Emerging Markets and Financial Intermediaries

Very preliminary, please do not circulate

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Abstract

Over the last fifteen years, emerging economies have experienced abrupt changes in bond spreads and large movements in capital flows. We propose a simple general equilibrium model where international investors hire fund managers to invest their capital either in the bonds of an emerging economy or in a riskless asset. We model the emerging economy as a small-open economy subject to an aggregate shock, populated by agents making decisions of consumption, borrowing and default. There is only an infinitesimal fraction of fund managers who have information on the fundamentals of the emerging country. This generates career concerns that distort the investment decision of uninformed fund managers. When the probability of default is sufficiently high, they prefer to invest in safe bonds even at a lower expected return to reduce the probability of being fired. This is what we define "reputational premium". As the economic and financial conditions change, the reputational premium can switch sign. This generates an overreaction of the market leading to excess volatility of spreads, capital flows and output.

1 Introduction

Over the last fifteen years, emerging economies have been exposed to severe fluctuations in the international financial environment. As Figure 1 shows, spreads between sovereign bond yields and US treasury bonds have been fluctuating wildly in many of the emerging countries. Ample anecdotal evidence and some empirical evidence suggests that spreads are more volatile than it would be validated by the underlying changes in default risk. For example, East- Asian spreads just before the East-Asian crises in 1997, or Russian bond spreads in the period of January - September 1997, or emerging market yields in general in the recent period after 2004 all have been considered by many to be too low compared to their level of risk[1]. In contrast, typically after crisis-type events like the East-Asian crisis or the Russian default and the near-collapse of the Long Term Capital Management in 1998, these spreads increased abruptly and significantly even in those countries which were not directly affected by the event. Abrupt changes of spreads were accompanied by large movements of capital from risky emerging market bonds to safe assets like Treasury bills; a phenomenon frequently dubbed as flight-to-liquidity or flight-to-quality. It is popular to attribute these fluctuations to changes in liquidity needs of market participants or to changes in their "risk-appetite". In this paper, we propose a mechanism that abstract from both these channels. We argue that career concerns of fund managers investing in emerging markets explain the excess volatility of spreads, capital flows and output, the oversensitiveness of the economy to economic conditions and their co-movement within emerging market countries with weak fundamental links.

We propose a simple, dynamic, general equilibrium model where international investors hire fund managers to invest their capital either in the bonds issued by entrepreneurs in an emerging economy or in a riskless asset (US-Treasury bond). The emerging country is modeled as a small-open economy with an OLG structure. Each period, it is hit by an aggregate productivity shock and has access to external financing by issuing one-period international bonds. After borrowing, the representative agent of the economy can decide whether to pay-back the loan or to default, consume the entire wealth and suffer a cost of defaulting. The financial market is populated by risk-neutral fund managers who attempt to time the market, that is, invest in

[1]See Kamin and von Kleist (1999) for a detailed discussion of the period before the Asian crises and IMF(1999b) and Duffie et al. (2003) about the period before the Russian default. See also Bronner at al. (2005) for additonal evidence that sovereign debt spreads fluctuate excessively compared to the change of the underlying default risk.

the emerging market bond when the country will not default and invest in the riskless bond if they think that the country will default in the next period. Managers compete for the capital of investors. We compare a model where no fund manager has private information about the emerging country, which we will define our benchmark model, with a model where we introduce an infinitesimal fraction of managers who have perfect information about the realization of the shock in the emerging country. In the benchmark model, the expected yield of a bond would be equal to the risk-less rate, that is, the bond would trade at its risk-neutral value.[2] In our main model, international investors would like to hire the informed managers only and uninformed managers, who know only the equilibrium probability of default of the emerging economy, are concerned to be fired. Investors have to judge the information of fund managers from their past performance. The concern to be fired distorts the incentives of fund managers, affecting their portfolio decisions and relative prices. Changes in prices affect the borrowing decision of the country and, hence, its default decision. This feeds back to the managers' portfolio decision. The analysis of the interaction between financial intermediation and the development of an emerging country is the focus of our analysis.

