1992	1994	-
Poland	1	1981-1994	-	-
Russia	3	1989	1991-1997, 1998-2000	
Seychelles	1	-	-	2008
South Africa	3	1985-1987, 1989	1993	-
Thailand	2	1981	1997-1998	-
Tunisia	1	1979-1982	-	-
Turkey	2	1980-1982	-	2000-2001
Uruguay	4	1983-1985, 1987	1990-91	2003
Venezuela	4	1983-1988	1990, 1995-1997	2004-2005
Total No of Crisis	67	28	17	22

Source: Author compiled from the literature and data sources

4.6 Data and variables for regression

Identifying the proper variables and incorporating them in the empirical model is a difficult task. The literature on debt sustainability identified a set of variables. Initially, 27 countries are selected but due to data availability and highly insignificant results, finally the sample of 12 countries are fully analyzed. The dataset contains 37 macroeconomic, external and financial indicators for the 12 countries from 1980 to 2013.Broadly, the variables are subdivided into different categories. The data is collected from world economic outlook (WEO), international financial statistics (IFS) and respective central banks.

Theoretically, country can caught into crisis due to illiquidity or due to insolvency. According to Manasse et al (2003) an illiquid borrower has no cash to meet its obligations even if he is able to repay its debt in future. Whereas an insolvent borrower is unable to repay its debt at maturity given future income. Variables used in the model are explained briefly below.

Debt solvency variables: These explain the strength of the economy to meet its debt repayments. Debt variables will be in normal ranges before the crisis and these variables show exponential changes during the crisis periods and revert back to normality in the post crisis periods. Variables like, total debt servicing to exports, total debt servicing to gdp.

Measures of liquidity: Share of short term debt in total debt and total foreign exchange reserves. According to Manasse et al (2003), many of the recent episodes are mostly due to illiquidity rather than solvency problem. One serious source of debt servicing problem arising due to the short maturities of sovereign debt or of private sector debt from abroad. The share of short term debt in the total sovereign debt or total debt (may be total debt will be more appropriate, as it will include all components) and in the total foreign exchange reserves may be a good indicator to assess the illiquidity.

Macroeconomic variables: The country may start reporting very low real growth rates with high inflationary situation, it may even fall into negative growth rates too before onset of the crisis. To capture economic growth aspects, gross domestic product, growth rate of gdp, inflation, domestic interest rates are included. Kaminsky (1999) argues that high real interest rates could be a sign of liquidity crunch, which leads to an economic slowdown and banking fragility.

International trade and finance factors: Current account deficit is true indicator of abnormality and in the pre-crisis periods, it is expected to grow abnormally and may increase further at the height of the crisis and will show improvement when the crisis ends. Other variables included are nominal exchange rate, real effective exchange rate, exports to gdp, imports/gdp, trade Openness, foreign direct investments to gdp, forex reserves.

Below mentioned variables are used to measure the country's ability to generate foreign currency revenues both in the short, to avoid illiquidity and in the long run to avoid solvency.

Global factors: In this globalized world, both positive and negative shocks are highly contagious. And many emerging economies have deep integration with the world economy and in some cases like Venezuela, Nigeria and Russia much of their gdp is contributed by oil revenues. To capture these effects, **f**ederal funds rate**,** gold price and international oil prices are included.

Debt servicing variables: Total debt servicing variables are included to understand the liquidity problems. Debt servicing to exports, short term external debt, interest on external debt.

Political factors: The countries which are included in this study might have under gone many structural changes and even regime shifts. But to focus more on economic variables than political variables, political economy variables are

excluded from the analysis to make the empirical model more parsimonious and also due to data related issues[7].

4.7 Methodology for regression

The Logit model is used to predict the occurrence of the sovereign debt crisis. Between the logit and probit models, logit models preferred. The logit model uses logistic distribution and probit uses normal distribution to calculate probabilities. Since, the occurrence of sovereign debt crisis is a rare event and the dependent variable is highly unlikely to have normal distribution. The dependent variable is defined as a binary variable, no crisis being considered as "0" and crisis period is defined as "1". Here, the aim is to predict the occurrence of the future sovereign debt crisis rather than identifying the past crisis episodes.

$$Yi = \begin{cases} 0 & If\ there\ is\ NO\ crisis \\ 1 & if\ there\ is\ crisis \end{cases}$$

$$E(Yi|\ xi) = \alpha + \beta xi = pi$$

The logit models is defined as:

$$\boldsymbol{Li = ln(pi|1 - pi) = zi = \ \alpha + \beta xi}$$

Where, *Yi* is the dependent variable and *Xi's are the regressors.*

4.8 Empirical estimations

In the empirical estimation, it is important to note that all the variables enter into the model in levels, this is to observe the actual change. In the first stage, individual logit regressions are estimated with each variable separately and the variables which found significant with proper sign are selected from each group of macroeconomic variables, trade variables, and global factors. Then,

[7]A number of political economy variables, a dummy for presidential election years, regime change, reflecting political uncertainty, and an index of corruption, political freedom will be a good predictors but this study excluded all these due to lack of sufficient data and reliable data source.

in the second stage, all the significant variables are used to test the final logit model. Since, the macroeconomic variables related in one way or the other, serious multicolinearity problems aroused and output was generated as "fully determined". Through, trial and error and a series of rearrangements, final significant variables are found, which explains the crisis occurrence meaningfully and which are free from multicolineality issues.

The whole sample period (from 1980 to 2013) is used to predict the probability of occurrence of crisis given the past history of all crisis events faced by that country. The default history of a country is included in the dependent variables itself, rather than as a possible regressor dummy.

Estimated results of the logit model are presented in Table-4.2 to Table-4.5 for twelve countries. The log likelihood ratio gives the overall goodness of fit of the model. For all the countries, this ratio is reported very high in the range of 16 to 37, meaning that the models as a whole are very significant. Next, when it comes to the coefficient of variation, the normal coefficient of determination (R^2) is of limited use in the limited dependent models. Here, McFadden's R^2 is calculated, which exactly does the same job as the normal R^2. The McFadden's R^2 is the highest for Brazil (0.827) followed by Dominican Republic (0.826), Peru (0.776), Philippines (0.757), Panama (0.673). The lowest but significant McFadden R^2 are reported for Nigeria (0.278), Ecuador (0.375), India (0.43), Venezuela (0.497), Turkey (0.578) and Paraguay (0.574).

The variables[8] which are found to be significant for each country are highly in conformity with debt crisis literature. First, current account deficit (cad) turned out to be very significant factor in determining the debt crisis, for all the countries, except Argentina, this variable is positive and highly significant. This means that as current account deficit increases, so do the probability of the occurrence of the debt crisis.

[8] The full descriptions of the variables and the data sources are given in Appendix-4.A.

The ratio of investment to gross domestic product (inv2gdp) displayed mixed results for different countries. It got positive sign for countries like Brazil (3.272) but negative sign for Argentina (-0.892) and Philippines (-0.955). This may be due to the dynamics and composition of investment in the respective counties. Another variable which showed similar divergent pattern is the percentage of multilateral debt in total external debt (md2ted). The increase in multilateral debt is expected to minimize the occurrence of crisis, as this form of debt is more specific and long term in duration. But, there is positive sign for Argentina and this may be due to the past heavy default history of the country. For all other countries, this variable got negative sign.

The debt related variables and foreign exchange market variables are found out to be highly significant in explaining the occurrence of debt crisis. The debt variables like, the share of external debt to gross national income (ed2gni) is positive with respect to Argentina (0.169), Brazil (0.686) and India (0.369) but negative with respect to Nigeria (-0.012) and Venezuela (-0.101). This may be due to the debt dynamics, composition and the growth pattern of the country. Long term external debt (edlong) is negative and significant for Argentina, Ecuador, Peru and Philippines. Total foreign exchange reserves to total external debt (tforex2ted) found to be negative and significant for Brazil (-0.560).

Ratio of external debt to exports is positive and significant for Dominican Republic (0.0820), Panama (0.153), Peru (0.042) and Turkey (0.081) but negative for Philippines (-0.01).This explains that exports are the future foreign currency earner and when debt increases more than exports then the country may dip into solvency problem in the long run.

This shows that as long term debt increases in the total external debt, the countries will have much needed time to accumulate resources to repay the debt and hence, less likely to default. In contrast, short term external debt to total forexreserves (std2forex) is found to be positive. Though, this variable turn out to be significant only for Nigeria (0.006), this gives a good comparison between long and short term debt impacts on debt crisis.

Real effective exchange rate, which can be seen as short-term havoc creators found out to be negative and significant for Philippines (-0.216) but positive for Peru (0.447).

