# Do Sovereign Credit Ratings Affect the Composition and Maturity of Sovereign Borrowing?

Kuntal Kumar Das*

## Abstract

I analyze the optimal choice between bank loans and bond finance for a sovereign debtor by incorporating the intermediation structures of the two debt instruments. I develop a three–period model to derive the composition and maturity structure of sovereign borrowing endogenously. The model allows for debt renegotiation in the event of financial distress, with the possibility of default. It incorporates the ability of "private monitoring" by the banks and "public monitoring" by the credit rating agencies. I find that the choice is determined endogenously by the trade–off between two deadweight costs: the cost of a default during a crisis and the cost of debtor moral hazard. In equilibrium, sovereigns use bank loans for financing short-term projects and issue long-term bonds for projects when crisis costs are large.

The predictions of the theoretical model are tested using data from emerging market economies. I find that there are additional informational contents in the sovereign credit ratings over and beyond the traditional macroeconomic factors.

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# 1  Introduction

One of the dominant features in the past one and half decade has been the change in the composition of the emerging market financial credit channel. In the nineties, the emerging markets experienced a rapid growth of bond issuance as the primary source of finance which during the seventies was dominated by the banks (see figures  A.2 and  A.3). But at the same time, the role of banks in mediating capital flows to emerging markets did not go away completely. On the contrary, the Asian countries have been relying heavily on the syndicate bank loans as the major source of borrowing in the period leading up to the 1997-1998 financial crises (see Goldstein 1998 (25)). Figure  A.4 displays the composition of capital flows to emerging markets since the end of the eighties, which includes borrowing by both private and public agents. Figure  A.5 shows the composition of capital flows between investment grade and sub-investment grade bonds in the emerging markets. This paper tries to explain this recent shift in trend in towards bond finance and studies the implications for the emerging market economies.

Bank loans and bonds clearly compete in the international market. But why some issuers float international bonds while others borrow from international banks have received very little systematic attention in the literature before. People have analyzed this problem in the domestic context (see Fama 1985 (22), Diamond 1991 (16), Rajan 1992 (41), Chemmanur & Fulghieri 1994 (11)) or have treated the two markets in isolation (see Eichengreen & Mody 2000 (20) and Eichengreen, Kletzer & Mody 2005(21) on the pricing of international bonds). But there has been little systematic analysis on the choice of debt instrument between bonds and bank loans, in an integrated fashion.[1]

This issue is important for numerous reasons. The composition of sovereign debt and how it affects debt restructuring negotiations in the event of financial distress has become a central policy issue in recent years. Over the past decade, share of sovereign bonds and greater dispersion of ownership these bonds have made sovereign debt difficult to renegotiate and restructure. Zettelmeyer (2003) (55) provides evidence on the recent restructuring episodes of different countries. He finds that there has been differential treatment of claims classes that were not legally prioritized in most debt restructurings that have taken place over the last 25 years. Restructurings under the Brady Plan in the late 1980s and 1990s, Russia and Ukraine during 1998-2000, Pakistan in 1999, Ecuador in 2000, Uruguay in 2003 and the on going Argentine restructuring are some examples. Differential treatment had two forms: First, defaulted instruments were often restructured on quite different terms. Second, governments have defaulted selectively on some classes of claims but not on others. For example, the "Brady Deals" that settled the debt crises of the 1980s restructured bank loans but not international bonds. Russia and Ukraine's restructurings involved domestic debt, bilateral official debt and bank loans, but not Eurobonds. Pakistan restructured bilateral official debt, bank claims and – for the first time – Eu-

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[1]The only exception being Hale (2007) (27) who also looks at the similar problem.

robonds, but not domestic debt. Ecuador restructured domestic debt, bilateral official debt and international bonds (both Eurobonds and Brady bonds), but not bank loans. Uruguay restructured both domestic and external bonds, but neither bank loans nor official bilateral loans.

Sovereign debt, which was composed of mainly syndicate bank loans in the 1970s and 1980s, has shifted gradually towards bond finance following the debt crises of late 1980s, first with the Brady deal and later with the growth in the international bond market.[2] There is no clear explanation for this composition, but one possible reason may be that syndicate bank loans were too easy to restructure. The new lenders may conceivably have counted on a lower risk of restructuring on international bonds, to the extent that these were widely dispersed, and were therefore more difficult to restructure. There are several things that make international bonds much harder to restructure than loans. First, they typically involve many more investors than do loans, even syndicate loans. Second, they may be in bearer form so investors may be untraceable.

The determinants of a borrowers' choice between bonds and bank loans are important for future policy making. From the point of view of policy, international capital flows mediated by banks and by the bond market pose different systematic risks. Thus, to understand the operation of the international financial markets, it is really important to understand the incentives and risks involved in the operations of these alternative mechanisms for capital flows. The recovery of global bond markets is of course one of the signal features of the last 15 years of international financial history.

Bank loans and bonds have different characteristics. Banks can act as delegated monitors on behalf of investors who cannot easily observe and discipline borrowers (Diamond 1984) (15). The information they can thereby acquire can be used to limit the use of funds for pricing loans. Banks can also cancel loans at relatively low costs which pose a credible threat to the borrowers and hence make monitoring effective. In contrast, the individual bondholders have little control over the issuer's actions until a bond matures and hence lack the incentive to incur the costs of securing private information about borrowers. Instead, public information – for example, the information assembled by the credit rating agencies dominate the market for debt securities. Securitized debt instruments are generally thought to have superior risk-sharing characteristics. Credit risk can be diversified away to a large extent by spreading individual loans across a substantial number of investors and enabling those investors to hold diversified portfolio of loans. Banks cannot engage in this practice to the same extent without eroding their capacity to make sunk costs in dedicated monitoring technologies. This trade-off is a way of understanding why lending takes place through both bank loans and bond markets.

In addition, banks can coordinate their actions more easily in the event of default and restructuring. They are relatively few in number and contractual arrangements such as sharing clauses reduce the incentive to hold out. The advantages of creditor coordination may make it even more profitable for banks

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[2]See Bolton and Jeanne (2005) (4).

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to monitor their borrowers. It is not necessary to assume that banks have an intrinsically superior ability to monitor, but they have more incentive to gather and use information. Transacting through bond markets has obvious advantages for investors in emerging market debt, notably the ability to diversify country risk. Among other things, obtaining external finance through bank loans is easier for small borrowers new to international markets, since banks have a comparative advantage in bridging the information asymmetries that are a barrier to the more widespread holding of international debt securities. Economies of scale (minimum issue size) also matters less for banks, whose intermediation technology is better suited to providing small loans.

To analyze these issues, we apply a theory of a borrower's choice of debt instrument from the corporate finance literature to the case of sovereign debt. This model helps us understand why some borrowers issue bonds and why others like to borrow from the syndicate banks. We construct a simple model of borrowing and lending. The model describes a market that is subject to moral hazard and adverse selection. It incorporates the possibility of private monitoring by the banks and public monitoring by the credit rating agencies. We derive the cost of debt endogenously with the possibility of re-negotiation and analyze the effect of possible default. We also derive the maturity structure in terms of short–term and long-term borrowing for these debt instruments. It finds that the reduced cost of information dissemination and large crisis costs have increased the willingness of the sovereigns to get themselves publicly monitored and made it easy for the countries to participate in the bond market, thus explaining the recent shift towards bond financing.

The paper then tests the implications of the theoretical model with data from the emerging market economies. We find that sovereign credit rating is important for activities of the sovereign as the rating process itself can operate as a powerful force for good governance, sound market-oriented growth, and the enforcement of the rule of law. Unrated countries are often perceived by creditors as riskier than they are, than even very high default risk countries. So countries are keen to get themselves rated.

## 2    Related Literature

The theories behind the choice between bank loans and bond finance have been developed and analyzed in the corporate finance literature. The literature focuses on issues like differential information set available to the banks and the bondholders, the difference in the number of creditors and the seniority of bank loans relative to bonds. For example, Diamond (1991) (16) addresses the choice between bank loans and directly placed debt and finds that borrowers with credit ratings towards the middle of the spectrum borrow from the banks, borrowers at the lower end issue junk bonds while other borrowers at the highest end issue investment grade bonds. Their crucial result hinges on the role of monitoring by the banks where reputation effects are important. Banks have a natural advantage in monitoring and they face a trade-off between the cost of

monitoring and the efficiency of alleviating moral hazard. Borrowers with good reputation choose safe projects and thus do not need to be monitored while it is impossible to provide enough incentives for the choice of safe projects to the borrowers with bad reputation. Hale (2007) (27) shows that even without differentiated reputation costs, the same result holds. Rajan (1992) (41) looks at the choice between informed and arm's–length debt. In his model, an informed bank can terminate the project with negative net present value at the interim stage, which the uninformed bondholders cannot. In doing so, the banks demand a surplus of the project which reduces the effort of the borrowers. So the choice between bank loans and arm's–length depends on the trade–off between ex–post continuation decision and the possible distortion to effort incentives with bank debt. Bolton and Freixas (2000) (3) investigate the choice between equity, bank debt and bond financing and find that riskier firms prefer bank loans, the safer ones borrow from the bond market while the ones in between issue both equity and bonds. Their result depends on the fact that bank loans are more flexible relative to bonds but are also more costly due to the cost of raising more capital for capital requirements. Their model predicts if the supply of loans is large, equity completely disappears from the market; the low–rated firms borrow from the banks while the high–rated firms issue bonds. Bolton and Scharfstein (1996) (5) analyze the optimal number of creditors a firm borrows from and shows that the optimal number of creditors depends on the trade-off between deterring strategic defaults and minimizing the ex–post inefficiency of liquidation. The optimal contract involves less risky firms borrowing from the multiple lenders to prevent strategic default, whereas the more risky ones borrow from one lender to minimize the inefficiency of liquidation.[3]

But these corporate finance models, however, are not directly applicable in the context of sovereign borrowing. Unlike in the case of corporate financing, banks do not have obvious informational advantage over bondholders in all areas of sovereign borrowing.[4] For instance, governments typically publish information related to their financial positions – such as fiscal and macroeconomic figures – in order to explain their budgets to the taxpayers, whereas only listed companies are obliged to disclose information about their accounts. Similarly, Bolton and Scharfstein's (1996) (5) argument does not hold here since sovereign lending is not usually collateralized.

There has been some empirical studies that analyze the aspects of debt composition for developing countries: debt versus equity and the maturity structure. Min (1998) (37), Schmukler and Vesperoni (2001) (47), Eichengreen and Mody (2000) (20), Jeanneau and Micu (2002) (30) and Fan, Titman and Twite (2003) (23) are to name a few. But these papers look at the bond or bank loan markets in isolation and have note been treated systematically in an integrated fashion. Few papers that have looked at the choice between bond and bank loan financing in an unified approach are Eichengreen, Kletzer and Mody (2005) (21), Tanaka (2006) (52) and Hale (2007) (27). Eichengreen, Kletzer and Mody (2005) (21)

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[3]Other papers are Rajan and Winton (1995) (42), Berlin and Loeys (1988) (2) and Chemmanur and Fulghieri (1994) (11)

[4]See Eichengreen, Kletzer and Mody (2005) (21)

find that banks reduce spreads as they obtain more information through repeated transactions with borrowers. But repeated borrowing has little influence in bond markets where publicly available information dominates. But spreads on bonds are lower when an IMF-supported program is present in the country issuing the bonds, as it conveys some positive information to the bondholders. Tanaka (2006) (52) looks at the theoretical considerations, but doesnot provide and empirical support. Hale (2007) (27) present a model of asymmetric information and shows how macroeconomic fundamentals affect the choice between bank lending and bond financing available to the emerging market borrowers. But none of these papers consider the choice between the debt instruments with their maturity structures, which we do in this paper.