First, we show that if the equilibrium probability of default of a bond is sufficiently small, then it will be traded with a discount, while if the probability of default is sufficiently large it will be traded with a premium compared to its risk-neutral value. That is, if the probability of default is small, fund managers will be willing to hold this asset even if they make losses in expectation. The reason is that investing in a bond with small probability of default is a good strategy for a fund manager who wants to hide its lack of information. So he is willing to lose in expectations on each trade in exchange for the higher probability of keeping his job. Symmetrically, if the probability of default is large, keeping out from the emerging market and investing in the risk-free asset has the same reputational advantage. Thus, a fund manager holds the bond with a large probability of default only if he is compensated with a premium for the larger probability of losing his job. We call the positive or negative difference between the expected yield of an emerging market bond and the risk-free return a *positive or negative reputational premium* respectively.

Second, we show that as economic conditions change, equilibrium will fluctuate between regimes with low probability of default but even lower spreads, and high probability of default, but even higher spreads due to the sign change of the reputational premium. The amplified

[2] The same would happen if fund managers would manage their own capital.

response in spreads will be accompanied by an amplified response in capital flows and output. Thus, due to the career concerns of fund managers, markets overreact to changes in economic conditions leading to volatile prices and volatile flows. In particular, we emphasize two types of shocks which can lead to fluctuations in the reputational premium. On the one hand, the shock can come from the demand side of the bond market, e.g., an increase in the risk-free rate. In this case, fund managers will be willing to hold a bond with a given probability of default only for a higher price as their outside investment opportunity gets more valuable. On the other hand, the shock can come from the supply-side of the bond market, e.g., a deterioration in the fundamentals of the country. In this case, for any given bond price, the country will default with larger probability. If the change in either the demand side or the supply side is large enough to move the equilibrium from a negative premium regime to a positive premium regime, then spreads increase significantly and capital flows away from emerging market bonds and output reduces. Notice that this happens with no changes in the investors' risk-appetite, given that preferences are fixed, or in the aggregate level of liquidity, given that the aggregate capital managed by funds stays constant.

Finally, demand-side shocks and supply-side shocks have different implications on the co-movement of spreads. In the first case, the equilibrium changes because the changing opportunity cost of fund managers. This will affect all emerging market spreads regardless of their fundamental links. In contrast, a country-specific fundamental change might effect the spreads only at the given country.

To our knowledge, this is the first paper to address the interaction between financial intermediation and the default probability and pricing of emerging country debt. This paper connects two distinct areas of economics and finance. On one hand there is a vast literature on reversal of capital flows and financial crisis in emerging economies, including Atkenson (1991), Cole and Kehoe (2000), Aguiar and Gopinath (2006), Caballero and Krishnamurthy (2003), Calvo and Mendoza (2000), Benczur (2005), Arellano (2006), Uribe and Yue (2006). On the other hand, there is a growing literature which analyzes the effect of delegated portfolio management on traders' decisions and asset prices in general (e.g. Dow and Gorton, 1997, Shleifer and Vishny, 1997, Allen and Gorton, 1993, Cuoco and Kaniel, 2001, Vayanos, 2003, Gümbel, 2005, Dasgupta and Prat, 2005, 2006, Kondor, 2007). However, the first group abstracts away from the effects of intermediation in financial markets, while the second group is silent on the real effects of these frictions.