Macroeconomic variables, broad money to gross domestic product (bm2gdp), government saving to gross domestic product (gsav2gdp), imports to gross domestic product (imp2gdp) and foreign direct investment to gross domestic product showed negative and significance for some of the countries. But these variables are highly effected by the domestic factors.

With respect to global factors (Table-5), the oil price found to be negative and significant with respect to oil producing and exporting countries like Ecuador (-0.092), Nigeria (-0.086) and Venezuela (-0.340). This indicates that the country's ability of debt repayment is curtailed by fluctuations in its revenue flows, especially, foreign currency flows.

The marginal effects: The marginal effects are checked after estimating the logit model for each country. Marginal effects in logit model show the change in probability that the binary dependent change from 0 to 1, when the regressor increase by one unit, by keeping all other variables constant. The Marginal effects are reported in the tables for each country and change is in accordance with the coefficient change.

The predicted probability: The predicted probability values in the logit model, estimate the probability of crisis happening. In other words, the probability the crisis takes place (i.e., crisis =1) given the regressors at their mean levels. It is found that Argentina (0.735), Panama (0.5365) and Ecuador (0.389) is expected to face sovereign debt crisis. And remaining countries, Brazil (0.0005), Dominican Republic (0.264), India (0.143), Paraguay (0.248), Peru (0.014), Philippines (0.203), Turkey (0.040), Nigeria (0.291) and Venezuela (0.042) are not in the crisis prone region.

Table-4.2:Logit model estimations for Argentina, Brazil and Dominican Republic

	(1) Argentina		(2) Brazil		(3) Dominican Republic	
VARIABLES	Coefficients	Marginal Effects	Coefficients	Marginal Effect	Coefficients	Marginal Effects
ed2gni	0.169**	0.0136***	0.686*	0.0207***		
	(0.0740)	(0.00369)	(0.407)	(0.00448)		
inv2gdp	-0.892**	-0.0720***	3.272*	0.0986***		
	(0.405)	(0.0206)	(1.876)	(0.0221)		
Cad			2.528*	0.0761***	1.031*	0.0369***
			(1.492)	(0.0172)	(0.601)	(0.00967)
tforex2ted			-0.560*	-0.0169***		
			(0.328)	(0.00457)		
bm2gdp			-0.151	-0.00453*		
			(0.110)	(0.00233)		
		-0.00891***				
Edlong	-0.110**					
	(0.0512)	(0.00262)				
md2ted	0.803*	0.0647**				
	(0.477)	(0.0310)				
					-2.506*	-0.0898***
gsav2gdp					(1.345)	(0.0131)
ed2exp					0.0820*	0.00294***
					(0.0492)	(0.000952)
tforex					-3.400	-0.122*
					(2.505)	(0.0656)
Constant	9.226		-68.18*		35.77*	
	(7.499)		(39.61)		(20.48)	
Log Likelihood	29.22		32.52		37.16	
McFadden's R^2	0.6215		0.8274		0.8261	
Predicted Probability	0.735		0.0002		0.2649	
Observations	34	34	34	34	33	33

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Table-4.3: Logit Model estimations for India, Panama and Paraguay

	(4) India		(5) Panama		(6) Paraguay	
VARIABLES	Coefficients	Marginal Effects	Coefficients	Marginal Effects	Coefficients	Marginal Effects
fdi2gdp	4.835**	0.497***				
	(2.151)	(0.149)				
ed2gni	0.369**	0.0379***				
	(0.157)	(0.0105)				
edst	0.0883*	0.00907**				
	(0.0523)	(0.00458)				
cad	2.169**	0.223***	0.466*	0.0317**	0.717*	0.0587***
	(1.044)	(0.0820)	(0.261)	(0.0132)	(0.367)	(0.0176)
er	-0.319**	-0.0327***				
	(0.158)	(0.0125)				
ed2exp			0.153*	0.0104***		
			(0.0784)	(0.00352)		
md2ted			-0.521*	-0.0355**	0.877*	0.0717**
			(0.313)	(0.0154)	(0.494)	(0.0279)
tds2exp			-0.458*	-0.0313***	0.346*	0.0283**
			(0.242)	(0.0112)	(0.203)	(0.0113)
bm2tforex					-6.023*	-0.493**
					(3.464)	(0.199)
tforex					6.84e-09	5.60e-10*
					(5.02e-09)	(3.35e-10)
goldprice					0.0188	0.00154*
					(0.0131)	(0.000882)
Constant	-1.389		1.874		-35.42*	
	(2.782)		(5.128)		(19.13)	
Log Likelihood	16.90		31.04		22.20	
McFadden's R^2	0.43		0.673		0.574	
Predicted Probability	0.143		0.536		0.248	
Observations	34	34	34	34	34	34

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table-4.4: Logit Model estimation for Peru, Philippines and Turkey

	(7) Peru		(8) Phillippines		(9) Turkey	
VARIABLES	Coefficients	Marginal Effects	Coefficients	Marginal Effects	Coefficients	Marginal Effects
ivs2gdp			-0.955*	-0.0422**		
			(0.565)	(0.0213)		
Reer	0.447*	0.0216***	-0.216*	-0.00953**		
	(0.243)	(0.00503)	(0.116)	(0.00377)		
Edlong	-2.347*	-0.113***	-0.534**	-0.0236***		
	(1.263)	(0.0252)	(0.268)	(0.00905)		
ed2exp	0.0422*	0.00203***	-0.0115	-0.000506	0.0817*	0.00450**
	(0.0222)	(0.000452)	(0.0279)	(0.00123)	(0.0492)	(0.00223)
Cad	2.106*	0.102***	-0.324	-0.0143	0.527	0.0290
	(1.242)	(0.0338)	(0.399)	(0.0171)	(0.517)	(0.0266)
md2ted					-0.611*	-0.0336**
					(0.363)	(0.0156)
tds2gni					-0.560	-0.0308
					(0.521)	(0.0267)
Constant	2.872		65.37**		-8.946	
	(6.015)		(32.65)		(7.215)	
Log Likelihood	36.51		32.44		16.43	
McFadden's R^2	0.776		0.757		0.578	
Predicted Probability	0.014		0.203		0.040	
Observations	34	34	34	34	34	34

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table-4.5: Logit Model Out estimation for Ecuador, Nigeria and Venezuela

	(10) Ecuador		(11 Nigeria		(12) Venezuela	
VARIABLES	Coefficients	Marginal Effects	Coefficients	Marginal Effects	Coefficients	Marginal Effects
oilprice	-0.0921**	-0.0130***	-0.0865*	-0.0145**	-0.340**	-0.0357***
	(0.0420)	(0.00418)	(0.0489)	(0.00665)	(0.160)	(0.0115)
cad	0.412*	0.0582**	0.119*	0.0200**	0.212*	0.0222**
	(0.225)	(0.0257)	(0.0647)	(0.00836)	(0.125)	(0.0108)
edlong	-0.946**	-0.134***				
	(0.441)	(0.0451)				
imp2gdp	0.450	0.0636*				
	(0.288)	(0.0354)				
ed2gni			-0.0129	-0.00216	-0.101	-0.0106
			(0.0119)	(0.00185)	(0.0780)	(0.00749)
std2forex			0.00622	0.00104		
			(0.00466)	(0.000690)		
md2ted					-0.787**	-0.0825***
					(0.382)	(0.0285)
tforex					0.396*	0.0415**
					(0.228)	(0.0189)
rir					-0.0781	-0.00819
					(0.0594)	(0.00550)
Constant	4.013		2.483		10.35	
	(2.692)		(2.244)		(6.875)	
Log Likelihood	17.71		12.52		21.95	
McFadden's R^2	0.375		0.278		0.497	
Predicted Probability	0.389		0.291		0.042	
Observations	34	34	33	33	34	34

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.

4.8.1 In-sample prediction of logit early warning system

After estimating logit early warning system, we need to check its in-sample and out of sample predictive power. Out of 34 crisis episodes, the logit early warning system developed above predicted the 29 crisis correctly but it missed 5 crisis episodes. The EWS model gave 10 false alarms on the whole. But an interesting observation to be noted here is that, in the neighborhood of false alarm years the model observed the crisis. This may be the reason that the model predicted the crisis babbles which eventually after one or two years busted.