## 3  Model Environment

We consider the problem of an entrepreneur that must borrow funds in order to invest in a project. We model it as a game with a three-period horizon – where the periods are denoted as $(t = 0, 1, 2)$. At time $t = 1$, entrepreneurs enter the debt market. Each entrepreneur (sovereign) has a single project and is in need of one unit (normalized) of external financing. They can raise this amount by either issuing bonds in the global market to investors or borrow the amount from a syndicate bank.[5] The bank and the bondholders are assumed to be risk-neutral and have access to a global capital market, which earn them a global (safe) interest rate of $R$ per unit of lending.

The sovereign borrowers are risk-neutral, but differ in their risk characteristics, parameterized as $p_i$ and $q_i$. The sovereign's type and action is private information and not observable by everyone. Each sovereign may be in financial distress with some probability; risky sovereigns are those with a greater chance of being in financial distress. Our main story is the decision and ability of the banks to monitor the sovereigns in order to build a relationship. We assume that this is important in order to determine if the sovereign exerted effort. In the event of financial distress, banks can devote additional resources to learn whether the sovereign should be allowed to continue operation under a renegotiated debt contract or should be liquidated. So the crucial distinction between the banks and bondholders is the following: Banks monitor the sovereigns and have more information about the sovereign's true type and they base their decision about renegotiation and liquidation based on that information. The bondholders however make their decision of extending their loan based on their information from the publicly available knowledge from the reports published by the credit–rating agencies and their expectations about the behavior of the other investors.

The parameters $p_i$ and $q_i$ characterizes the sovereign's ability to service its debt. At time $t = 1$, sovereign $i$ decides to borrow either from the bank or

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[5]To keep the model simple, we will assume that the entrepreneur's borrowing choice is between a bank and the bond market, and we will not explicitly model the choice of entreprenuers across banks.

issue bonds in the market and invest in a project. At time $t = 1$, the sovereign $i$ receives a gross return of $Y > R$ with probability $p_i$ and has the ability to fully service its debt. But they can choose not to repay the debt and default. In that case, they face an output loss of $L$.[6] But with probability $1 - p_i$, the sovereign $i$ receives a gross return of 0 from the project and faces a *liquidity* problem. If the creditors roll over the debt for the sovereigns facing a liquidity crisis at time $t = 1$, then the sovereigns receive a gross return of $Y > R$ with probability $q_i$ and 0 with probability $1 - q_i$. The decision to roll over the debt is taken independently by the two creditor parties.

After the initial investment, the banks observe $p_i$, the ex–ante creditworthiness of the sovereigns, and invest in a monitoring technology to observe the true value of $Y$. The bond-holders also observe $p_i$ but cannot monitor. So they receive imperfect and heterogeneous private information about the true state of $Y$ with some probability. Since the banks monitor the sovereigns and have more information about the true state of sovereign $i$'s creditworthiness, they base their decision based on that information. The bondholders however make their decision of extending the new loan based on their information from the publicly available knowledge and their expectations about the behavior of the other investors. When public knowledge is available, investors incorporate the agency's assessment into their own forecast. This provides a focal point towards which the investor's belief gravitate and the causes the investors to revise their expectations about the decision of other investors in rolling over the debt. So the bondholders roll over the loans only if the number of creditors rolling over the loan is above a critical mass. But if the creditors do not roll-over debt at time $t = 1$, the sovereigns can choose to restructure their debt or default. If the debt is restructured, the sovereigns pay back a maximum amount of $y$ to the creditors and face an output loss of $L$ in period $t = 1$.[7] We can think of this amount $y$ as being the outcome of a bargaining game (exogenous to the model) between the lenders and the borrowers. If they do not agree to a restructuring plan and default strategically , they face an output loss of $L$ in period $t = 1$ and also $t = 2$ in period.[8]

The game ends in period $t = 1$ if the gross outcome from the project is $Y$ and the debt is repaid in full by the sovereigns or if the creditors refuse to roll over the debt following a liquidity crisis and the debtor pays back $y$ after debt restructuring. But if the debt is rolled over to the next period $t = 2$ and the project return is 0, then the sovereign can pay out nothing to the creditors. This captures the possibility that an early restructuring might be desirable and delaying a default can be costly. (see Appendix A.1)

We now define the concept of sovereign insolvency, liquidity and default.

*At time $t = 1$, a sovereign is solvent but illiquid if the cash flow from the*

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[6] The loss of output has been justified in the literature by Eaton and Gersovitz(1981) (18), Bulow and Rogoff (1989) (8) and Dooley (2000) (17)

[7] The sovereigns could make this partial repayment by raising funds through sales of government assets.

[8] We do not allow for partial repayments as it does not improve the qualitative results of the model, but adds more complications.

*investment is at least equal to the restructured debt amount. The sovereign is insolvent if the cash flow from the investment is less than the restructured debt amount. At time $t = 2$, a sovereign is in default whenever it fails to meet its contractual obligation as agreed at $t = 0$ in full and the creditors refuse to roll over the debt. At time $t = 2$, a sovereign is in default whenever it fails to meet its contractual obligation as agreed at $t = 1$ in full.*

It is important here to distinguish between an insolvent sovereign and an illiquid sovereign. If the sovereign is insolvent, then the creditors are collectively better off by agreeing to an early liquidation and receiving $y$ at $t = 1$, whereas they are better off by rolling over if it is illiquid. But the decision to roll over the debt for a creditor depends on their assessments of the sovereign's ability to repay in future (economic fundamentals) and on their expectations about the actions of the other investors. So an illiquid but solvent debtor may also be forced to default if creditors refuse to roll over the debt at $t = 1$.

There is also the possibility of the debtor to choose not to service its debt in full, given the absence of the sovereign bankruptcy court. This *strategic default* can arise in either of the two cases: First, the sovereign receives a cash flow of $Y$ but refuses to service its debt in full. The second case is when the creditors do not roll over the debt in period $t = 1$ and the sovereign refuses to pay the maximum possible amount $y$. But whenever the sovereign defaults, it experiences a '*crisis cost*' – an output loss of $L$ during the same period. In addition we assume that if the sovereign in default fails to reach an agreement with its creditors within one period, the economy experiences an output loss of $L$ in the subsequent period as well.

Given the incentive structure and information about the state of the economy, we can derive the maximum rates of return that the different classes of creditors can expect. Since the original investment amount is one dollar, it represents the repayment amounts as well. The maximum possible contractual debt repayment, denoted by $r$, will depend on whether the *incentive compatible constraint* or the *cash flow constraint* binds first. The incentive constraint of not to default is given by $r < L$ which states that the sovereigns have no incentive to default when the maximum debt repayment is less than the crisis cost. The cash flow constraint is given by $r < Y$ states that the maximum debt repayment cannot be greater than the cash flow $Y$. Since $L < Y$, the borrower cannot credibly pledge the maximum cash flow $Y$ towards debt repayment given its incentive to default strategically whenever $r > L$. On the other hand, when

$$L > Y \tag{1}$$

then the cost of a strategic default is sufficiently high so that the sovereign can pledge a maximum of $Y$ towards debt repayment. For simplicity, we assume here that (1) holds. We first start by analyzing the baseline model without any public monitoring (i.e. no credit rating agencies).

# 4   Model without Public Monitoring

Let's first consider the case where the banks have access to the monitoring technology and can verify the financial state of the sovereigns in the interim stage. The individual bondholders on the other hand lack the incentive to incur the costs of securing private information about the borrowers. Thus, the difference between bank lending and bond finance here is that of monitored and non-monitored finance. The public information available to all the creditors, the banks as well as the bondholders, about the *ex–ante* creditworthiness of the sovereigns is the common knowledge about $p_i$. However, banks and the bondholders differ in their ability to observe $q_i$. The banks have a monitoring technology that allows them to acquire imperfect information about the *ex–ante* probability $q_i$ with a cost of $c$ per unit of lending.

If on the other hand the sovereign issues bonds, it will have to borrow from multiple investors. Since monitoring is too expensive for individual bondholders, they do not monitor. We assume *ex–ante*, $q_i$ is uniformly distributed according to the density function $\phi(u)$ with support $[0, u_i]$ where $\frac{y}{Y} \leq u_i \leq 1$ and $\bar{q}_i = \frac{u_i}{2}$. Without monitoring, the bondholders can only observe at $t = 0$. They also cannot verify the true realization of $q_i$ at $t = 1$.

If the sovereign issues bonds, it will have to borrow from multiple atomistic investors, say $N$. Since monitoring by each investor is impossible and too expensive, bondholders do not monitor at all. Without monitoring, they observe the population mean of $\bar{q}_i$ given by $\mu \equiv \frac{1}{N} \sum_{i=1}^{N} \bar{q}_i$ . We first focus on the short–term lending where the repayment is due at $t = 1$. We will consider the possibility of long–term finance in the next section. For simplicity, we also assume that the credit-markets are perfectly competitive and that neither the borrowers nor the lenders discount the future. We also assume that the contracts are incomplete so that the repayment cannot be made contingent on cash flows. For expositional simplicity, we drop the subscript $i$ from the subsequent discussions whenever possible.

## 4.1   Bank financing with short–term maturity

We will first derive the equilibrium behavior of the bank with short–term maturity of loans. The equilibrium pricing of bank loans is derived using backward induction. In the period $t = 1$, if the cash flow is $Y$ and if condition (1) holds, then the sovereign repays its debt in full and the game ends. If the cash flow is zero in period $t = 1$, the bank conducts its evaluation and decides whether to roll over the loan or not. If the bank decides to roll over, it enters into Nash bargaining with the borrower over the terms of repayment. The sovereigns, however, have no bargaining power since it suffers a crisis if the bargaining fails. Hence it can be shown that rollover occurs if and only if the sovereign is solvent ($p > \frac{y}{Y}$), and the bank captures all of the $t = 2$ cash flow $Y$ following a rollover if (1) holds.

At date $t = 0$, banks choose an interest rate and a level of resources to be

devoted to evaluate a borrowing sovereign in the event of a financial distress. They work backward in the spirit of dynamic programming, first determining their strategy in the event of financial distress before arriving at the interest rate to be charged. Let $\Pi_B$ denote the expected profit of the banks given that the borrowing sovereign is in financial distress and that the banks devote an amount of resources $c$ to evaluate whether the sovereign should be allowed to continue under a renegotiation arrangement. The expected profit of the firm under short term bank finance is given by

$$\Pi_B(p, r_B) = pr_B + (1-p)\left[\int_{\frac{y}{Y}}^{u} qY f(q)dq + \int_0^{\frac{y}{Y}} yf(q)dq\right] - c - R \quad (2)$$

The term in the parenthesis is the net worth of a borrower facing a liquidity problem at period $t = 1$, conditional on the lending being terminated at $t = 1$ if and only if it is insolvent. To derive the interest rate in equilibrium charged by the banks, $r_B$, we use the zero–profit conditions of the banks. The equilibrium interest rate is therefore given by

$$r_B^* = \frac{R + c - (1-p)\left[\int_{\frac{y}{Y}}^{u} qY f(q)dq + \int_0^{\frac{y}{Y}} yf(q)dq\right]}{p} \quad (3)$$

The maximum level of risk at which the bank is willing to lend out to the sovereigns is given by the cash flow constraint, $r_B^* \leq Y$. So we can derive the probability above which banks are willing to lend and it is given by

$$\tilde{p}_B \equiv \frac{R + c - \left[\int_{\frac{y}{Y}}^{u} qY f(q)dq + \int_0^{\frac{y}{Y}} yf(q)dq\right]}{Y - \left[\int_{\frac{y}{Y}}^{u} qY f(q)dq + \int_0^{\frac{y}{Y}} yf(q)dq\right]} \quad (4)$$

So banks are willing to lend if and only if $p > \tilde{p}_B$.