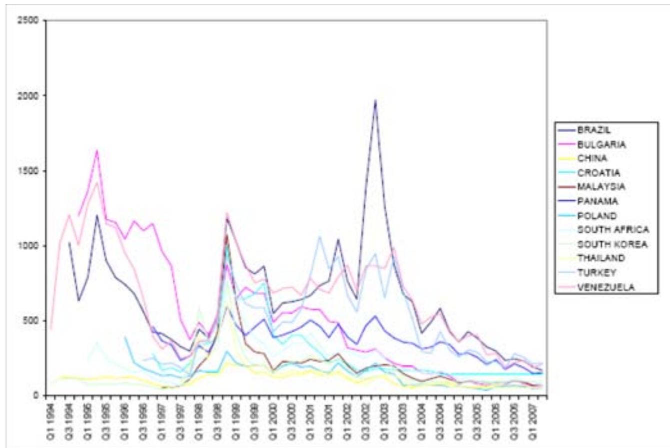

Figure 1: JPMorgan EMBI+ spreads in the period 1994-2007 for different emerging markets in basis points. Countries are sellected by data availability. Source of data: Datastream.

In the next section, we present our model with endogenous default and delegated portfolio management. First, we introduce the financial side of the model, that is, international investors and fund managers that manage their investments. We compare two settings: the benchmark model where all the fund managers are uninformed, with a model with an infinitesimal mass of informed managers that create career concerns for all the uninformed ones. Then, we present the macroeconomic side of the model, that is, we describe the representative agents in the emerging economy and their decision to invest, consume, borrow and default. In Section 3, we present and discuss our main results. In Section 4, we conclude. Finally, the appendix includes all the proofs that are not presented in the text.

2 The model

We present a model which analyzes the effects of fund managers' career concerns to the real economy. In particular, we focus on the relationship between the incentives of fund managers investing in emerging market bonds and the development and financial fragility of these emerging countries.

We proceed in steps. First we build up the financial side of the model, i.e., the demand side of the bond market, and highlight the price effect of the agency problem between investors and fund managers. This analysis gives the required rate of return of fund managers on emerging market bonds for any given default probability. We will refer to this relationship as the *pricing* *rule.*

In the second step, we analyze the problem of a representative entrepreneur in an emerging country. We consider a small-open economy with a representative entrepreneur who can borrow from the international financial markets only. We assume that even if the lender cannot directly seize the assets of the entrepreneur in the case of default, a default is still costly. For given bond prices and given aggregate shocks, the entrepreneur trades off the costs and benefits of default and decides whether to pay back the loan or not . We will refer to the emerging relationship between the probability of default as a function of the bond prices as the *repayment rule.*

In the third step, we will check that given the conditions on the capital market how many of the potential entrepreneur will decide to invest in their available project. The mass of active entrepreneurs will determine the aggregate level of borrowing and lending and the aggregate level of production of the emerging country. We will refer the relationship between equilibrium bond prices and the aggregate level of economic activity as the *entry rule.*

In the final step, we present the equilibrium of the model. The equilibrium price and individual default rate are determined by the intersection of the pricing rule and the repayment rule in the bond price and default probability space. The aggregate level of activity and lending are determined by the equilibrium bond price and the entry rule.

2.1 Career concerns and bond prices

In this section, we present the financial side of the model. We introduce investors who can invest only through fund managers. First we present the benchmark case, where there is no uncertainty about the skill of the fund mangers. In this case, the interest rates are determined by a standard arbitrage condition. Then we introduce uncertainty about the type of the fund manager. In this case, as investors are motivated to look for the informed managers, they – rationally – fire fund managers with low performance. This affects the incentives of fund managers, which affect the interest rate spread. We derive the equilibrium dynamics of prices under career concerns as a function of the fundamental characteristics of the emerging country.

2.1.1 Investors and fund managers

There are Γ investors in the economy with one unit of capital each. They live for one period, and they are risk neutral. They consume at the end of the period, so they maximize their monetary profit. They can invest in any asset only trough fund managers. We assume that the contract between investors and fund managers is exogenously fixed and linear, i.e. fund managers keep γ share of the revenue while investors get $1-\gamma$ share of the revenue. Thus, the direct interest of fund managers and investors is the same, both want to maximize profits. This is a useful assumption as we want to abstract from the distortions introduced by the explicit contractual incentives. We only want to focus on the implicit incentives of career concerns of fund managers. To keep the analysis simple, we focus on the $\gamma \to 0$ case.