Table- 4.6: The Debt-crisis entries correctly predict

Country	No of Crisis	Predicted Correctly	Missed Crisis Episodes	False Alarm
Argentina	3	1983-1995 2000-2005	2013	0
Brazil	2	1983-1993,	1998-1999	1994
Dominican	3	1982-1999, 2005	2002	0
Ecuador	3	1982-1995, 1999-2000, 2008-2009	0	0
India	3	1991, 2003, 2007-09	0	2013
Nigeria	5	1982-92, 1986-88, 1992, 2001, 2004-05	0	1995, 1996
Panama	2	1983-1996, 1987-1994	0	2003, 2009
Paraguay	2	1986-1992, 2003-2004	0	1980
Peru	3	1980, 1984-1997	2000	0
Philippines	2	1983-1992	1994	0
Turkey	2	1980-1982, 2000-2001	0	1999
Venezuela	4	1983-1988, 1990, 1995-1997, 2004		1989, 2003
Total No of Crisis	**34**	**29 (85.29%)**	**5 (14.7%)**	**10 (29%)**

Source: Author's calculations

The findings of this study with "logit early warning system" outperform the results compared to related studies. This study predicts 85% of all the sovereign debt crisis episodes with 10% false alarms and 15% missed crisis episodes. Manasse et al (2003) uses the same logit model, which predicts 74% of all the sovereign debt crisis. This may due to the definition adopted with respect to sovereign debt crisis. Another study, Ciarlone and Trebeschi (2006) predict sovereign debt crisis by employing multinomial logit model on macroeconomic variables and identifies about 78% of the crisis periods

accurately with 34% false alarms. Jedidi (2013) uses a panel logit model but uses composite indexes as explanatory variables. The study predicted 74 percent of the crisis episodes correctly.

It means that the logit early warning system outperforms compared to the multinomial logit model and panel logit models and it gives less false alarms. This is may be due to relatively less stringent crisis definition that the above studies adopted, which did not identify all the crisis episodes. This may also be due to reduction in average crisis resolving period. Moreover, none of these studies included the financial crisis period and its impact cannot be ruled out on the output.

We can conclude that the logit EWS model is very efficient in predicting sovereign debt crisis. Due to lack of forecasted data, out of sample prediction could not be performed. But by reducing the sample period in the first model, excluding some years of data, in the sense, the new sample is take as 1980 to 2005 only and the data from 2005 to 2013 is used for out of sample prediction. The model was tested for out of sample prediction. The results are very encouraging and predicted all most all the crisis periods in the late 2005.By estimating the predicted probabilities, it is found that, Argentina, Panama and Ecuador is expected to face sovereign debt crisis in the near future. And the remaining countries, Brazil, Dominican Republic, India, Paraguay, Peru, Philippines, Turkey, Nigeria and Venezuela are not in the crisis prone region.

4.9 Summary

This chapter discussed the early warning systems for the sovereign debt crisis. The early warning systems are generally developed since sovereign defaults are very costly. The weak international bankruptcy laws and enforcement mechanisms with respect to sovereign default making the situation more complicated. In the event of default, defaulting country and its lender has to renegotiate over the reduction of the defaulted debt to resolve a debt crisis but creditors had to forgo almost 40% of the amount. This is precisely why we need to predict these crisis episodes. In line with the above arguments, here, an

effort is made, to predict whether the emerging economies are prone to sovereign debt crisis or not. The early warning system is developed by using a set of variables from 1980 to 2013, including macroeconomic, external and debt variables, which results in sovereign debt crisis if they are not properly controlled. The study extended the literature by incorporating more recent financial crisis period and due to its stringent crisis definition, it also identifies more crisis episodes.

In order to predict the sovereign debt crisis in the emerging economies, a large number of macroeconomic, debt, forex, trade and global factors are identified and tested for 12 countries by constructing a logit model. In the first stage, individual regressions are estimated and those variables which found to be significant are selected and used in the full model. The variables like current account deficit, external debt parameters like external debt to gross national income, multilateral debt, long term external debt, forex parameters like total forex to exports real effective exchange rate, macro parameters like investment to gross domestic product, gross saving to gross domestic product and global factors like oil prices are found to be very significant in explaining the debt crisis.

The findings of this study outperform the results compared to previous studies. This study predicts 85% of all the sovereign debt crisis episodes with 15% missed crisis episodes and 10% false alarms. By estimating the predicted probabilities, it is found that, Argentina, Panama and Ecuador are expected to face sovereign debt crisis in the near future. And the remaining countries, Brazil, Dominican Republic, India, Paraguay, Peru, Philippines, Turkey, Nigeria and Venezuela are not in the crisis prone region.

Appendix-4.A: Data variables, sources and definitions

Code	Variable	Description	Source
Crisis	Crisis period	0= No Crisis Period and 1= Crisis Period	Author calculated
gdp	Economic growth	Gross domestic product (current US dollar)	IMF-WEO
gdppci	Per capita GDP	Gross domestic product per capita (Current US dollar)	IMF-WEO
inv2gdp	Investment to GDP	Investment as a percentage of GDP	IMF-WEO
cad	Current account deficit	Current account deficit	IMF-WEO
openness	Trade openness	Sum of exports and imports of goods and services/GDP (%)	IMF-WEO
er	Exchange rate	Exchange rate (No. of domestic currency units per 1 US dollar)	IMF-WEO
fdi2gdp	Foreign direct investment	Foreign direct investment, net inflows (% of GDP)	IMF-WEO
ed2exp	External debt stocks	External debt stocks (% of exports of goods, services and primary income)	IMF-WEO
ed2gni	External debt stocks	External debt stocks (% of GNI)	IMF-WEO
edlong	Long-run external debt	External debt stocks, long-term (DOD, current US$)	IMF-WEO
edst	Short-run external debt	External debt stocks, short-term (DOD, current US$)	IMF-WEO
std2forex	Short-term debt	Short-term debt (% of total reserves)	IMF-WEO
std2ted	Short-term debt	Short-term debt (% of total external debt)	IMF-WEO
md2ted	Multilateral debt	Multilateral debt (% of total external debt)	IMF-WEO
ied2exp	Interest payments on external debt	Interest payments on external debt (% of exports of goods, services and primary income)	IMF-WEO
amed	Average maturity	Average maturity on new external debt commitments (years)	IMF-WEO
tds2exp	Total debt service	Total debt service (% of exports of goods, services and primary income)	IMF-WEO
tds2gni	Total debt service	Total debt service (% of GNI)	IMF-WEO
tforex	Total reserves	Total reserves (includes gold, current US$)	IMF-WEO

tforex2ted	Total reserves	Total reserves (% of total external debt)	IMF-WEO
bm2gdp	Broad money	Broad money (% of GDP)	IMF-WEO
bm2tforex	Broad money to total reserves	Broad money to total reserves ratio	IMF-WEO
inf	Inflation	Inflation, consumer prices (annual %)	IMF-WEO
rir	Real interest rate	Real interest rate (%)	IMF-WEO
govd2gdp	Government debt	Government debt, total (% of GDP)	IMF-WEO
exp2gdp	Exports	Exports of goods and services (% of GDP)	IMF-WEO
imp2gdp	Imports	Imports of goods and services (% of GDP)	IMF-WEO
gni	Gross national income	GNI (current US$)	IMF-WEO
ggni	Growth of Gross National Income	GNI growth (annual %)	IMF-WEO
ggnipci	GNI per capita growth	GNI per capita growth (annual %)	IMF-WEO
gsav2gdp	Gross savings	Gross savings (% of GDP)	IMF-WEO
nbtot	Net barter terms of trade	Net barter terms of trade index (2000 = 100)	IMF-WEO
goldprice	Gold price	Gold price in dollars	World Gold Council, FED
fedrate	Interest rate	Federal Reserve interest rate	IMF-WEO, FED
oilprice	Oil Price	Crude oil price-brent (dollars per barral)	U.S. Energy Information Administration (EIA)

Source: Author's own compilations

Appendix-4.B: Probit model estimations of early warning system

Table-4.B.1: Probit model estimations for Argentina, Brazil and Dominican Republic

	(1)	(2)	(3)
VARIABLES	Argentina	Brazil	Dominican Rep
ed2gni	0.0874**	0.0384	
	(0.0342)	(0.0471)	
inv2gdp	-0.463**	0.161	
	(0.198)	(0.186)	
cad		0.215*	0.622*
		(0.123)	(0.350)
tforex2ted		-0.0826*	
		(0.0489)	
bm2gdp		-0.00902	
		(0.0157)	
edlong	-0.0590**		
	(0.0264)		
md2ted	0.453*		
	(0.259)		
gsav2gdp			-1.518*
			(0.777)
tforex			-2.077
			(1.414)
ed2exp			0.0493*
			(0.0279)
Constant	4.674	-2.490	21.73*
	(3.882)	(4.799)	(11.82)
Observations	34	34	33

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table-4.B.2: Probit model estimations for India, Panama and Paraguay