## 4.2 Bond financing with short–term maturity

The other alternative for the sovereigns is to issue bonds with the repayment due at $t = 1$. The bondholders do not invest in the monitoring technology and work backward in the spirit of dynamic programming to arrive at the interest rate to be charged. We assume that $\left(\mu < \frac{y}{Y}\right)$ such that the bondholders will not roll over credit to borrowers facing liquidity problems at $t = 1$. So the profit function of the bondholders is given as

$$\Pi_b(p, r_b) = pr_b + (1-p)y - R \quad (5)$$

Hence they are willing to lend at a contractual interest rate $r_b$, which solves the zero profit condition and the equilibrium interest rate charged on the bonds is given by

$$r_b^* = \frac{R - (1-p)y}{p} \quad (6)$$

Given the cash flow constraint, we can derive the probability above which bond market is willing to lend to the sovereigns and it is given by

$$\tilde{p}_b \equiv \frac{R - y}{Y - y} \tag{7}$$

So the bond market is willing to lend to any borrower with $p > \tilde{p}_b$.

## 4.3   Sovereign's objective and equilibrium financing

Let $\Delta(p, r_B)$ and $\Delta(p, r_b)$, respectively, denote the expected payoffs of a sovereign who enters the debt market at time $t = 0$ and decides to borrow from the banks or to issue publicly traded bonds. These are given by

$$\Delta(p, r_B) = p(Y - r_B) - (1 - p)L \left[ \int_{\frac{y}{Y}}^{u} (1 - q)f(q)dq + \int_0^{\frac{y}{Y}} f(q)dq \right] \tag{8}$$

$$\Delta(p, r_b) = p(Y - r_b) - (1 - p)L \tag{9}$$

The sovereign's choice between approaching the bank for a loan and issuing bonds depends on the relative magnitudes of $\Delta(p, r_B)$ and $\Delta(p, r_b)$, which, in turn, depends on the probability $p$ and the interest rate charged by both the parties. In equilibrium, the sovereigns choose the type of finance that maximizes his expected pay–off, given that the financing costs are determined by perfect competition. So borrowers will prefer bond finance over bank finance as long as $\Delta(p, r_b) > \Delta(p, r_B)$ .

**Proposition 1.** *Bank financing and bond financing coexist if and only if* $0 < c < \frac{(Y - R)[A - y + L(1 - B)]}{Y - y - L}$ *where* $A = \left[ \int_{\frac{y}{Y}}^{u} qYf(q)\,dq + \int_0^{\frac{y}{Y}} yf(q)\,dq \right]$ *and* $B = \left[ \int_{\frac{y}{Y}}^{u} (1 - q)Yf(q)\,dq + \int_0^{\frac{y}{Y}} f(q)\,dq \right]$. *Under this condition, borrowers with* $p \in [p_b^*, 1]$ *issue bonds, whereas those with* $p \in [p_B^*, p_b^*]$ *borrow from banks and those with* $p \in [0, p_B^*]$ *will not borrow at all, where* $p_b^* \equiv 1 - \frac{c}{[A - y + L(1 - B)]}$ *and* $p_B^* \equiv \frac{R + c + LB - A}{Y + LB - A}$, $p_b^* > p_B^*$.

*Proof.* See appendix                                                                    □

The condition for the coexistence of bank lending and bond finance is given by $0 < c < \frac{(Y - R)[A - y + L(1 - B)]}{Y - y - L}$, which has the following intuitive interpretation. The term in the numerator $(Y - R)[A - y + L(1 - B)]$ is the net gain from monitoring the borrower and rolling over the debt if and only if the borrower is solvent, instead of terminating lending to all borrowers facing liquidity problems at $t = 1$.

Thus, bank lending strictly dominates bond finance when monitoring is costless ($c = 0$). But if the cost of monitoring is high, i.e. $c > \frac{(Y - R)[A - y + L(1 - B)]}{Y - y - L}$, no sovereign borrows from banks and only those with the lowest default probabilities $\left( p > \frac{R - y + L}{Y - y + L} \right)$ issue bonds. Thus, the relative choice between bank

loans and bond financing is determined by the relative cost and benefiting of monitoring. The benefit of borrowing is small for borrowers facing a low–risk of liquidity problems, whereas it is large for high–risk borrowers who value the option of renegotiating the contract in the interim. This may explain why only the low–risk emerging market economies issued bonds during the 1980s.

# 5 Model with Public Monitoring: The Role of Credit Rating Agencies

The crucial assumption thus far has been that banks have better information about the sovereign borrowers as compared to the market. This may not be valid in the context of sovereign lending. While small, unlisted companies often do not publish information about their accounts, governments normally do publish information about their financial states. Moreover, bond issuers are also typically 'monitored' by the credit-rating agencies which publish their assessments about the issuer's creditworthiness. In practice, it is virtually impossible for Emerging Market Economies to issue bonds in the international market without having a credit rating.

Thus, we modify the model to allow an outside agency to monitor the borrower and publish its credit assessments to the bond market. This means that the bondholders now have the same information and assessment about the borrower's creditworthiness as banks. Even though these credit ratings are backward looking variables, they give an indication of the creditworthiness of the sovereigns, and the borrowers will use this information while lending. Bank loans and bonds, however, differ in two important ways. First, bank lending relies on private monitoring, which keeps the assessment of the borrowers private to the creditor bank, whereas bond finance is based on public monitoring, which makes this information publicly available.[9] Thus, public monitoring eliminates any information asymmetry between the bond holders and any potential third party, and makes the bonds easily transferable. Second, due to the large number of dispersed creditors holding sovereign bonds, coordination during a roll-over in the interim stage is much more difficult, and likely to fail with bond finance.[10] Since syndicate bank lending is usually managed by one or a group of two institutions, there is no problem of coordination.

Now, each borrower has the option of publishing the *ex–ante* distribution of $q_i$ at $t = 0$, and the realization of $q_i$ at $t = 1$, if it enters into a liquidity problem. For this service, they need to pay an up-front fee of $d$ to the credit–rating agencies, in addition to the monitoring cost of $c$.[11] It is also obvious that

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[9]This analysis implicitly assumes that the loans are provided by a single bank, or a syndicate that acts like a single entity. In the case of syndicated bank lending, the information obtained by a manager is shared within the community only. In this sense, syndicated lending relies on private monitoring. Although some bondholders holding a large stake in one sovereign may monitor it privately, those that hold a dispersed portfolio are likely to rely on a public monitoring service provided by rating agencies.

[10]Without Collective Action Clauses (CACs), this becomes even more difficult.

[11]Assuming that the market for public monitoring is perfectly competitive, a public monitor

if public monitors care about their reputation, they have incentive to reveal the truth about their client's creditworthiness as long as bondholders can detect false reports with a small probability.

Borrowers will also use different types of credit depending on the maturity of their projects. Both bank loans and bond finance are now available at different maturities. As before, short–term credit is repayable at time $t = 1$, but can be rolled over in the interim. In addition, the lenders can also borrow long–term credit which is repayable at time $t = 2$.

## 5.1 Bank financing with short–term maturity

The role of short–term bank financing has already been discussed in section 3.1.1. short–term bank loans are repayable at $t = 1$ with the possibility of a rollover for an additional period. Hence the profit function of banks, the contractual rate of return, and the cut-off risk level at which the bank stops lending, are given by the earlier equations (2), (3) and (4).

## 5.2 Bank financing with long–term maturity

We now consider the financing strategy of a bank that decides to lend long–term. If banks decide to lend long–term and find a borrower to be insolvent at time $t = 1$, then they cannot interfere since the repayment is due at $t = 2$. This arises due to the nature of the adverse selection problem. Even though banks monitor and know the true nature of the sovereigns, they are not able to disseminate the information outside. The true type of the sovereign $q_i$ is private information to the bank, and banks cannot sell their long–term claims to a third party in the interim due to this adverse selection problem. On the other hand, the borrowers will never opt for an early restructuring at $t = 1$ when the payment is due at $t = 2$. A cost-benefit analysis reveals that this is true because, for the borrower, the cost of defaulting and restructuring the debt at $t = 1$ is always larger than the cost of waiting until $t = 2$. The benefit from waiting for the sovereign when the repayment is due at $t = 2$ is given by $q(Y - r_{B,2}) - (1 - q)L$, which is his expected pay–off from waiting until the $t = 2$ cash flow is realized, where $r_{B,2}$ is the contractual repayment due at time $t = 2$. The cost of such waiting is $L$, which is his pay–off from defaulting and seeking an early restructuring at $t = 1$. Since we have

$$q\left(Y - r_{B,2}\right) - (1 - q)L > L \tag{10}$$

sovereigns never opt for early restructuring in this case. This is a form of ex-post debtor moral hazard, and it is costly for creditors who prefer an early debt restructuring at $t = 1$ whenever $q < \frac{y}{Y}$.

If banks can identify the loans that are effectively in default $\left(q < \frac{y}{Y}\right)$ at $t = 1$, it is not costless for them to hold on to these claims. They may be subject to a regulatory requirement to make specific provisions against these impaired loans. Specifically, we assume that the cost of provisioning per unit of

charges $c + d$ to its clients and makes zero profits.

loan is given by $\alpha$ and banks face a regulatory requirement to provision against expected losses from all such loans with $q < \frac{y}{Y}$ at $t = 1$.[12] Then the profit function of the banks issuing longer maturity loans is given by

$$\Pi_{B,2}(p, r_{B,2}) = pr_{B,2} + (1-p)\left[\bar{q}r_{B,2} - \alpha \int_0^{\frac{y}{Y}} f(q)\, dq\right] - R - c \qquad (11)$$

where $\bar{q} = \bar{q}_i = \frac{u_i}{2}$. Thus, following the zero profit condition of the banks, the contractual repayment of long–term loans, denoted by $r_{B,2}$, is given by

$$r_{B,2}^* = \frac{R + c - (1-p)\alpha \int_0^{\frac{y}{Y}} f(q)\, dq}{p + (1-p)\bar{q}} \qquad (12)$$

The probability above which the banks are willing to lend to a borrower is therefore given by the cash-flow constraint and as long as $p > \tilde{p}_{B,2}$, where

$$\tilde{p}_{B,2} = \frac{R - \bar{q}Y + \alpha \int_0^{\frac{y}{Y}} f(q)\, dq}{(1-\bar{q})Y + \alpha \int_0^{\frac{y}{Y}} f(q)\, dq} \qquad (13)$$

## 5.3 Bond financing with short–term maturity

Let the sovereign hire a public monitor, a credit rating agency, to publish its assessment of the borrower's creditworthiness, allowing the market to observe $q_i$. Now for the bond market, the introduction of the credit rating agency helps them observe the true creditworthiness of the sovereign from the publicly available information disseminated by the agency.[13] Suppose that the borrower issues short–term bonds repayable at $t = 1$, as before. Due to the publicly available information, all the bondholders observe $q_i$ at $t = 1$. Since they can now distinguish between borrowers, they might be willing to participate in a debt exchange program to extend the maturity should the borrower face a liquidity problem. Consider a distressed debt exchange at time $t = 1$, in which the borrower facing a liquidity problem offers bondholders the option of exchanging their claims for a new debt, paying the original contractual rate at $t = 2$ with probability $q_i$. If the debt exchange fails, the borrower is forced to default, and the bondholders receive a repayment equal to $y$.