Fund managers are also risk neutral but they live forever. There are infinite mass of potential fund manager are available. They do not have any capital, so they can become actual fund managers only in those periods when they get capital from investors, i.e. when they are hired. One investor can hire only one fund manager and a fund manager can be hired by a single investor.

A hedge fund can invest either in emerging market bonds or in the riskless asset with gross return R. The price of a one-period, zero-coupon, emerging market bond in period t is p_t. Fund managers take the price of the bond as given. As we will see, there are two pay-off relevant states for a fund manager. In the low state, L, the country is hit by a sufficiently low productivity shock and does not pay back the loan and the manager's gross return is zero. In the high state, H, the country experienced a high productivity shock, pays back one unit, and the return on the bond is $\frac{1}{p_t}$, where – in equilibrium – $\frac{1}{p_t} > R$. Thus, fund managers would like to invest in the emerging market bonds in the high state and in the riskless asset in the low state. The threshold and the implied probability of repayment will be endogenously determined. We will specify this relationship later together with the real sector in the emerging country. For now we take the probability of default as given and denote it by q_t

2.1.2 The benchmark case

Let us suppose first that all fund managers have the same skill to time the market. In particular, all of them know q_t, the probability of the low state, but none of them has any additional information. As this fact is known to the investors, each of them picks fund managers randomly and each of them weakly prefers to stick to this fund manager forever. We make the tie-braking assumption that this weak preference is sufficient motivation to keep the fund manager. It is easy to see that – under the weak conditions given in the next proposition – the bond price is given by the simple arbitrage condition

$$(1-q_t)\frac{1}{p_t}=R \tag{1}$$

, i.e., the expected return on the bond is equal to the return on the riskless benchmark, R.

Proposition 1 *If $b_t(p_t)$, a continuous function, is the aggregate supply of emerging market bonds for the price p_t and*

$$b_t^{-1}(0)\leq(1-q_t)\frac{1}{R}\leq b_t^{-1}(\Gamma) \tag{2}$$

for any t then the unique p_t which is consistent with an equilibrium must satisfy (1).

Proof. If (1) does not hold, all fund managers chooses the strategy with the higher pay-off. Condition (2) rules out that such corner solution is an equilibrium. This condition, together with the continuity of $b_t(p_t)$ guarantee that the interior solution exists. ■

Equation (1) defines the pricing rule in the benchmark case of no agency problems between investors and fund managers as $1/p_t$ is the required return of fund managers for any given default probability, q_t.

2.1.3 Career concerns

In contrast to the benchmark case, let us suppose now that ε proportion of the potential fund managers are informed (I). Informed fund managers at time t get a signal whether state H or L will be realized at time $t+1$. For the sake of simplicity, we assume that they get a perfect signal and know for sure which state is realized each period. The rest of the fund managers are not informed (N) and do not get a signal ever. We assume that they do not know whether they are the informed type or the uninformed type before they are hired.

First, we determine the optimal hiring decision of a representative investor. Let us suppose that in equilibrium a fraction μ_t of uninformed fund managers invest in the emerging market bond (E) and a fraction $1-\mu_t$ invest in the risk-less treasury bond (T). Let us fix $\mu_t=\mu$. The investor's belief that the fund manager is informed conditional on him having invested in the emerging market bond and the high or the low shock being realized are respectively

$$\Pr(I|E,H)=\frac{\varepsilon}{\varepsilon+\mu(1-\varepsilon)}>\varepsilon \quad \text{and} \quad \Pr(I|E,L)=0.$$

On the other hand, the investor's belief that the fund manager is informed conditional on him having invested in the US-Treasury bond and the high or the low shock being realized are respectively

$$\Pr\left(I|T,L\right)=\frac{\varepsilon}{\varepsilon+\left(1-\mu\right)\left(1-\varepsilon\right)}\ >\varepsilon\quad\text{and}\quad\Pr\left(I|T,H\right)=0.$$

This implies that the investor rationally keeps the fund manager if he is successful fires him if he is unsuccessful. In that case it he knows for sure that the fund manager is uninformed and it is profitable for him to hire a new young manager as long as there is a probability $\varepsilon > 0$ that he is informed. Observe that this implication is independent from the size of ε, as long as $\varepsilon > 0$, on the fraction μ_t and on the length of the track-record of the fund manager which the investor can observe. In equilibrium the fund managers who are not fired are the ones who have never made an unsuccessful decision during their full employment.