	(4)	(5)	(6)
VARIABLES	India	Panama	Paraguay
fdi2gdp	2.755**		
	(1.182)		
ed2gni	0.209**		
	(0.0842)		
edst	0.0516*		
	(0.0294)		
cad	1.210**	0.280*	0.423**
	(0.543)	(0.152)	(0.215)
er	-0.179**		
	(0.0839)		
ed2exp		0.0930**	
		(0.0465)	
md2ted		-0.314*	0.523*
		(0.181)	(0.299)
tds2exp		-0.279**	0.207*
		(0.139)	(0.119)
bm2tforex			-3.578*
			(2.097)
tforex			4.16e-09
			(3.00e-09)
goldprice			0.0110
			(0.00773)
Constant	-0.875	1.104	-21.16*
	(1.581)	(2.862)	(11.48)
Observations	34	34	33

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table-4.B.3: Probit model estimations for Peru, Philippines and Turkey

	(7)	(8)	(9)
VARIABLES	Peru	Phillippines	Turkey
ivs2gdp		-0.494*	
		(0.283)	
reer	0.253**	-0.115*	
	(0.127)	(0.0601)	
edlong	-1.321**	-0.281**	
	(0.652)	(0.133)	
ed2exp	0.0239**	-0.00607	0.0452
	(0.0115)	(0.0154)	(0.0285)
cad	1.205*	-0.164	0.295
	(0.665)	(0.209)	(0.303)
md2ted			-0.340*
			(0.206)
tds2gni			-0.314
			(0.300)
Constant	1.681	34.32**	-4.940
	(3.419)	(16.45)	(4.251)
Observations	34	34	34

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table-4.B.4.: Probit model estimations for Ecuador, Nigeria and Venezuela

	(10)	(11)	(12)
VARIABLES	Ecuador	Nigeria	Venezuela
oilprice	-0.0536**	-0.0531*	-0.201**
	(0.0233)	(0.0302)	(0.0871)
cad	0.239*	0.0704*	0.123*
	(0.128)	(0.0364)	(0.0711)
edlong	-0.532**		
	(0.225)		
imp2gdp	0.259*		
	(0.157)		
ed2gni		-0.00840	-0.0625
		(0.00745)	(0.0452)
std2forex		0.00381	
		(0.00283)	
md2ted			-0.448**
			(0.192)
tforex			0.225*
			(0.120)
rir			-0.0455
			(0.0318)
Constant	2.190	1.584	6.345
	(1.493)	(1.398)	(3.986)
Observations	34	33	34

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Chapter-5

Summary, Policy Implications and Limitations

5.1 Summary

In the backdrop of global financial crisis, the interest in sovereign debt and sovereign debt crisis got revived due to the challenges it posed to both emerging and advanced economies, especially, due to the fact that emerging economies started facing more challenges. As the advanced economies are caught up in a liquidity trap situation due to “zero bound interest rates”, these economies resorted to unconventional monetary policies. Apart from the havoc created by huge capital flows in exchange rate movements in emerging economies, the advanced countries' monetary policies are posing challenges to emerging economies by destabilizing international debt markets. These policies have implications on the cost of borrowing of emerging economies. Hence, spillover effects on sovereign bond yields and their determinants need to be analyzed empirically. Given the huge costs involved in the sovereign default, there is a need to predict the event of default and proneness to crisis by these selected countries.

In this context, this study aimed at examining following main objectives. One, the study analyzed vulnerabilities and volatile situations in the international financial markets in general and debt markets in particular. The interest rates, exchange rates, bond yields in emerging economies found to be more volatile in recent times. Second, the study tried to analyze the proximate determinants of sovereign bond yields empirically in this high volatile environment. Third, an early warning system was developed for 12 emerging economies and found the results which are more efficient than the earlier studies.

When it comes to the definition of emerging economies, this study adopted the standard and most accepted definition of emerging economies as classified by International Monetary Fund (IMF). IMF classifies all the economies into advanced and emerging and developing countries. From the emerging and

developing countries list, the sample countries are identified and selected based on the sovereign debt crisis episodes from 1980 to 2013.

Sovereign debt crisis is defined based on a four-point criteria, which is adopted from the literature. A sovereign is said to be in crisis, when at least one of the following criterion is met. One, if a sovereign goes for restructuring and/or rescheduling on either external or domestic debt repayments or impose a whole moratorium on debt repayments. Two, if a sovereign obtains a large financial assistance package from the IMF above its country quota. Third, if a sovereign accumulates arrears on external obligations toward commercial creditors in excess of 5 percent of commercial debt outstanding or has a rescheduling or restructuring agreement with commercial creditors. Fourth, if the sovereign missed debt repayments of interest or principal on external obligations vis-à-vis official and commercial creditors in an amount of more than 5 percent of the debt service ratio paid by year end.

There are about 67 sovereign debt crisis episodes identified in 27 emerging countries from 1980 to 2013. But due to data availability and consistency issues the final econometric analysis is done only for 12 countries.

In **Chapter 2**, various issues and debates on sovereign debt crisis are analyzed in depth. First, the issue of debt is analyzed in a historical perspective and it tries to find the answers to questions like, is default country specific? Why only some countries default and others don't? Then, it focused on questions like, when and where the countries default, duration and time elements of the crisis etc.

Under the theoretical issues, tax smoothing theory, inter-generational and intra-generational debt issues, complete sovereign debt model, Eaton and Gersovitz (1981) and self-fulfilling crises are discussed. Under the empirical issues, sovereign debt issue, repayment, default characteristics of sovereign debt, debt composition and sovereign debt maturity are analyzed. In the sovereign debt literature, "sovereign default" is the key episode, this is analyzed under the title "sovereign default: costs and benefits". Next, a kind of

debt that attracted the recent literature but mostly theoretical is the "odious debt". It is also analyzed in a detailed manner. Odious debt problem arises when the new regimes do not honor the debts incurred by the old regimes.

Sovereign debt renegotiation dominated the debt literature over time. It basically addresses the question of, how the debt problem is solved in the post default scenario. This issue is analyzed in detail under the section "Sovereign debt renegotiation". Sovereign debt pricing is one new dimension in sovereign debt renegotiation and part of it. Next, the issue of "debt overhang" is analyzed. Debt overhang is something the high debt country itself takes an initiative to reduce the debt burden rather than creating defaulting problems. Debt laffer curve, proposed by Krugman is a part of it.

The legal aspects of sovereign debt are also briefly discussed. These are very important developments that took place over the period of time, in a space where, there is less scope for legal binding. In the legal aspects, sovereign immunity, attachment proceedings, the "act of state", international comity are some of the key issues which are analyzed.

Various policy proposals of debt resolving mechanisms, international Debt Commission, Oechsli (1981) ideas, Market based mechanisms and international debt facility are some of the key new deployments over the last 50 years are also analyzed here. But, the policy proposals are very aspirational but very week in implementation part. Apart from the above proposals, there are some proposals from International Monetary Fund (IMF) itself. Collective action clauses (CACs) and Sovereign debt restructuring mechanism (SDRM) are two new evolving developments. Finally, the Samaritan dilemma is analyzed, which is basically about the physiological approach to debt, charity and human behavior.

Chapter 3 is one of the main empirical chapters of the thesis. Important findings of these chapters are given below: In the present study, the sovereign bond yields of twelve emerging economies are analyzed and an attempt is made to identify the determinants of sovereign bond yields over the period

1980–2013 using the panel regressions and panel cointegration techniques, as there is no consensus on the determinants of the sovereign bond yields. Some studies found that fiscal variables determine the bond yields for advanced economies, but some found the contrary. The empirical results of pedroni cointegration tests and dynamic ordinary least squares (DOLS) tests show that the factors like US 10 year benchmark bond yields (usyield), government debt to gdp (govd2gdp), federal reserve rate (fedrate), oil price (oilprice), real interest rates (rir) and volatility index (Vix) are the proximate determinants of the emerging economies' bond yields.

Our results are in conformity with the existing literature. This study found that a one percent increase in the US bond yields will increase the bond yields of the emerging economies around 10 percent. This shows that the distortions in the US debt market can be very devastating for the emerging economies debt markets. The coefficient of inflation found to be negative and insignificant. The reason may be that now, high inflation is a norm than exception these days in emerging economies. But interest rates (rir) found to be positively related and significant with respect to domestic bond yields. When it comes to volatility index (vix), the countries with weak fundamentals (fiscal stress) will be subject to more volatile bond yields in the event of sudden upward shift in global risk appetite. In this study, the coefficient of oil price found to be negative and significant, despite of the composition of the countries, which includes major oil producing countries, namely, Russia, Mexico, Venezuela. The reason seems to be the low oil prices prevailing in the global markets since 2006.