Even though the credit rating agencies publish their assessment about the sovereign's creditworthiness, bondholders form their own expectations based on

---

[12]The provisioning cost is introduced to capture the cost of committing to hold non-transferable claims for two–periods. The qualitative results of our analysis do not change as long as the non-transferability of claims is costly for banks, which we believe to be a realistic assumption. Moreover, this provisioning requirement implies that banks have to monitor their long–term loans even though they cannot interfere with the borrowers in the interim.

[13] "The rating process, as well as the rating itself, can operate as a powerful force for good governance, sound market-oriented growth, and the enforcement of the rule of law. From a business perspective, sovereign credit ratings serve as a baseline for evaluating the economic environment surrounding investment possibilities and as a benchmark for investors to distinguish among markets, which provides valuable information and a basis for evaluating risk." (US Department of State 2006 (54))

that information. It is thus not necessary that their expectations match and that everyone agrees to a debt-restructuring plan. There are several other factors that make bonds much harder to restructure. Typically, since many investors are involved, and some of them may be untraceable, there arises the problem of "coordination failure." This generates a strategic complementarity where we have multiple equilibria.[14] Either everyone agrees to a debt-restructuring plan or none of them do so. Thus, even if the sovereign is solvent but illiquid, a debt restructuring plan may fail.

We assume that $\pi$ be the probability of co-ordination failure when $q_i$ is in the range of $\frac{y}{Y} < q_i < u_i$. The profit condition for bondholders is then given by

$$
\begin{aligned}
\Pi_{b,1}\left(p, r_{b,1}\right) = p r_{b,1} &+ (1-p)(1-\pi) r_{b,1} \int_{\frac{y}{Y}}^{u} q f(q)\, dq \\
&+ (1-p) y \left[\pi \int_{\frac{y}{Y}}^{u} f(q)\, dq + \int_{0}^{\frac{y}{Y}} f(q)\, dq\right] - R
\end{aligned}
\tag{14}
$$

As before, we derive the equilibrium short–term bond rate from the zero–profit condition of the bondholders, which is given by

$$
r_{b,1}^{*} = \frac{R - (1-p)\alpha\left[\pi \int_{\frac{y}{Y}}^{u} f(q)\, dq + \int_{0}^{\frac{y}{Y}} f(q)\, dq\right]}{p + (1-p)(1-\pi)\int_{\frac{y}{Y}}^{u} q f(q)\, dq}
\tag{15}
$$

The probability above which the bond market is willing to lend to the sovereign is given by $p > \tilde{p}_{b,1}$, where

$$
\tilde{p}_{b,1} = \frac{R - A + \pi \int_{\frac{y}{Y}}^{u} (qY - \alpha) f(q)\, dq}{Y - A + \pi \int_{\frac{y}{Y}}^{u} (qY - \alpha) f(q)\, dq}
\tag{16}
$$

It is important to note that $\tilde{p}_{b,1} < \tilde{p}_{b}$, which is easy to see by comparing (7) with (16). Thus, it is clear that bondholders are willing to lend to riskier borrowers ex ante when they can observe $q_i$.

## 5.4   Bond financing with long–term maturity

Now let us consider a long–term bond with the contractual repayment due at $t = 2$. Here, bonds are subject to debtor moral hazard similar to the bank loans, and thus will not be restructured in the interim. But the adverse selection problem will be eliminated by the presence of public monitors, who facilitate the trade of bonds in the interim stage. Since the credit rating agency publishes the information about $q_i$, long–term bonds can be traded in the secondary market at time $t = 1$. The transferability implies that bondholders facing a provisioning rule, such as banks, can sell the claim in the interim to another party which is not subject to this regulation, such as a hedge fund, so that the cost of provisioning

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[14] For multiple equilibria in coordination games, see Morris and Shin (2003) (40).

need not be priced in. Hence, the profit function of the bondholders issuing longer maturity bonds is given as

$$\Pi_{b,2}(p, r_{b,2}) = pr_{b,2} + (1-p)\,\overline{q}r_{b,2} - R \tag{17}$$

The zero–profit condition of the bondholders implies that the contractual rate, $r_{b,2}$, charged by the bondholders issuing long–term bond is given by

$$r_{b,2}^* = \frac{R}{p + (1-p)\,\overline{q}} \tag{18}$$

Given the resource constraint, investors are willing to buy long–term bonds as long as $p > \tilde{p}_{b,2}$, where $\tilde{p}_{b,2}$ is given as

$$\tilde{p}_{b,2} = \frac{R - \overline{q}Y}{(1 - \overline{q})\,Y} \tag{19}$$

## 5.5   Sovereign's objective and equilibrium financing

The objective of the borrower is to choose the particular form of financing, short–term bank or bond finance, and long–term bond or bank finance, that maximizes their expected payoffs. The expected payoffs of a sovereign from obtaining short–term and long–term bank loans, $\Delta_{B,1}(p, r_{B,1})$ and $\Delta_{B,2}(p, r_{B,2})$ respectively, is given by

$$\Lambda_{B,1}(p, r_{B,1}) = pY + (1-p)\left[\int_{\frac{y}{Y}}^{u} qYf(q)\,dq + \int_{0}^{\frac{y}{Y}} yf(q)\,dq\right]$$
$$- (1-p)\,L\left[\int_{\frac{y}{Y}}^{u}(1-q)\,Yf(q)\,dq + \int_{0}^{\frac{y}{Y}} f(q)\,dq\right] - R - c \tag{20}$$

and

$$\Lambda_{B,2}(p, r_{B,2}) = pY + (1-p)\left[\int_{0}^{u}(qY - L(1-q))\,f(q)\,dq\right]$$
$$- (1-p)\left[\alpha \int_{0}^{\frac{y}{Y}} f(q)\,dq\right] - R - c \tag{21}$$

Borrowers issuing bonds pay a fee equal to $c + d$ to a rating agency. Their expected pay–off from issuing a short–term bond $\Lambda_{b,1}(p, r_{b,1})$ and a long–term bond $\Lambda_{b,2}(p, r_{b,2})$, are given by

$$\Lambda_{b,1}(p, r_{b,1}) = pY + (1-p)\left[\int_{\frac{y}{Y}}^{u} qYf(q)\,dq + \int_{0}^{\frac{y}{Y}} yf(q)\,dq\right]$$
$$- (1-p)\left[\int_{\frac{y}{Y}}^{u}(1-q)\,Yf(q)\,dq + \int_{0}^{\frac{y}{Y}} f(q)\,dq\right] \tag{22}$$
$$- (1-p)\,\pi \int_{\frac{y}{Y}}^{u}(L + qY - y)\,f(q)\,dq - R - c - d$$

and

$$\Lambda_{b,2}\left(p, r_{b,1}\right) = pY + (1-p)\int_0^u \left[qY - L\left(1-q\right)\right]f\left(q\right)dq - R - c - d \quad (23)$$

Thus, when public monitoring is available, the borrowers will choose the form of financing depending upon the relative magnitude of the above expressions.

**Proposition 2.** *For financing short–term projects, borrowers prefer bank loans over bond finance, when public monitoring is available. If d is small and the crisis cost L is large, borrowers issue long–term bonds to finance projects with uncertain timing of cash flows.*

*Proof.* See appendix $\qquad\qquad\square$

The basic intuition is the following: If the announcement cost $d$ is small, and the crisis costs are large, then the benefit of restructuring the debt of all insolvent borrowers outweighs the cost of crisis. In order to be rated by the credit rating agency, the borrowers have to pay an up-front fee, which makes bank loans cheaper in the short–term. Apart from the announcement costs, bonds are also subject to rollover problems due to coordination failures, making bonds expensive for short–term financing. The choice between the long–term financing instruments for the sovereign depends on the benefits of transferability of the bonds in the interim stage, vis-a-vis the announcement costs of public monitoring. Finally, the choice between short–term and long–term bond financing depends on the trade–off between the two dead-weight costs: the cost of debtor moral hazard versus the crisis cost of a default at $t = 1$, if the cost, $d$, is small. Since banks can monitor their loans, short–term bank lending eliminates debtor moral hazard by ensuring that unsustainable debt is restructured early, but only at the cost of causing a crisis at $t = 1$. On the other hand, long–term bond finance has the advantage of allowing borrowers to avoid a costly default with some probability, but is subject to debtor moral hazard and delays the restructuring of unsustainable debt. So if the crisis costs are large and the announcement cost $d$ is small, all those with $p > p_{b,2}^*$ issue bonds to finance projects with an uncertain timing of cash flows, where

$$p_{b,2}^* = \frac{R + c + d - \int_0^u \left[qY - L\left(1-q\right)\right]f\left(q\right)dq}{Y - \int_0^u \left[qY - L\left(1-q\right)\right]f\left(q\right)dq} \quad (24)$$

Proposition 2 is consistent with the empirical observations that syndicated bank loans to Emerging Market Economies' sovereigns tend to have shorter maturity compared to bonds. This analysis provides one explanation as to why bond issuance has overtaken syndicated bank lending to Emerging Market Economies during the 1990s. Given that the crisis cost of a default is large, borrowers prefer to obtain long–term credit when the timing of the cash flow is uncertain, and issuing long–term bonds is cheaper than obtaining long–term bank loans since public monitoring makes bonds transferable.[15]

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[15]We have assumed that countries cannot issue bonds at $t = 1$ after $q$ has been realized. It is easy to show that even if we relax this assumption and allow bond issuance at $t = 1$, sovereigns that are insolvent at $t = 1$ cannot issue bonds.

# 6    Testable Implications and Empirical Analysis

The theoretical model presented in the previous section has some testable implications. The main message that emerges from the discussion is that global credit rating agencies help the borrowers in the bond market coordinate to some extent. They publish their assessment about the credit-worthiness of the borrowers, and this public information makes bonds transferable by eliminating the adverse selection problem to a certain degree. When borrowers are drawn from a risk distribution, low risk borrowers get access to the bond market, the borrowers in the intermediate range of the risk distribution borrow from the banks, and those with very high risk levels either cannot borrow or can issue junk bonds. The relationship between the risk level and the debt instrument is illustrated below. If we denote $Y$ as the choice variable for each sovereign, then we can summarize the above implications as follows:

$$\begin{aligned} Y &= \textit{no borrowing} \text{ if } 0 \leq p \leq p_B^* \\ &= \textit{bank financing} \text{ if } p_B^* \leq p \leq p_b^* \\ &= \textit{bond financing} \text{ if } p_b^* \leq p \leq 1 \end{aligned} \tag{25}$$

## 6.1    Overview of the rating systems

Sovereign credit ratings play an important role in determining a country's access to the international capital market. Sovereign ratings are assessments of a government's ability and willingness to repay its public debt. They are assessments of the relative likelihood that a borrower will default on its obligations. Governments generally seek credit ratings to ease their own access (and the access of other issuers domiciled within their borders) to international capital markets, where many investors, particularly US investors, prefer rated securities over unrated securities of apparently similar credit risk. In this sense, they are forward-looking, quantitative measures of default probabilities computed by the credit rating agencies.[16]

   The credit rating issued by major international rating agencies such as Standard and Poor's, Fitch Ratings, and Moody's is a key variable affecting a country's access to capital markets. Risk ratings not only affect investment decisions in the international bond and loan markets, but they also affect allocation of foreign direct investment and portfolio equity flows.[17] Sovereign ratings have also been affecting the flow of performance-based official aid.[18] Sovereign rating is also important for activities of the private sector, even when the sovereign is not issuing bonds. As a result, countries are keen to get themselves rated.

   "The rating process, as well as the rating itself, can operate as a powerful force for good governance, sound market-oriented growth,

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[16]Reinhart (2002) (44) finds that sovereign credit ratings do a good job of predicting defaults, even though they fail to systematically predict currency crises.