Chapter 4 is also one of the main empirical chapters of the thesis. Important findings of these chapters are as follows: International debt markets are highly volatile, highly contagious and pose a high risk to emerging economies. The debt servicing difficulties and defaults are increasing in the recent times but the duration of the sovereign debt crisis has drastically come down.

With respect to prediction of the sovereign debt crisis in the emerging economies, variables like current account deficit, external debt parameters like

external debt to gross national income, multilateral debt, long term external debt, forex parameters like total forex to exports real effective exchange rate, macro parameters like investment to gross domestic product, gross saving to gross domestic product and global factors like oil prices are found to be very significant in explaining the debt crisis.

The findings of this study outperform the results compared to previous studies. This study predicts 85% of all the sovereign debt crisis episodes with15% missed crisis episodes and 10% false alarms. The present study found that Argentina, Panama and Ecuador are expected to face the sovereign debt crisis. Remaining countries (viz., Brazil, Dominican Republic, India, Paraguay, Peru, Philippines, Turkey, Nigeria and Venezuela) are not in the crisis prone region.

5.2 Policy implications

Based on an extensive literature review and empirical analysis, the following policy implications are derived:

1. As far as the odious debt is concerned, the literature explicitly points out that creditors should take proper safe guards when extending credit to politically and environmentally volatile countries. Some of the safeguards are in the form of collateral or some reprisals mechanism in agreement and constant monitoring options or making central banks also as a part of agreement etc.

2. With respect to legal aspects: Since the sovereign immunity is not as rigid as earlier times now due to various acts and court judgments, there is a lot improvement in sovereign debt agreements. The collective action clauses (CACs) and sovereign debt restructuring mechanisms (SDRM) have to be effectively employed in every contract and along with these, creditors should come up with clauses which actually reduce the “credit cascading”.

3. Since, the current study exposed the vulnerabilities of emerging markets and volatile situations in the international debt markets, emerging

economies need to protect themselves from the possible debt crisis by adopting various mitigating strategies. On the fiscal front, the emerging economies must follow, fiscal responsibility and accountability and try to maintain low debt to gdp ratios and fiscal deficits and increase tax revenue to avoid the solvency type crisis. On the monetary front, efficient management of interest rate and exchange rate are the two shields that insulate the emerging economies from external shock to the maximum extent. Along with these, monetary authorities should maintain adequate forex reserves to avoid “liquidity” type crisis. Since, emerging economies cannot control the global events and policies of other countries, all countries should try for an international monetary coordination.

4. The early warning system identified various variables, which are country specific depending on the nature of the economy. So, to avoid possible debt crisis of "liquidity” and/or “solvency” kind, the counties need to control macro, debt and external factors as identified in the early warning system.

5. When it comes to the oil rich countries, the low international oil prices adversely affecting these economies. So, these economies need to develop alternative revenue sources and diversify their economic activities.

5.3 Scope and limitations

The present study suffers from few limitations, the important one being the data limitation. The consistent data on all variables considered in the study are available only from 1980 onwards. Longer duration of the data would have been helpful to predict crisis more accurately.

Moreover, due to lack of relevant and comparable data, the study had to exclude some important emerging economies like Russia and South Korea. Second, for the same reason, the study could not include non-economic variables like political and sociological factors, which might have strengthened the findings. Since the choice of the country to default or not to

default depends on multifaceted elements, including various socio-economic and political variables in the model may help to predict the crisis with more accuracy.

Third, when it comes to sovereign bond yields, analysis with daily data may capture more dynamic elements. But since most of the macroeconomic variables are unavailable at daily frequency, the present study had to confine to yearly data. The possible proxies need to be developed to capture the dynamism in the bond markets.

Fourth, when it comes to sovereign bond yields, analysis with daily data may capture more dynamic elements but problem is that not all macroeconomic variables are in daily frequency. So if some good proxies are found, then this analysis can be further improved.

Finally, the model gets more strength, if variables like government expenditure pattern and wasteful expenditure are included as explanatory variables. Since the wasteful expenditure will generate less future income for the government and reduce the repayment ability. But, there is no consensus on what to be classified as wasteful expenditure.

References

Abbas, S. A., Belhocine, N., El-Ganainy, A., & Horton, M. (2011). Historical patterns and dynamics of public debt—evidence from a new database. *IMF Economic Review*, 59(4), 717-742.

Aguiar, M., & Gopinath, G. (2004). Emerging market business cycles: The cycle is the trend. *National Bureau of Economic Research.* (No. w10734)

Aguiar, M., Amador, M., & Gopinath, G. (2006). Efficient Expropriation: Sustainable Fiscal Policy in a Small Open Economy. *Federal Reserve Bank of Boston*. Woking Paper No. 06-9.

Alesina, A. and R. Perotti. (1995). The Political Economy of Budget Deficits. *IMF Staff Papers*, 42, 1–31.

Alessandro, M., Sandleris, G., & Van Der Ghote, A. (2011). *Sovereign Defaults and The Political Economy Of Market Re-access* (No. 2011-08). Universidad Torcuato Di Tella.

Fuertes, A. M., & Kalotychou, E. (2007). Optimal design of early warning systems for sovereign debt crises. *International Journal of Forecasting*, *23*(1), 85-100.

Ardagna, S. (2009). Financial markets' behaviour around episodes of large changes in the fiscal stance. *European Economic Review*, 53(1), 37-55.

Arellano, C., & Ramanarayanan, A. (2012). Default and the maturity structure in sovereign bonds. *Journal of Political Economy*, 120(2), 187-232.

Arellano, Cristina. 2008. "Default Risk and Income Fluctuations in Emerging Economies." *American Economic Review*, 98(3): 690–712.

Atkeson, A. (1991). International lending with moral hazard and risk of repudiation. *Econometrica: Journal of the Econometric Society*, 1069-1089.

Adnan Aziz, M., & Dar, H. A. (2006). Predicting corporate bankruptcy: where we stand?. *Corporate Governance: The international journal of business in society*, 6(1), 18-33.

Baldacci, E., & Kumar, M. (2010). Fiscal deficits, public debt, and sovereign bond yields. IMF Working Papers, 1-28.

Basu, S. S. (2009). *Essays on sovereign debt and international capital flows* (Doctoral dissertation, Massachusetts Institute of Technology).

Bauer, M., & Rudebusch, G. (2011). Signals from unconventional monetary policy. FRBSF Economic Letter, 2011, 36.

Bauer, M. D., & Rudebusch, G. (2013). Expectations for monetary policy liftoff. FRBSF Economic Letter, 34.

Bauer, M. D., & Neely, C. J. (2014). International channels of the Fed's unconventional monetary policy. *Journal of International Money and Finance*, 44, 24-46.

Beck, R., & Fidora, M. (2008). The Impact of SWFs on Global Financial markets. *European Central Bank Occasional Paper Series.*

Beers, David T., and Ashok Bhatia, (1999). Sovereign Defaults: History. *Standard & Poor's Credit Week*, December 22

Beim, D. O., & Calomiris, C. W. (2001). *Emerging financial markets*. New York: McGraw-Hill/Irwin Professional Pub.

Benjamin, D., & Wright, M. L. (2009). Recovery before redemption: A theory of delays in sovereign debt renegotiations. *CAMA Working Papers*, Australian National University, Centre for Applied Macroeconomic Analysis.

Berg, A., Borensztein, E., & Pattillo, C. (2004). Assessing early warning systems: how have they worked in practice?. *IMF staff papers*, 462-502.

Bi, R. (2008). Beneficial Delays in Debt Restructuring Negotiations. *IMF Working Papers*, 1-29.

Bird, G., & Rowlands, D. (2002). Do IMF programmes have a catalytic effect on other international capital flows?. *Oxford Development Studies*, *30*(3), 229-249.

Black, F. and M. Scholes (1973). The Pricing of Options and Corporate Liabilities. *Journal of Political Economy* 81, no. 3: 637-654.

Bolton, P., & Jeanne, O. (2007). Structuring and restructuring sovereign debt: the role of a bankruptcy regime. *Journal of Political Economy*, 115(6), 901-924.

Bonilla, S. (2011). Odious Debt: Driving Change in Sovereign Debt Governance. In *Odious Debt* (pp. 107-143). Gabler.

Bordo, M. D., & Rockoff, H. (1996). The gold standard as a "good housekeeping seal of approval". *The Journal of Economic History*, 56(02), 389-428.

Borensztein, E., & Panizza, U. (2009). The costs of sovereign default. *IMF Staff Papers*, *56*(4), 683-741.