[17]See Kaminsky and Schmukler (2002) (32)

[18]See International Development Association (2006a and 2006b) (**?** ) (28)

and the enforcement of the rule of law. From a business perspective, sovereign credit ratings serve as a baseline for evaluating the economic environment surrounding investment possibilities and as a benchmark for investors to distinguish among markets, which provides valuable information and a basis for evaluating risk. (US Department of State 2006 (54))"

Having no rating may have worse consequences than having a low rating. Unrated countries are often perceived by creditors as riskier than they are, riskier than even very high default risk countries.[19] Most of the unrated countries, however, do need external credit, and resort to relationship-based borrowing from commercial banks, or to selling equity to foreign direct investors. Because of their ongoing relationship with the borrowers, banks can monitor the latter's willingness and ability to repay debt. On the other hand, borrowers rely heavily on standard indicators such as credit ratings to monitor the borrower. Sovereign ratings for the Emerging Market Economies began in late 1980s after the debt crises. Of the countries that have been rated by Standard and Poor's, the rating was established in 2004 or earlier for only 20 countries. The total number of countries rated by Standard and Poor's is 90. The rating system by Fitch Ratings for the sovereigns was introduced in 1994 with an initial rating for 24 countries. The number of countries being rated by Fitch Ratings has gone up to 98.[20] Figure A.5 shows the evolution of the number of ratings by each agency. It can be seen that the number of countries being rated plummeted during the mid 1990s, with a steady increase each year following that.

We use sovereign credit ratings by the two main international rating agencies: Standard and Poor's ($S\&P$) and Fitch Ratings. Although these agencies do not use the same methodology in arriving at the qualitative codes, there is a correspondence between the rating levels used by the two agencies as shown in Table A.1. $S\&P$ and Fitch Ratings use similar qualitative letters to describe the rating order. Both agencies start from $AAA$ and go to $SD$ for $S\&P$ and $DDD$ for Fitch Ratings, to describe the downgrade in ratings. We, however, have grouped the ratings in 21 categories, using a linear scale following the literature (see Cantor and Packer 1996 (9) and Ratha, De and Mohapatra 2007 (43)).[21] We have eliminated any rating lower than $C$ in order to efficiently estimate the system. The primary reason for the elimination of the categories below $C$ is this: Even though a rating below $C$ is just one notch down, it signifies effective default and it is hard to measure the severity of this. Table A.1 establishes the relationship between the qualitative ratings and the associated quantitative

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[19]The UNDP recently partnered with Standard and Poor's to rate eight African countries during 2003–2006 and interestingly the new ratings did not lie at the bottom of the spectrum (see Standard and Poor's 2006 (48)).

[20]Many countries are rated by export credit agencies, insurance agencies, and international banks. But these ratings are tailored for internal use in these institutions and meant for specific purposes such as short–term trade credit. They may not be useful for risk evaluation by general instituional investors.

[21]Afonso, Gomes and Rother (2007) (1) have also tried a logistic transformation of the ratings.

numbers derived by the linear transformation.

Sovereign credit ratings issued by different agencies tend to be highly correlated. The ratings are exactly the same across the rated countries by both the agencies. They vary slightly (usually by one or two notches) for the emerging market economies, but these differences are mainly due to the different timing of the ratings. Figure A.6 and A.7 shows the evolution of sovereign credit ratings for selected countries. The figure shows that rating changes over time are sticky. This means that re–rating does not occur with any regularity, but only when a country requests and pays for it, or when some significant, unforeseen event prompts the rating agencies to revisit the rating themselves.[22]

## 6.2 Data and Variables

The ratings database is created with sovereign foreign currency ratings provided by the two international rating agencies: Standard and Poor's and Fitch Ratings. Our sample covers the period from 1988 to 2006. Fitch Ratings was introduced in 1994, so we have fewer data for the credit ratings published by Fitch Ratings. Our sample includes 48 countries, mainly driven by the availability of data. We also consider only those countries which have data for more than 2 years to exploit the time-series dimension.

We follow the literature in selecting the explanatory variables for this study. Many researches have found that the credit ratings by major global agencies are explained to a significant extent by only a handful of macroeconomic variables related to growth, international reserves, external debt, and policy (see Lee 1993 (33), Cantor and Packer 1996 (9), Rowland and Torres 2004 (46) and Sutton 2005 (51), among others).

## 6.3 Estimating the credit rating residual

In developing a model for determining the choice of financing between bank loans and bonds for the sovereigns, we proceed in the following manner. First, we estimate sovereign ratings for the rated countries as a function of the variables identified in the literature – GDP per capita, growth rate of real GDP, inflation rate, ratio of total debt service to exports, ratio of international reserves to short–term debt, and rule of law. Here are a few intuitive explanations: *GDP Per Capita* – A higher GDP per capita should have a positive impact on credit ratings. GDP per capita is a proxy for the level of development for a country. More developed countries should have better institutions that are less vulnerable to exogenous shocks and prevent government over-borrowing, *Real GDP Growth* – A higher growth rate should improve the credit rating. An increase in the growth rate should strengthen the government's ability to repay outstanding debt obligations, *Inflation* – Higher inflation indicates that the country might have problems at the macroeconomic policy level, and should reduce credit ratings, *Total Debt Service / Exports* – A higher value of this ratio indicates a

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[22]Rating agencies were severely criticized for failing to predict the Asian crisis and then for downgrading the countries after that, which deepened the crisis further (Reinhart 2002) (44).

worsening situation of the government to repay the debt obligations and so it should have a negative impact on the credit ratings, *Total External Debt / GDP* – A higher overall country's external indebtedness generates additional fiscal burden. This ratio should have a negative impact on the ratings, *International Reserves / short–term Debt* – The higher the ratio, the better the credit rating, since international reserves is a liquidity indicator and more reserves improve a country's ability to repay its foreign currency obligations and protects the country from future default, *Rule of Law* – This is a measure of the effectiveness of the institutions in a country. A higher value of this variable indicates a better economy, and should lead to a higher sovereign credit rating.

We use lagged values of the explanatory variables instead of contemporaneous values, in order to avoid inconsistent estimates, and limit the possibility of reverse causality from ratings to explanatory variables. For example, the current sovereign ratings may plausibly influence the risk premium and willingness of the investors to hold foreign-currency liabilities of the country, or GDP per capita might itself depend on the ratings.

The dependent variable is the long–term foreign currency rating assigned to a country by the two major rating agencies: Standard and Poor's and Fitch Ratings. The sovereign ratings are converted to a numeric scale with one denoting the lowest rating (corresponding to $C$ for both $S\&P$ and Fitch Ratings) and 21 denoting the highest rating (corresponding to $AAA$ for both $S\&P$ and Fitch). We have gathered ratings for all countries from 1988 for Standard and Poor's and from 1994 for Fitch Ratings. The frequencies of the ratings by both agencies vary across countries. While some countries have been rated once every two or three years, some have been rated more than once in a particular year. For the countries where there has been a change in rating within a particular year, we have taken an average of all such ratings. The dataset represents an unbalanced panel covering a wide set of countries from 1988 to 2007. The estimates of the credit ratings regression are from an OLS estimation of pooled data and are presented in Table A.2. As predicted, all the explanatory variables have the expected signs and most of them are strongly statistically significant in both regressions. The R–squared from the regression using $S\&P$ data is 0.51 and using Fitch data is 0.54, indicating that more than 50 percent of the variation in the credit ratings is explained by only a handful of macroeconomic variables.

The credit rating residuals are simply the residuals from each of these regressions. We use the credit rating residual (purged of the effects of the obvious macroeconomic variables) as an explanatory variable.

Our main aim is to test whether credit ratings explain the choice of the debt instrument and their maturity structure. Previous studies (see Kaminsky, Lizondo and Reinhart 1998 (31), Hale 2007 (27) and Eichengreen, Kletzer and Mody 2005 (21)) have found that many macroeconomic fundamentals are important as explanatory variables of the magnitude and cost of capital flows to emerging markets, and the probability of financial crisis. But many of the variables are all highly correlated, and therefore cannot be included simultaneously

as explanatory variables.[23] A more parsimonious approach is therefore adopted. The variables are chosen to minimize collinearity and maximize the interpretive power of the model. The explanatory variables used in the regression include country characteristics with respect to external position (ratio of external debt to GDP, ratio of total debt service to exports, ratio of international reserves to short–term debt, ratio of international reserves to imports, export volatility and real exchange rate), country characteristics with respect to the financial sector (ratio of domestic credit to GDP) and a global variable (US five–year Treasury rate).

## 6.4 Regression Framework

The starting point of our analysis is a pooled cross section and time series analysis. We estimated our model by Ordinary Least Squares. Our regression equation takes the form

$$Y_{it} = \beta X_{it} + \gamma Z_{it} + \alpha_i + \epsilon_{it} \tag{26}$$

where $Y_{it}$ is the dependent variable denoting the choice between bond and bank financing with a specific maturity structure, $X_{it}$ is the credit rating residual as explained earlier, $Z_{it}$ is a vector of control variables, $\alpha_i$ is the individual effects for each country, and $\epsilon_{it}$ is the error term independent across countries and over time. There are three ways to estimate this equation: pooled OLS, fixed effects, or the random effects estimation. We do not use fixed effects regression as there is not much variation in a country's rating over time. The country dummies included in the regression will capture the country's average rating, while all other variables will only capture movements in the ratings across time. Even though statistically correct, a fixed effects regression would be seriously stripped of meaning. We therefore use the pooled OLS regressions for estimation. The data does not represent a panel; it is a cross-section in which the time dimension might play an important role.

## 6.5 Results

### 6.5.1 Choice between bank loan and bond financing

Our first regression is the estimation of the choice between bond finance and bank loan finance. The dependent variable is the ratio of bonds to bank loans. As predicted by the theoretical model, this ratio would decrease as credit ratings improve and the sovereigns are able to borrow more in the international market. The results of this regression are reported in Table A.3. All explanatory variables have the expected signs, and most of them are significant at one or five percent levels of significance.

To interpret the coefficient on the credit rating residuals, note that an increase in this variable signifies better political stability and a decrease in both

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[23]For example, the growth rate of real GDP can be explained to a large extent by a combination of the other variables.

the perceived risk level and the probability of junk issues by the borrower (or an analogous effect).[24] This should help the countries in accessing the bond market more. The coefficient on the credit rating residual is negative, which suggests that as a rating for a country improves, bond lending increases compared to bank financing. This effect is highly significant in both regressions. This implies that investors assign a higher weight to political stability if the borrowers come from an otherwise relatively risky country. The effects of the other explanatory variables are as expected, with the exception of the global variable. A higher US Treasury rate is expected to reduce total bank lending and increase the share of bank loans. Even though this variable is not significant, the sign is in the wrong direction. Eichengreen and Mody (2000) (20) and Hale (2007) (27) also find puzzling effects of the US interest rate on capital flows to emerging market economies. Further investigation of the effect of global variables on the perceived country risk should be conducted to fully understand these results.

The effect of the country variables are as expected. The ratio of external debt to GDP has the predicted effect in both regressions, even though they are not statistically significant. The ratio of debt service to exports, which is a more short–run measure of indebtedness, has the predicted sign and is strongly significant. A more short–run variable seems to be more important for the borrowers that choose between bank loans and bonds. A lower ratio of international reserves held by the central bank to short–term debt increase the perceived risk of borrowers and therefore increases the probability that bank loans will be issued. This is indeed the case in both specifications. The variable, however, is highly significant in the first specification with S&P ratings, but insignificant in the specification with Fitch ratings. The magnitude of this variable in both the regressions is almost the same. Investors pay more attention to the ratio of reserves to short–term debt when it is low than when it is high. The variable will therefore be more important for countries in danger of debt or currency crises and hence the difference in the significance of the results might be due to slightly different samples for the two different regressions.

The ratio of domestic credit to GDP is also an important determinant. An increase in this ratio suggests an overall improvement in the domestic financial system and so it is hard to tell which way the sign of this variable should go. In our specifications, this variable is statistically significant with a negative sign in both the cases. This suggests that an improvement in the domestic financial system lowers the perceived risk by borrowers and increases the probability of bond issuance.[25]

The real exchange rate also affects the choice of debt instruments in a statistically significant way in both regressions. The way the variable has been constructed, an increase in the real exchange rate implies real depreciation. Thus one should expect that an increase in this variable (real depreciation) decreases the perceived risk due to a lower chance of a currency crisis and the result

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[24]My dataset does not allow me to consider the cases of junk bonds and investment grade bonds separately.

[25]Eichengreen, Kletzer and Mody (2005) (21) also find similar positive effects of this variable in seperate regressions of bank loans and bonds, in isolation.

23

supports the prediction. A real exchange rate depreciation shifts the country's preference from bank loans to bond financing. Export volatility does not seem to matter to the borrowers in the choice between bank loans and bonds. Higher export volatility should lower bond issuance or increase bond spreads due to added moral hazard and substitution toward bank loans. But within the framework of the model, export volatility does not seem to affect the perceived risk while considering the bond market in isolation (see Eichengreen and Mody 2000 (20)).[26]

### 6.5.2 Choice between maturity structure: short–term versus long–term borrowing

We now turn to the choice of maturity of the loans, between short–term and long–term borrowing. The choice and ability of countries to borrow short–term or long–term also depends on the perceived risk of these countries by investors. The results of the regression analysis are reported in Table A.4. We discuss the results in brief to avoid repetition. The dependent variable is the ratio of short–term to long–term borrowing. As before, most of the explanatory variables are statistically significant at less than the ten percent level in both specifications. The credit rating residual, which is related to the country's political stability and the assessment of investors about their state, is negatively related to the ratio of short–term to long–term borrowing. This indicates that if the perceived risk of investors goes down (an increase in the rating residual), countries will be able to borrow more long–term as compared to short–term. This is indeed the case in both the regressions and this variable is highly statistically significant in both the regressions. The magnitude of this coefficient is also the same in both regressions. The global variable and other country variables also have similar and expected results. The US five–year treasury rate has a negative sign, as expected, even though it is not significant in the Fitch regression. External debt to GDP leads to more perceived risk and decreases the ability to borrow long–term. Similarly, debt services to exports, a measure of the short–term indebtedness of a country, also decreases the ability to borrow long–term compared to short–term borrowing. The ratio of central bank international reserves to short–term debt and the ratio of the reserves to imports have opposing effects. The ratio of domestic credit to GDP is negative, which suggests that an improvement in the domestic financial system is valued by the investors and the country is able to borrow more long–term. As noted earlier, export volatility also reduces the probability to borrow long–term. The effect of the real exchange rate is positive, as expected. The R–squared from both regressions is around 50 percent, which explains almost half of the variation in the data.

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[26]Hale 2007 (27) also does not find any significant effect of export volatility on the choice of debt instruments.

### 6.5.3 Choice between bank loans and bonds with specific maturity structure

One of the important implications from the theoretical model is that countries who decide to borrow short–term will borrow from the banks. When they are uncertain about the cash-flows from their project, and if the crisis costs are very high, they would borrow from the bond market. Hence, for short–term projects we should find that the ratio of bank loans to bond finance will increase. This notion in captured by regressing the ratio of bank loans to bond finance on all the previous global and country characteristics with the addition of an interactive term, credit rating residuals with short–term borrowing as a percentage of total borrowing. The results from these regressions are presented in Table A.5. The main variable of interest is the interactive term between credit rating residuals and short–term debt as a percentage of total debt. The way to interpret this coefficient is the following: A positive coefficient on this variable indicates that for two countries with otherwise similar ratings, the one choosing to borrow more short–term debt decides to get more bank financing compared to bonds. This variable is positive and statistically significant in both regressions, confirming the predictions. The magnitude of this variable in 0.83 for the $S\&P$ regressions and 0.43 for the Fitch regressions, suggesting that for a one percent increase in short–term loans, more than half of that is borrowed through bank financing. The other variables have expected results, even though some of them are not significant. The credit rating residuals in the two regressions have dissimilar effects, which is puzzling. One plausible explanation is the following. If ratings residuals increase, the perceived political stability and country risk improve, countries tend to borrow more from the bond market. At the same time, if they are likely to borrow more short–term, then they are likely to go for more bank financing since short–term lending eliminates debtor moral hazard by restructuring unsustainable debt early. These two opposing effects might give rise to the puzzling signs of the rating variable. Other country characteristics have similar effects, as discussed earlier.

### 6.5.4 Robustness checks

As a robustness check, we have tried different specifications. As in most panel data applications, we run fixed effect regressions to check if the results still hold. We run it separately for all the three different models. The results are reported in Tables A.6 and A.7. The results for the interactive model are not reported. We see from the tables that the credit ratings variable is still statistically significant in both the models and the other explanatory variables are similar in magnitude and also hold their sings in all the specifications. This leads us to believe that our model is quite robust.

# 7 Conclusion and Policy Implications

This paper tries to explain the recent shift in the preference towards bond financing for emerging market economies. It finds that the reduced cost of information dissemination and large crisis costs have increased the willingness of sovereigns to get themselves publicly monitored and have made it easy for countries to participate in the bond market, thus explaining this shift. We develop a theoretical model and then test empirically the implications of that model in terms of the borrowing decisions of the sovereign and the associated maturity structure of his borrowing. We find that sovereign credit rating is important for activities of the sovereign, as the rating process itself can operate as a powerful force for good governance, sound market-oriented growth, and the enforcement of the rule of law. Unrated countries are often perceived by creditors as riskier than they are, riskier than even very high default risk countries. Thus countries have a strong incentive to be rated.

Our analysis finds that the ease of rollover makes bank loans more attractive for short–term borrowing, whereas the transferability makes bonds cheaper for long–term financing. Sovereigns prefer bank loans over bond finance, when public monitoring is available, for financing short–term projects. When the cost of a debt crisis is large compared to the announcement costs, sovereigns prefer long–term bonds to long–term bank loans for financing their projects. This analysis shows that there are two inefficiencies in today's international financial architecture. Defaults, when unavoidable, always pose a deadweight cost, even though ex–ante, it is necessary to prevent strategic defaults by countries. The size and cost of this default is aggravated when long–term bond issuers have no incentive to structure their unsustainable debt at an early stage.

There may be ways to improve welfare. One possible approach is to redesign the bond contract where state-contingent debt can be a solution. A second possibility might be to design a mechanism through which an international institution like the IMF can intervene to prevent a crisis. IMF lending conditional on early debt restructuring might improve welfare.

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# Appendix

***Proof of Proposition*** *1.* The choice of financing is determined by the relative magnitude of $\Delta\left(p, r_B\right)$ and $\Delta\left(p, r_b\right)$. Sovereigns prefer bond financing over bank loans if and only if $\Delta\left(p, r_B\right) > \Delta\left(p, r_b\right)$. This requires

$$p\left(Y - r_b\right) - \left(1 - p\right) L > p\left(Y - r_B\right)$$
$$- \left(1 - p\right) L \left[ \int_{\frac{y}{Y}}^{u} \left(1 - q\right) f\left(q\right) dq + \int_{0}^{\frac{y}{Y}} f\left(q\right) dq \right] \quad \text{(A.1)}$$

which implies

$$\left(1 - p\right)\left(y - L\right) > \left(1 - p\right) \left( \int_{\frac{y}{Y}}^{u} qY f\left(q\right) dq + \int_{0}^{\frac{y}{Y}} y f\left(q\right) dq \right)$$
$$- \left(1 - p\right) L \left( \int_{\frac{y}{Y}}^{u} \left(1 - q\right) f\left(q\right) dq + \int_{0}^{\frac{y}{Y}} f\left(q\right) dq \right) - c \quad \text{(A.2)}$$

which can be written as

$$p \left( \int_{\frac{y}{Y}}^{u} qY f\left(q\right) dq + \int_{0}^{\frac{y}{Y}} y f\left(q\right) dq - y \right)$$
$$- pL \left( \int_{\frac{y}{Y}}^{u} \left(1 - q\right) f\left(q\right) dq + \int_{0}^{\frac{y}{Y}} f\left(q\right) dq - 1 \right)$$
$$> \left( \int_{\frac{y}{Y}}^{u} qY f\left(q\right) dq + \int_{0}^{\frac{y}{Y}} y f\left(q\right) dq - y \right) \quad \text{(A.3)}$$
$$- L \left( \int_{\frac{y}{Y}}^{u} \left(1 - q\right) f\left(q\right) dq + \int_{0}^{\frac{y}{Y}} f\left(q\right) dq - 1 \right) - c$$

It can be shown that the expression

$$\left( \int_{\frac{y}{Y}}^{u} qY f\left(q\right) dq + \int_{0}^{\frac{y}{Y}} y f\left(q\right) dq - y \right)$$
$$= \int_{\frac{y}{Y}}^{u} qY f\left(q\right) dq + \int_{0}^{\frac{y}{Y}} y f\left(q\right) dq - \int_{0}^{u} y f\left(q\right) dq \quad \text{(A.4)}$$
$$= \int_{\frac{y}{Y}}^{u} \left(qY - y\right) f\left(q\right) dq > 0$$

and the expression

$$L \left( \int_{\frac{y}{Y}}^{u} (1-q) f(q) \, dq + \int_{0}^{\frac{y}{Y}} f(q) \, dq - 1 \right)$$

$$= L \left( \int_{0}^{u} f(q) \, dq + \int_{\frac{y}{Y}}^{u} qf(q) \, dq - 1 \right) \tag{A.5}$$

$$= L \left( - \int_{\frac{y}{Y}}^{u} qf(q) \, dq \right) < 0$$

Hence borrowers prefer bond finance over bank loans when $p > p_b^*$, $p_b^* \equiv 1 - \frac{c}{[A-y+L(1-B)]}$. The two conditions necessary for bank loans and bond finance to co-exist are

$$0 < p_b^* < 1 \tag{A.6}$$

and

$$\Delta (p, r_b) > 0 \tag{A.7}$$

$\forall p \geq p_b^*$. Condition (A.6) can be expressed as

$$0 < 1 - \frac{c}{[(A-y) + L(1-B)]} < 1 \tag{A.8}$$

where $A = \left[ \int_{\frac{y}{Y}}^{u} qY f(q) \, dq + \int_{0}^{\frac{y}{Y}} yf(q) \, dq \right]$

and $B = \left[ \int_{\frac{y}{Y}}^{u} (1-q) Y f(q) \, dq + \int_{0}^{\frac{y}{Y}} f(q) \, dq \right]$

which can be written as

$$0 < c < \left( \int_{\frac{y}{Y}}^{u} qY f(q) \, dq + \int_{0}^{\frac{y}{Y}} yf(q) \, dq - y \right)$$
$$- L \left( \int_{\frac{y}{Y}}^{u} (1-q) f(q) \, dq + \int_{0}^{\frac{y}{Y}} f(q) \, dq - 1 \right) \tag{A.9}$$

Condition (A.7) can be expressed as

$$p (Y - r_b) - (1 - p) L < 0 \tag{A.10}$$

which is satisfied as long as

$$p_b^* > \frac{R - y + L}{Y - y + L} \tag{A.11}$$

and so

$$c < \frac{(Y - R) [(A - y) + L(1 - B)]}{Y - y + L} \tag{A.12}$$

Using the fact that $\frac{Y+L}{Y-y+L} > 1$, the necessary and sufficient condition for bank lending and bond finance to co-exist can be written as

$$0 < c < \frac{(Y - R) [(A - y) + L(1 - B)]}{Y - y + L} \tag{A.13}$$

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Those with probability $p < p_b^*$ borrow from banks as long as the participation constraint $\Delta(p, r_B) > 0$ is satisfied. Hence, sovereigns with $p_B^* < p < p_b^*$ will borrow from banks where

$$p_B^* \equiv \frac{R + c + LB - A}{Y + LB - A} \tag{A.14}$$

It is also easy to check that the condition $p_B^* < p_b^*$ holds. We note that $p_B^* < p_b^*$ if and only if

$$\frac{R + c + LB - A}{Y + LB - A} < 1 - \frac{c}{[(A - y) + L(1 - B)]} \tag{A.15}$$

Solving the above for $c$, the above expression can be written as

$$c < \frac{(Y - R)[(A - y) + L(1 - B)]}{Y - y + L} \tag{A.16}$$

which is same as the expression (A.12). Hence $p_B^* < p_b^*$ as long as bank loans and bond finance coexist. $\qquad\square$

**Proof of Proposition** *2.* From the expressions (20) and (22), it can be shown that short–term bank lending strictly dominates short–term bond finance. Comparing equations (20) and (22), we find that for all $\pi > 0$ and $d > 0$, we have $\Delta_{B,1}(p, r_{B,1}) > \Delta_{b,1}(p, r_{b,1})$. Thus, borrowers always use bank loans to finance short–term projects.