Bradley, M and M Gulati (2012). Collective Action Clauses for the Eurozone: An Empirical Analysis. *SSRN Working Paper*, March.

Breimann, L., Friedman, J.H., Olshen, R.A. & Stone, C.J., (1983), *Classification and Regression Trees*, Wadsworth Publishers.

Breitung, J. (2000). The local power of some unit root tests for panel data. In *Advances in Econometrics*, Volume15: *Nonstationary Panels, Panel Cointegration, and Dynamic Panels*, ed. B. H. Baltagi, 161–178. Amsterdam: JAI Press.

Breitung, J., and S. Das. (2005). Panel unit root tests under cross-sectional dependence. *Statistica Neerlandica* 59: 414–433.

Brownlie, Ian. (2003). *Principles of Public International Law*, Sixth edition. Oxford and New York: Oxford University Press.

Buchanan, J.M. (1972). The Samaritan's Dilemma. Reprinted in: Buchanan, J.M. (1977), *Freedom in Constitutional Contract*, Texas A&M University Press: 169-185.

Buchheit, Lee C. (1986). Sovereign Immunity.*Business Law Review*, 7(3): 63–64.

Buchheit, Lee C. (1995). The Sovereign Client. *Journal of International Affairs*, 48(2): 527–40.

Bulow, J. I., & Rogoff, K. (1988). Sovereign debt: Is to forgive to forget?.*The American Economic Review*, 79 (3), pp. 690-712.

Bussiere M., Fratzscher M., (2002). Towards a New Early Warning System of Financial Crises. *European Central Bank Working Paper*, No. 145.

Calvo, G. A. (2002). On dollarization. Economics of Transition, 10(2), 393 403.Wiley Online Library.

Calvo, G. A., & Talvi, E. (2005). *Sudden stop, financial factors and economic collpase in Latin America: learning from Argentina and Chile (*No. w11153). National Bureau of Economic Research.

Cantor, R, and Frank Packer, (1996). Determinants and Impact of Sovereign Credit Ratings. *Federal Reserve Bank of New York Policy Review* (October), pp. 37–52.

Catão, L., &Bennett Sutton. (2002). Sovereign Defaults: The Role of Volatility. *IMF Working Paper* 02/149 (Washington: International Monetary Fund).

Cato, L., & Kapur, S. (2006). Volatility and the debt-intolerance paradox. *IMF Staff Papers*, 195-218.

Chamon, M. (2007). Can Debt Crises Be Self-Fulfilling? *Journal of Development Economics*, 82(1): 234–44.

Chang, R., & Velasco, A. (2000). Banks, debt maturity and financial crises. *Journal of international Economics*, 51(1), 169-194.

Choi, I. (2001). Unit root tests for panel data. *Journal of International Money and Finance* 20: 249–272.

Choi, S. J., Gulati, M., & Posner, E. A. (2013). Dynamics of Contract Evolution, The. *NYUL Rev.*, *88*, 1.

Ciarlone A., Trebeschi G., (2005). Designing an Early Warning System for Debt Crises. *Emerging Market Review*, 6 (4), 376-395.

Ciarlone A., Trebeschi, G., (2004). Currency and Debt Crises: A Review of the Early Warning Systems. *Country and Political Risk: Practical Insights for Global Finance*, (ed) S. Wilkin, Risk Book.

Cline (1995). *International Debt Re-examined*. (Washington: Institute for International Economics).

Cohen, D. (1992). The Debt Crisis: A Postmortem. *NBER Macroeconomics Annual* 1992, Volume 7, National Bureau of Economic Research, Inc, NBER Chapters, 65–114.

Cohen, D. (1993). Low Investment and Large LDC Debt in the 1980's, .*American Economic Review*, 83, 437–49.

Cohen, D. and C. Valadier (2011). 40 years of sovereign debt crises. *CEPR Discussion Papers* 8269, Centre for Economic Policy and Research.

Cohen, Daniel & Richard Portes, (2006). Toward a Lender of First Resort. *IMF Working Papers* 06/66, International Monetary Fund.

Cole, H. L., & Kehoe, P. J. (1998). Models of sovereign debt: Partial versus general reputations. *International Economic Review*, 39, 55-70.

Cole, H. L., & Kehoe, T. J. (2000). Self-fulfilling debt crises. *The Review of Economic Studies*, 67(1), 91-116.

Committeri, M., & Spadafora, F. (2013). You never give me your money? Sovereign debt crises, collective action problems, and IMF lending.*IMF Working Paper*.

Corden, Max, 1989. An International Debt Facility?.*Analytical Issues in Debt*.Ed. by Jacob A. Frenkel, Michael P. Dooley, and Peter Wickham (Washington: International Monetary Fund), pp. 151–71.

Corsetti, Giancarlo, Bernardo Guimmaraes and Nouriel Roubini(2003). International Lending of Last Resort and Moral Hazard: A Model of IMF's Catalytic Finance.*Journal of Monetary Economics,* 53 (3), 441-471.

Cottarelli, Carlo and Curzio Giannini, (2002). Bedfellows, Hostages, or Perfect Strangers? Global Capital Markets and the Catalytic Effect of IMF Crisis Lending.*IMF Working Paper* 02/193 Washington: International Monetary Fund.

Cruces, J. J. and C. Trebesch (2011). Sovereign Defaults: The Price of Haircuts. *CESifo Working Paper Series* 3604, CESifo Group Munich.

Cuadra, G. and H. Sapriza (2008). Sovereign default, interest rates and political uncertainty in emerging markets. *Journal of International Economics*, 76, 78–88.

Das, U., Papapioannou, M., Pedras, G., Ahmed, F., & Surti, J. (2010). Managing Public Debt and Its Financial Stability Implications. *IMF Working Paper* 10/280.

De Paoli, Bianca, Glenn Hoggarth and Victoria Saporta (2006). Costs of Sovereign Default. *Financial Stability Paper* No.1, Bank of England.

Debevoise, Whitney (1984). Exchange Controls and External Indebtedness: A Modest Proposal for a Deferral Mechanism Employing the Bretton Woods Concepts. *Houston Journal of International Law.7*, 157–68.

Dell'Ariccia, G., Schnabel, I., & Zettelmeyer, J. (2006). How Do Official Bailouts Affect the Risk of Investing in Emerging Markets?. *Journal of Money, Credit and Banking*, 1689-1714.

Dell'Ariccia, G., Schnabel, I., & Zettelmeyer, J. (2002). Moral Hazard and International Crisis Lending: A Test. *IMF Working Paper* 02/181 Washington: International Monetary Fund.

Depetris Chauvin, N., & Kraay, A. (2005). What has 100 billion dollars' worth of debt relief done for low-income countries?. *International Finance Working Paper*, EconWPA.

Detragiache, Enrica, and Antonio Spilimbergo, (2001). Crises and Liquidity: Evidence and Interpretation. *IMF Working Paper* 01/2 Washington: International Monetary Fund.

Dooley (2000). Can Output Losses Following International Financial Crises Be Avoided?. *National Bureau of Economic Research Working Paper* 7531, February.

Dreher, Axel. (2004). Does the IMF cause Moral Hazard? A Critical Review of the Evidence. *International Finance Working Paper* 0402003, Econ WPA.

Duffie, D., Pedersen, L. H., & Singleton, K. J. (2003). Modeling sovereign yield spreads: A case study of Russian debt. *The Journal of Finance, 58*(1), 119-159.

Eaton, Jonathan, and Raquel Fernandez, (1995). Sovereign Debt. *NBER Working Paper* 5131, Prepared for Handbook of International Economics.

Edison, Hali J. (2000). Do Indicators of Financial Crisis work? An Evaluation of an Early Warning System. *International Finance Discussion Papers*, Board of Governors of the Federal Reserve System, Number 675, July

Edwards, Martin S (2006). Signalling Credibility? The IMF and Catalytic Finance.*Journal of International Relations and Development*, 9 (1), 27-52.

Eichengreen, B., & Kletzer, K. (2003). Crisis resolution: next steps (No. w10095). *National Bureau of Economic Research Working Paper*.

Engen, E. M., & Hubbard, R. G. (2005). Federal government debt and interest rates. *NBER Macroeconomics Annual* 2004, 19, 83-160. MIT Press.

Eslava, M. (2006). The Political Economy of Fiscal Policy: Survey. *RES Working Papers* 4487. Inter-American Development Bank.

Faini, R. (2006). Fiscal policy and interest rates in Europe. *Economic Policy*, 21(47), 443-489.

Feder, G., Just, R., (1977). A Study of debt servicing capacity applying logit analysis. *Journal of Development Economics* 4, 25–38.