For projects with uncertain cash flows, financing can be done by either short–term or long–term credit. We first show that long–term bond issuance dominates long–term bank loans if $d$ is small. Comparing $\Delta_{B,2}(p, r_{B,2})$ and $\Delta_{b,2}(p, r_{b,2})$ from expressions (21) and (23) respectively, we have that $\Delta_{B,2}(p, r_{B,2}) > \Delta_{b,2}(p, r_{b,2})$ if and only if

$$pY + (1 - p) \int_0^u [qY - L(1 - q)] f(q)\, dq - R - c - d$$
$$> pY + (1 - p) \left[ \int_0^u (qY - L(1 - q)) f(q)\, dq - \alpha \int_0^{\frac{y}{Y}} f(q)\, dq \right] - R - c \tag{A.17}$$

which is true if and only if

$$d < (1 - p) \alpha \int_0^{\frac{y}{Y}} f(q)\, dq \tag{A.18}$$

Thus, borrowers prefer long–term bonds over long–term bank finance for a small $d$.

The final part of the proof is to show that long–term bonds dominate short–term bank loans. From equations (22) and (23), it can be seen that borrowers

choose long–term bond finance over short–term bank loans when $\Delta_{b,2}\left(p, r_{b,2}\right) > \Delta_{B,1}\left(p, r_{B,1}\right)$. This holds if and only if

$$pY + (1-p)\int_0^u \left[qY - L\left(1-q\right)\right] f\left(q\right) dq - R - c - d$$

$$> pY + (1-p)\left[\int_{\frac{y}{Y}}^u qY f\left(q\right) dq + \int_0^{\frac{y}{Y}} y f\left(q\right) dq\right] \tag{A.19}$$

$$- (1-p) L \left[\int_{\frac{y}{Y}}^u \left(1-q\right) Y f\left(q\right) dq + \int_0^{\frac{y}{Y}} f\left(q\right) dq\right] - R - c$$

which implies

$$d < (1-p)\int_0^u \left[qY - L\left(1-q\right)\right] f\left(q\right) dq$$

$$- (1-p)\left[\int_{\frac{y}{Y}}^u qY f\left(q\right) dq + \int_0^{\frac{y}{Y}} y f\left(q\right) dq\right] \tag{A.20}$$

$$- (1-p) L \left[\int_{\frac{y}{Y}}^u \left(1-q\right) Y f\left(q\right) dq + \int_0^{\frac{y}{Y}} f\left(q\right) dq\right]$$

The right–hand side of expression (A.20) is positive as long as

$$\int_0^{\frac{y}{Y}} \left(y - qY\right) f\left(q\right) dq < \int_0^{\frac{y}{Y}} q f\left(q\right) dq \tag{A.21}$$

The left–hand side is the benefit of restructuring the debt of all insolvent borrowers at $t = 1$, whereas the right–hand side is the crisis cost of implementing this rule. Using the fact that $q_i \sim U\left[0, u_i\right]$, this inequality can be expressed as $\frac{Y+L}{2Y} > 1$, which holds under equation (1). Thus, if the crisis costs are large and the announcement cost is small, borrowers issue long–term bonds to finance projects with uncertain cash flows.

$\square$

Table A.1: S&P and Fitch rating system conversion scale

|  | **Rating** | | **Assigned Grade** | |
|---|---|---|---|---|
|  | (S&P) | (Fitch) | (S&P) | (Fitch) |
| **Investment Grade** | | | | |
| Highest quality | AAA | AAA | 21 | 21 |
| Very high quality | AA+ | AA+ | 20 | 20 |
|  | AA | AA | 19 | 19 |
|  | AA- | AA- | 18 | 18 |
| High quality | A+ | A+ | 17 | 17 |
|  | A | A | 16 | 16 |
|  | A- | A- | 15 | 15 |
| Good quality | BBB+ | BBB+ | 14 | 14 |
|  | BBB | BBB | 13 | 13 |
|  | BBB- | BBB- | 12 | 12 |
| **Speculative Grade** | | | | |
| Speculative | BB+ | BB+ | 11 | 11 |
|  | BB | BB | 10 | 10 |
|  | BB- | BB- | 9 | 9 |
| Highly speculative | B+ | B+ | 8 | 8 |
|  | B | B | 7 | 7 |
|  | B- | B- | 6 | 6 |
| High default risk | CCC+ | CCC+ | 5 | 5 |
|  | CCC | CCC | 4 | 4 |
|  | CCC- | CCC- | 3 | 3 |
| Veru high default risk | CC | CC | 2 | 2 |
|  | C | C | 1 | 1 |

Notes: Standard and Poor's and Fitch Ratings (various years)

Table A.2: Credit ratings residual regression

| Explanatory variables | S&P | Fitch |
|---|---|---|
| Log of GDP per capita | 1.695*** | 1.751*** |
| | (0.2210) | (0.2710) |
| Growth rate of real GDP | 0.141*** | 0.0470 |
| | (0.0460) | (0.0510) |
| Inflation rate | −0.002* | -0.0010 |
| | (0.0010) | (0.0010) |
| Total debt service / Exports | −0.052*** | −0.052*** |
| | (0.0080) | (0.0090) |
| Total external debt / GDP | −0.027*** | −0.0130 |
| | (0.0080) | (0.0100) |
| Reserves / short–term debt | 0.167** | 0.387*** |
| | (0.0710) | (0.1310) |
| Rule of law | 0.1560 | 0.431** |
| | (0.1670) | (0.1830) |
| Constant | -2.5160 | −4.706** |
| | (1.7950) | (2.3310) |
| Adjusted R–squared | 0.515 | 0.529 |
| Observations | 193 | 163 |

Notes: Standard errors are in parentheses. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

Table A.3: Ratio of bank loans to bond financing

| Explanatory variables | S&P | Fitch |
|---|---|---|
| Credit rating residuals | -0.115** | -0.175*** |
| | (0.0480) | (0.0620) |
| Total external debt / GDP | -0.0090 | -0.0080 |
| | (0.0050) | (0.0080) |
| Total debt service / Exports | 0.018*** | 0.018** |
| | (0.0060) | (0.0070) |
| Reserves / short–term debt | -0.147*** | -0.1830 |
| | (0.0500) | (0.1330) |
| Reserves / Imports | 0.0030 | 0.0120 |
| | (0.0070) | (0.0090) |
| Domestic Credit / GDP | -0.001* | -0.001** |
| | (0.0000) | (0.0000) |
| Export volatility | 0.0000 | 0.0000 |
| | (0.0000) | (0.0000) |
| Log of real exchange rate | -2.488*** | -2.752*** |
| | (0.6010) | (0.8020) |
| US 5–year treasury rate | -0.0850 | -0.1890 |
| | (0.0910) | (0.1210) |
| Constant | 13.957*** | 15.492*** |
| | (2.9660) | (4.0050) |
| Adjusted R–squared | 0.228 | 0.213 |
| Observations | 193 | 163 |

Notes: Standard errors are in parentheses. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

Table A.4: Ratio of short–term to long–term borrowing

| Explanatory variables | S&P | Fitch |
|---|---|---|
| Credit rating residuals | -0.225*** | -0.295*** |
| | 0.079 | 0.085 |
| Total external debt / GDP | 0.017* | 0.035*** |
| | 0.009 | 0.01 |
| Total debt service / Exports | 0.039*** | 0.061*** |
| | 0.009 | 0.01 |
| Reserves / short–term debt | 1.065*** | 1.702*** |
| | 0.083 | 0.181 |
| Reserves / Imports | -0.041*** | -0.070*** |
| | 0.011 | 0.012 |
| Domestic Credit / GDP | -0.001* | -0.002*** |
| | 0.001 | 0.001 |
| Export volatility | -0.000*** | -0.000** |
| | 0.000 | 0.000 |
| Log of real exchange rate | 1.365 | 3.675*** |
| | 1.003 | 1.091 |
| US 5–year treasury rate | -0.277* | -0.253 |
| | 0.153 | 0.164 |
| Constant | -1.942 | -14.216*** |
| | 4.95 | 5.443 |
| Adjusted R–squared | 0.561 | 0.478 |
| Observations | 193 | 163 |

Notes: Standard errors are in parentheses. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

Table A.5: Ratio of bank loans to bonds with long–term financing

| Explanatory variables | *S&P* | Fitch |
|---|---|---|
| Credit rating residuals | -0.098 | 0.177*** |
| | 0.070 | 0.063 |
| Total external debt / GDP | 0.016*** | 0.015*** |
| | 0.004 | 0.004 |
| Total debt service / Exports | -0.011** | -0.013*** |
| | 0.004 | 0.004 |
| Reserves / short–term debt | 0.330*** | 0.182** |
| | 0.038 | 0.073 |
| Reserves / Imports | 0.003 | 0.005 |
| | 0.005 | 0.005 |
| Domestic Credit / GDP | 0.000 | 0.000 |
| | 0.000 | 0.000 |
| Export volatility | -0.000*** | -0.000** |
| | (0.0000) | (0.0000) |
| Log of real exchange rate | 1.114** | 1.112** |
| | 0.4590 | 0.4300 |
| US 5–year treasury rate | 0.0800 | 0.144** |
| | 0.0690 | 0.0640 |
| Rating residuals * short–term debt | 0.831*** | 0.427* |
| | 0.2860 | 0.2490 |
| Constant | -5.638** | -5.630** |
| | 2.2660 | 2.1660 |
| Adjusted R–squared | 0.465 | 0.271 |
| Observations | 192 | 160 |

Notes: Standard errors are in parentheses. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