Ferguson, N., & Schularick, M. (2006). The empire effect: the determinants of country risk in the first age of globalization, 1880–1913. *The Journal of Economic History*, 66(02), 283-312.

Fernandez, R., & Rosenthal, R. W. (1990). Strategic models of sovereign-debt renegotiations. *The Review of Economic Studies*, 57(3), 331-349.

Forbes, K. J., & Chinn, M. D. (2004). A decomposition of global linkages in financial markets over time. *Review of Economics and Statistics*, 86(3), 705-722.

Frank, C., Cline, W., (1971). Measurement of debt servicing capacity: an application of discriminant analysis. *Journal of International Economics* 1, 327–344.

Frankel J. A., Rose A. K., (1996). Currency Crashes in Emerging Markets: an Empirical Treatment. *Journal of International Economics*, 41 (3-4), 351-366.

Fuertes, Ana-Maria and Kalotychou, Elena (2006). Early Warning Systems for Sovereign Debt Crisis. *Computational Statistics and Data Analysis*.

Fuertes, Ana-Maria and Kalotychou, Elena (2007). Optimal design of early warning systems for sovereign debt crises. *International Journal of Forecasting* 23, 85–100

Gagnon, J., Raskin, M., Remache, J., & Sack, B. (2011). The financial market effects of the Federal Reserve's large-scale asset purchases. *International Journal of Central Banking*, 7(1), 3-43.

Garman and Klass (1980). On the Estimation of Security Price Volatility from Historical Data. *Journal of Business.*

Gelos, R. G., R. Sahay, and G. Sandleris (2004). Sovereign Borrowing by Developing Countries: What Determines Market Access? *IMF Working Papers* 04/221, International Monetary Fund.

Gelos, R. G., Sahay, R., & Sandleris, G. (2011). Sovereign borrowing by developing countries: What determines market access? *Journal of international Economics*, 83(2), 243-254.

Gennotte, G., Kharas, H., Sadeq, S. (1987). A valuation model for developing-country debt with endogenous rescheduling. *World Bank Economic Review*, 1, 237– 271.

Ghosh, Swati, and Atish Ghosh, (2002). Structural Vulnerabilities and Currency Crises. *IMF Working Paper* No. 02/9 Washington

Gibson, R., & Sundaresan, S. M. (1999). A model of sovereign borrowing and sovereign yield spreads. *SSRN Papers*

Gilchrist, S., López-Salido, D., & Zakrajšek, E. (2014). *Monetary policy and real borrowing costs at the zero lower bound* (No. w20094). National Bureau of Economic Research.

GOI (2009-10), "India's External Debt- a Status Report". Ministry of Finance.

Goldstein, M., Kaminsky, G. L., & Reinhart, C. M. (2000). *Assessing financial vulnerability: an early warning system for emerging markets*. Peterson Institute.

Grossman, Herschel I., and John B. Van Huyck. (1988). Sovereign Debt as a Contingent Claim: Excusable Default, Repudiation, and Reputation. *American Economic Review*, 78(5): 1088–97.

Hadri, K. (2000). Testing for stationarity in heterogeneous panel data. *Econometrics Journal*, 3: 148–161.

Hague, Nadeem Ul, Mark, N. C., & Mathieson, D. J, (1998). The Relative Importance of Political and Economic Variables in Creditworthiness Ratings. *IMF Working Paper* 98/46 Washington

Hamilton, J. D., & Wu, J. C. (2012). The effectiveness of alternative monetary policy tools in a zero lower bound environment. *Journal of Money, Credit and Banking*, 44(s1), 3-46.

Harris, R. D. F., and E. Tzavalis. (1999). Inference for unit roots in dynamic panels where the time dimension is fixed. *Journal of Econometrics* 91. 201 226.

Hartelius, K. J., Kashiwase, K., & Kodres, L. E. (2008). Emerging market spread compression: is it real or is it liquidity?. *IMF Working Papers*, 1-36.

Hatchondo, J. C., L. Martinez, and H. Sapriza (2007). The Economics of Sovereign defaults. *Economic Quarterly*, 163–187.

Hauner, D., Kumar, M. S. (2009). Financial conditions and fiscal performance in emerging markets. *Contemporary Economic Policy*. 27(1), 86 96.

Hemming, Richard, and Murray Petrie, (2002). A Framework for Assessing Fiscal Vulnerability. *IMF Working Paper* 00/52 Washington: International Monetary Fund.

Hemming, Richard, Michael Kell, and Axel Schimmelpfennig, (2003), Fiscal Vulnerability and Financial Crises in Emerging Market Economies, *IMF Occasional Paper* No. 218 Washington: International Monetary Fund.

Im, K. S., M. H. Pesaran, and Y. Shin. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics,* 115: 53–74.

Imbs, J. M., & Ranciere, R. (2005). The overhang hangover. SSRN papers

International Monitory Fund (2002). Early Warning System Models: The Next Step Forward. *Global Financial Stability Report,* March.

International Monitory Fund (2013). Old Risks, New Challenges. *Global Financial Stability Report.* April

Jeanneret Alexandre, Eric Paget-Blanc and Slim Souissi (2014). Sovereign Defaults by Currency Denomination. March 31.

Jen, S. L. (2007). How big could sovereign wealth funds be by 2015?. *Revue d'économie financière (English ed.)*, *9*(1), 195-198.

Kaminsky G. L., Lizondo S., Reinhart C. M., (1998). Leading indicators of currency crises. *IMF Staff Papers*, 88 (2),1-48.

Kao, C., & Chiang, M. H. (2000). Testing for structural change of a cointegrated regression in panel data. Syracuse University. *Manuscript*.

Kapur, Sandeep, Ana Fostel, and Luis Catão. (2007). Persistent Gaps, Volatility Types, and Default Traps. *IMF Working Paper* 07/148.

Kenen, Peter B (1990). Organizing Debt Relief: The Need for a New Institution. *Journal of Economic Perspectives, 4 (Winter),* 7–18.

Kinoshita, N. (2006). Government debt and long-term interest rates.*SSRN papers*

Kirmann, A., Maltritz, D., (2003). Sovereign risk in a structural approach — evaluating sovereign ability-to-pay and probability of default. *Dresden Discussion Paper Series in Economics*, No.7/03.

Kletzer, Kenneth M., and Brian D. Wright. (2000). Sovereign Debt as Intertemporal Barter. *American Economic Review*, 90(3): 621–39.

Knot, K., & De Haan, J. (1995). Fiscal policy and interest rates in the European Community. *European Journal of Political Economy*, 11(1), 171-187.

Krishnamurthy, A., Vissing-Jorgensen, A. (2011). The effects of quantitative easing on interest rates: channels and implications for policy (No. w17555). *National Bureau of Economic Research*.

Krugman, P. (1988). Financing vs. forgiving a debt overhang. *Journal of Development Economics,* 29, 253–268.

Kumar, M. S., & Okimoto, T. (2011). Dynamics of international integration of government securities' markets. *Journal of Banking & Finance*, 35(1), 142 154.

Laeven, L., & Valencia, F. (2012). Systemic Banking Crises Database: An Update. *IMF Working Paper* 12/163.

Larrain, Guillermo, Helmut Reisen, and Julia von Maltzan, (1997). Emerging Market Risk and Sovereign Credit Ratings. *OECD Development Centre Technical Papers* No. 124 (Paris: Organisation for Economic Co-operation and Development).

Laubach, T. (2009). New evidence on the interest rate effects of budget deficits and debt. *Journal of the European Economic Association*, 7(4), 858-885.

Lee, H. W., Xie, Y. A., & Yau, J. (2011). The impact of sovereign risk on bond duration: Evidence from Asian sovereign bond markets. *International Review of Economics & Finance*, 20(3), 441-451.

Phillips, M. S., & Lane, M. T. D. (2000).Does IMF financing result in moral hazard? (No. 0-168).*IMF Working Paper* 00/168 (Washington: International Monetary Fund).

Lee, Suk Hun, (1993). Are the credit ratings assigned by bankers based on the willingness of LDC borrowers to repay? *Journal of Development Economics*, 40, 349-359.

Levin, A., C.-F. Lin, and C.-S. J. Chu. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics* 108: 1–24.

Lindbeck, A., Nyberg, St., Weibull, J.W. (1999), Social Norms and Economic Incentives in the Welfare State. *Quarterly Journal of Economics, Vol. CXIV*, Feb. 1-35.

Longstaff, Francis A et al. (2011). How Sovereign Is Sovereign Credit Risk? *American Economic Journal: Macroeconomics* 3(2), 75-103.

Lucas, Robert (1990). Why doesn't Capital Flow from Rich to Poor Countries? *American Economic Review* 80 (2): 92–96

Marc, F., & Frédéric, Z. (2009). *Development Centre Studies The Making of Global Finance 1880-1913*. OECD Publishing.

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

Marichal, C. (1989). *A century of debt crises in Latin America: from independence to the Great Depression, 1820-1930*. Princeton, NJ: Princeton University Press.

McGuire, P., & Schrijvers, M. A. (2003). Common factors in emerging market spreads. *BIS Quarterly Review*, December.

Michael Tomz and Mark L. J. Wright (2013). Empirical research on sovereign debt and default. *NBER working paper*.

Mody, A., & Saravia, D. (2006). Catalysing Private Capital Flows: Do IMF Programmes Work as Commitment Devices?. *The Economic Journal*, 116(513), 843-867.

Moody's (2008). Sovereign Default and Recovery Rates, 1983–2007. Special comment, *Moody's Investors Service*.

Morris, Stephen and Hyun Song Shin (2006). Catalytic Finance: When does it Work? *Journal of International Economics*, 70 (1), 161-177.

Obstfeld, M., & Taylor, A. M. (2003). Sovereign risk, credibility and the gold standard: 1870–1913 versus 1925–31. *The Economic Journal*, 113(487), 241 275.

Olivares and Caminal (2009). What Can Creditors Do when A Sovereign Nation Defaults? Issued by Mattison Public Relations on behalf of Sweet & Maxwell. Dec 11

Oshiro, Naoto and Saruwatari, Yasufumi (2005). Quantification of sovereign risk: Using the information in equity market prices. *Emerging Markets Review* 6, 346–362.

Ostrom, Elinor (2010). Beyond markets and states: polycentric governance of complex economic systems. *American Economic Review* (American Economic Association) 100 (3): 641–672

Pan, Jun and Kenneth J. Singleton (2008). Default and Recovery Implicit in the Term Structure of Sovereign *CDS* Spreads. *The Journal of Finance*, Vol. LXIII, NO. 5 October.

Pattillo, C., Poirson, H., & Ricci, L. A. (2011). External debt and growth. *Review of Economics and Institutions*, *2*(3), 30.

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and statistics*, 61(S1), 653-670.

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric theory*, 20(03), 597-625.

Perkins, J. (2004). *Confessions of an economic hit man*. Berrett-Koehler Publishers.

Pescatori A., Sy A. N. R., (2003). Debt Crises and the Development of International Capital Markets. *IMF Working Paper*, WP 04/44.

Pescatori, A., Sy A. N. R., (2007). Are Debt Crises Adequately Defined? *IMF Staff Papers*, 54, 306–337.

Peter, M., (2002), Estimating Default Probabilities of Emerging Market Sovereigns: A New Look at a Not-So-New Literature, *the Graduate Institute Of International Studies Working*, Paper No. 1

Poghosyan, T. (2014). Long-run and short-run determinants of sovereign bond yields in advanced economies. *Economic Systems*, 38(1), 100-114.

Presbitero, A. F. (2008). The debt-growth nexus in poor countries: a reassessment. *Economics: The Open-Access, Open-Assessment E-Journal*, *2*.

Rasmussen (2007). Sovereign Debt Restructuring, Odious debt, and the Politics of Debt Relief. *NBER Working Paper*

Reinhart, C. M., K. S. Rogoff, and M. A. Savastano (2003). Debt Intolerance. *Brookings Papers on Economic Activity*, 34, pp 1–74.

Reinhart, Carmen M., (2002), "Default, Currency Crises and Sovereign Credit Ratings," *NBER Working Paper* 8738. Also in *The World Bank Economic Review*, 16 (2), 151–170.

Richmond, C., & Dias, D. A. (2008). Duration of capital market exclusion: stylized facts and determining factors. *Department of Economics, University of California, Los Angeles*.

Kolb, R. W. (Ed.). (2011). *Sovereign debt: from safety to default* (Vol. 605). John Wiley & Sons.

Rochet, Jean Charles. (2006). Optimal Sovereign Debt: An Analytical Approach. *Inter-American Development Bank Research Department Working Paper*573.

Rodrik, D., & Velasco, A. (1999). Short-term capital flows (No. w7364). *National Bureau of Economic Research working paper.*

Rogoff, Kenneth S., and Jeromin Zettelmeyer. (2002). Bankruptcy Procedures for Sovereigns: A History of Ideas, 1976–2001. *IMF Staff Papers*, 49(3), pp 470–507.

Rojas-Suarez, L., (2001), *Rating Banks in Emerging Markets,* Institute for International Economics, Washington, DC.

Rose, A. K. (2005). One reason countries pay their debts: renegotiation and international trade. *Journal of Development Economics*, 77, 189–206.

Roubini, Nouriel, (2001). *Debt Sustainability: How to Assess Whether a Country is Insolvent.* New York: New York University (December).*http://pages.stern.nyu.edu/~roubini/debt.pdf*

Ruiz-Arranz, M., T. Cordella, and L. A. Ricci (2005). Debt Overhang or Debt Irrelevance? Revisiting the Debt Growth Link. *IMF Working Papers* 05/223, International Monetary Fund.

Sachs (1995). Do We Need an International Lender of Last Resort? *Frank D. Graham Lecture at Princeton University*, Vol. 8, April 20. Available at http://www.ksg.harvard.edu/cid/ciddirector/publicat.html

Sachs, J. (1989). The Debt Overhang of Developing Countries. *Debt, Growth and Stabilization: Essays in Memory of Carlos Dias Alejandro*, ed. By J. de Macedo and R. Findlay, Oxford: Blackwell, pp 80–102.

Sandleris, Guido. (2005). Sovereign Defaults: Information, Investment and Credit. *Society for Economic Dynamics* 2005 Meeting Papers 21.

Saravia, M. D., & Mody, M. A. (2003). *Catalyzing capital flows: Do IMF-supported programs work as commitment devices?* (No. 3-100). International Monetary Fund.

Shiller, R. J. (1993). Measuring asset values for cash settlement in derivative markets: hedonic repeated measures indices and perpetual futures. *The Journal of Finance*, 48(3), 911-931.

Shleifer, Andrei. (2003). Will the Sovereign Debt Market Survive? *American Economic Review*, 93(2): 85–90.

Singh, T. R. (2010). An ordered probit model of an early warning system for predicting financial crisis in India. *IFC Bulletin*, *25*, 185.

Standard & Poor's, (2002). Sovereign Defaults: Moving Higher Again in 2003? (September 24)

Sturzenegger, F., & Zettelmeyer, J. (2008). Haircuts: estimating investor losses in sovereign debt restructurings, 1998–2005. *Journal of International Money and Finance*, *27*(5), 780-805.

Sturzenegger, F., & Zettelmeyer, J. (2005). Haircuts: Estimating Investor Losses in Sovereign debt Restructurings, 1998-2005. *IMF Working Paper* No.05/137.

Sy, Amadou, (2003). Rating the Ratings Agencies: Anticipating Currency Crises or Debt Crises. *IMF Working Paper*. No. 03/122 (Washington: International Monetary Fund).

Uribe, M., & Yue, V. Z. (2006). Country spreads and emerging countries: Who drives whom? *Journal of international Economics*, 69(1), 6-36.

Vaona, Andrea, (2008), STATA tip: A quick trick to perform a Roy-Zellner test for poolability in Stata, *Quaderni della facoltà di Scienze economiche dell'Università di Lugano,* USI Università della Svizzera italiana.

Villemot, S. (2012). *Essays on Modelling the Sovereign Default Risk* (Doctoral dissertation, Paris, EHESS).

Visco I., (1978). On obtaining the right sign of a coefficient estimate by omitting a variable from the regression. *Journal of Econometrics*, 7, 115-117.

Weinschelbaum, F., & Wynne, J. (2005). Renegotiation, collective action clauses and sovereign debt markets. *Journal of International Economics*, 67(1), 47-72.

Wright, M. L. (2002). Reputations and sovereign debt. *Manuscript, Stanford University*.

Yeyati, Levy, Eduardo, and Ugo Panizza. 2006. The Elusive Costs of Sovereign Defaults. Inter-American Development Bank Research Department Working Paper 581.

Yucel, Eray (2011). A Review and Bibliography of Early Warning Models.*Munich Personal RePEc Archive*, August

Yue, V. Z. (2006). Sovereign Default and Debt Renegotiation. http://www.econ.nyu.edu/user/yue/Yue_2006.pdf.

Yue, V. Z. (2010). Sovereign default and debt renegotiation. *Journal of international Economics*, *80*(2), 176-187.

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