Table A.6: Fixed Effects: Ratio of bank loans to bond financing

| Explanatory variables | S&P | Fitch |
|---|---|---|
| Credit ratings | -0.059** | -0.078** |
| | (0.028) | (0.037) |
| Total external debt / GDP | 0.002 | 0.001 |
| | (0.004) | (0.005) |
| Total debt service / Exports | -0.006* | -0.007* |
| | (0.004) | (0.004) |
| Reserves / short–term debt | -0.057 | 0.044 |
| | (0.040) | (0.062) |
| Reserves / Imports | 0.001 | 0.004 |
| | (0.004) | (0.005) |
| Domestic credit / GDP | -0.001* | -0.001* |
| | (0.000) | (0.000) |
| Export volatility | 0.000* | 0.000 |
| | (0.000) | (0.000) |
| Log of real exchange rate | -0.924*** | -0.778* |
| | (0.341) | (0.452) |
| US 5–year treasury rate | -0.130*** | -0.133*** |
| | (0.040) | (0.048) |
| Adjusted R–squared | 0.111 | 0.148 |
| Observations | 329 | 236 |

Notes: Standard errors are in parentheses. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

Table A.7: Fixed Effects: Ratio of short–term to long–term borrowing

| Explanatory variables | S&P | Fitch |
|---|---|---|
| Credit ratings | -0.186*** | -0.239*** |
| | (0.059) | (0.057) |
| Total external debt / GDP | 0.019** | 0.017** |
| | (0.008) | (0.007) |
| Total debt service / Exports | 0.011 | 0.018*** |
| | (0.008) | (0.006) |
| Reserves / short–term debt | 0.871*** | 1.256*** |
| | (0.082) | (0.094) |
| Reserves / Imports | -0.037*** | -0.040*** |
| | (0.008) | (0.007) |
| Domestic credit / GDP | -0.000 | -0.000 |
| | (0.001) | (0.001) |
| Export volatility | -0.000*** | -0.000*** |
| | (0.000) | (0.000) |
| Log of real exchange rate | -1.283* | -0.806 |
| | (0.741) | (0.687) |
| US 5–year treasury rate | -0.041 | -0.050 |
| | (0.089) | (0.074) |
| Adjusted R–squared | 0.276 | 0.356 |
| Observations | 330 | 236 |

Notes: Standard errors are in parentheses. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.
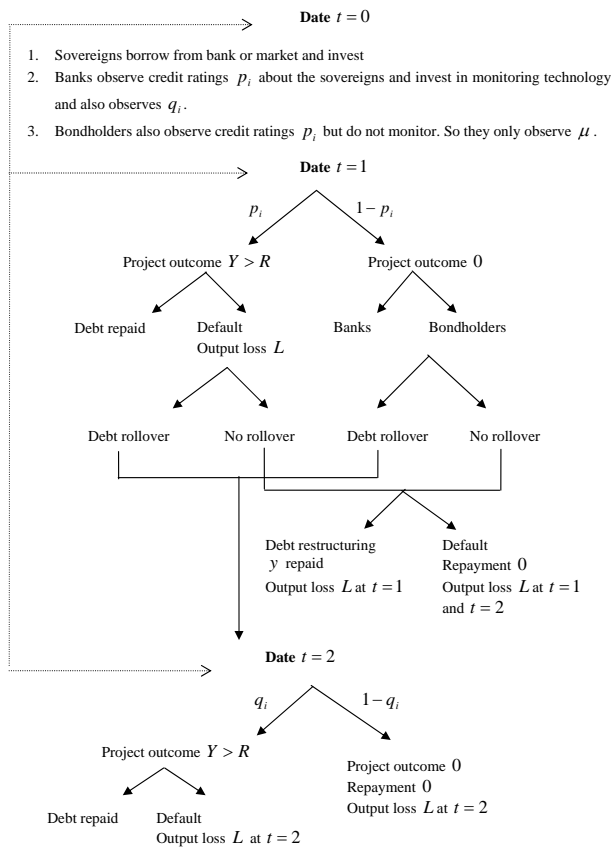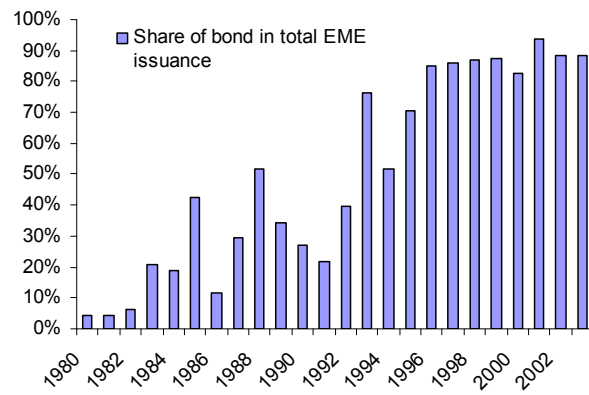
## Figure A.1: Time Line

**Date** $t = 0$

1. Sovereigns borrow from bank or market and invest
2. Banks observe credit ratings $p_i$ about the sovereigns and invest in monitoring technology and also observes $q_i$.
3. Bondholders also observe credit ratings $p_i$ but do not monitor. So they only observe $\mu$.

**Date** $t = 1$

$p_i$      $1 - p_i$

Project outcome $Y > R$      Project outcome $0$

Debt repaid    Default
Output loss $L$

Banks    Bondholders

Debt rollover    No rollover    Debt rollover    No rollover

Debt restructuring
$y$ repaid
Output loss $L$ at $t = 1$

Default
Repayment $0$
Output loss $L$ at $t = 1$
and $t = 2$

**Date** $t = 2$

$q_i$      $1 - q_i$

Project outcome $Y > R$

Debt repaid    Default
Output loss $L$ at $t = 2$

Project outcome $0$
Repayment $0$
Output loss $L$ at $t = 2$

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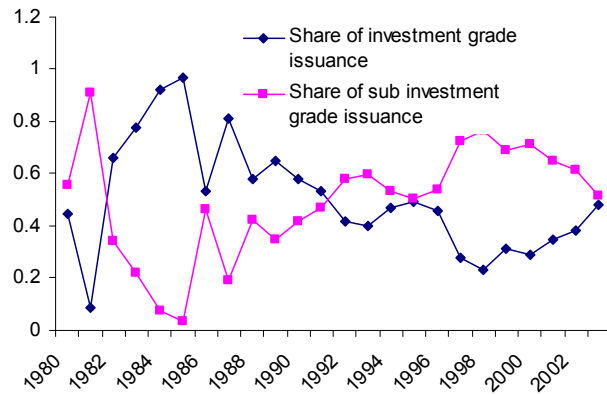Figure A.2: Share of bonds in total EME issuance



Source: Bondware and Loanware

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Figure A.3: New issuance of eurobonds and syndicate loans by emerging market sovereigns: 1980–2003
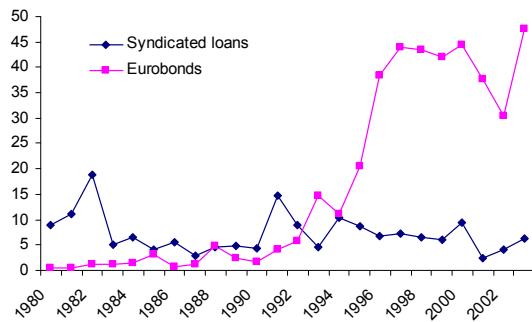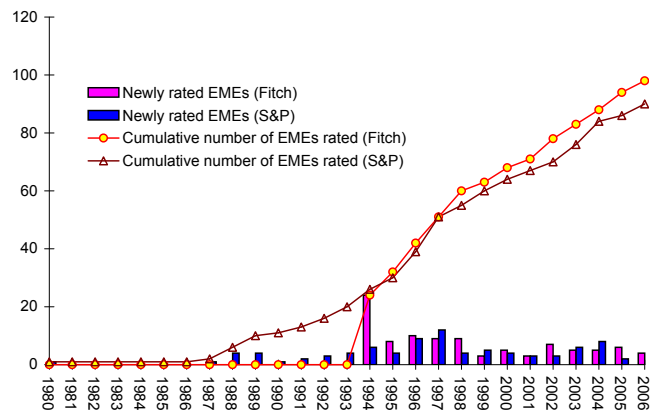


Source: Bondware and Loanware

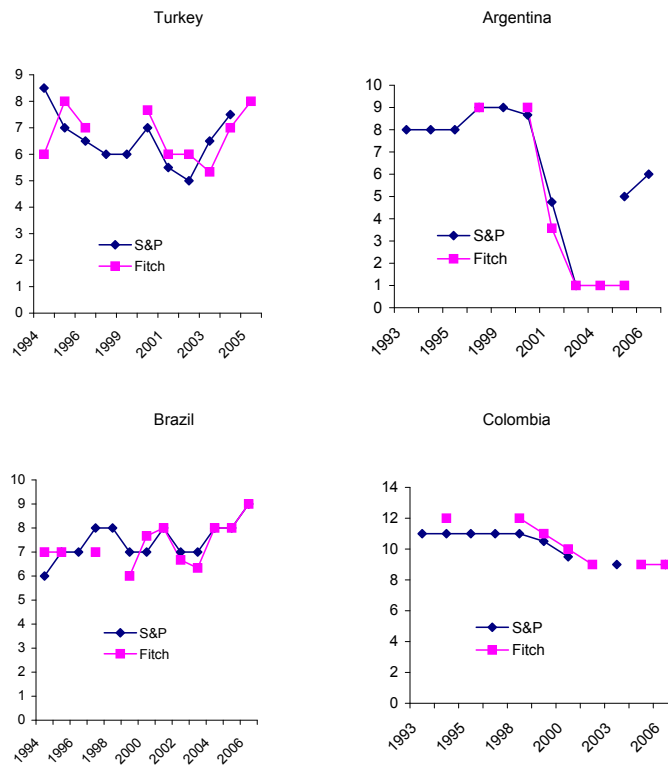Figure A.4: Share of investment grade and sub–investment grade bonds in EMEs



Source: Bondware and Loanware

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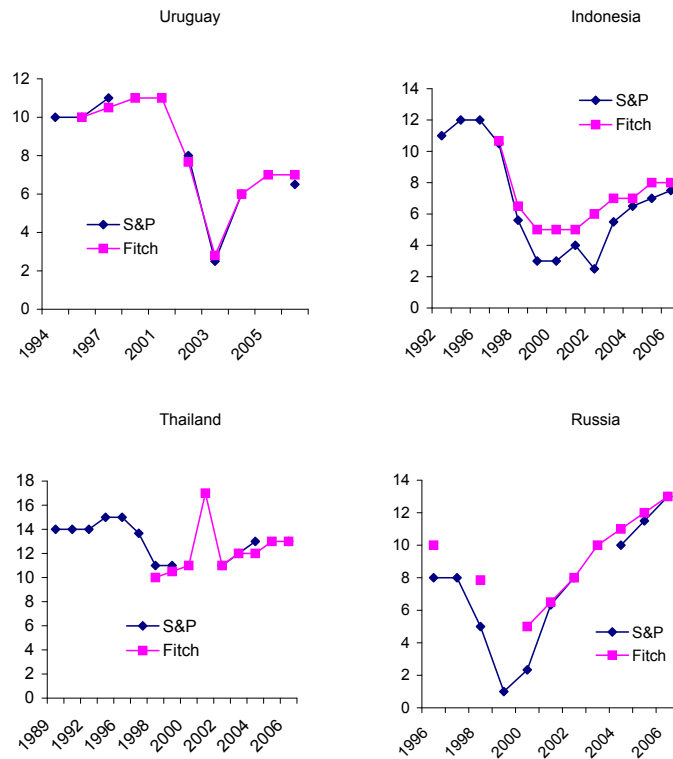Figure A.5: Number of EME sovereigns with $S\&P$ and Fitch credit ratings



Source: Standard and Poor's and Fitch Ratings

Figure A.6: Sovereign credit ratings in selected countries–1



Source: Standard and Poor's and Fitch Ratings

Figure A.7: Sovereign credit ratings in selected countries–2



Source: Standard and Poor's and Fitch Ratings