The value function of a hired fund manager is

$$W_t=\max_{\mu_t}\left\{\mu_t\left(\left(1-q_t\right)\left(\frac{1}{p_t}+\delta W_{t+1}^H\right)\right)+\left(1-\mu_t\right)\left(R+q_t\delta W_{t+1}^L\right)\right\}$$

where δ is the discount rate of the fund manager, μ_t is the probability that the given fund manager chooses to invest in the emerging country in period t, while W_{t+1}^H and W_{t+1}^L are the continuation value of a rehired fund manager given that the state is high or low respectively.

The exact value of W_{t+1}^H and W_{t+1}^L depends on the details of the economy of the emerging country. However, we are able to partially characterize equilibrium relationship between the bond price and default rates without specifying these details. Note that to have an interior equilibrium, fund managers have to be indifferent between the emerging bond and the benchmark return R, i.e.

$$q_t\delta W_{t+1}^L+R=\left(1-q_t\right)\left(\delta W_{t+1}^H+\frac{1}{p_t}\right). \tag{3}$$

Let us define the reputational premium Π as the difference between the expected repayment and the risk free rate R

$$\Pi\left(q_t,W_{t+1}^H,W_{t+1}^L\right)\equiv\frac{1-q_t}{p_t}-R=\delta\left(q_tW_{t+1}^L-\left(1-q_t\right)W_{t+1}^H\right). \tag{4}$$

We saw that this premium is zero without career concerns. Thus, this premium characterizes the price distortion implied by career concerns. In our full model, the premium can be negative or positive. Typically, it is positive when q_t is sufficiently large and negative when q_t is sufficiently small.

The change of signs of the reputational premium is very intuitive. Betting on large probability events is especially attractive for an uninformed fund manager with career concerns, because it increases the chance that he will not make an unsuccessful decision and will not be fired. In contrast, even if the return compensates for the risk of default, holding a bond which pays off with small probability is especially unattractive for the uninformed fund manager as it increases the chance that he loses her job. In equilibrium, this preference for large probability events will be priced. Fund managers are ready to give up a part of their expected return for a large probability of reemployment. Thus, in expectation they lose on the large probability bets and gain on the small probability bets. The real effects of this premium are the focus of our analysis. The presence of the reputational premium is based on a single critical assumption. We assume that informed fund managers are relatively scarce, so prices are determined by the uninformed fund managers. These uninformed fund managers naturally prefer those investments which help them to be successful more often and pool with the informed ones. These types of investments increase the chance to keep their job. The fact that in our model one wrong investment decision makes investors to fire the manager is an artifact of our simplifying assumption of perfect signals. However, the intuition behind our mechanism would remain the same even in a more general environment where both types of fund managers get a signal about the emerging country shock, but with different precision.

Notice that in equilibrium the price gives information only about the net amount of bonds sold. It does not give any information about the net demand of informed and uniformed managers separately. The main reason is that in equilibrium the uninformed fund manager is indifferent whether to invest or not, so the price does not imply anything about the aggregate demand of uninformed investors. This property is independent of the size of ε.

To emphasize the fact that our results are implied by the presence of uncertainty about the fund managers type and not the extent of this uncertainty, we assume that ε is very small, i.e., $\varepsilon \to 0$.

In general, we can find the equilibrium value of W_t as a function of q_t and the series $\{q^L_{i,t+1}\}_{i=t+1}^{\infty}$, where $q^L_{i,t+1}$ is the probability of default in period i given that the country defaulted in each period between $t+1$ and i. The reason is that we know that fund managers are indifferent between the two strategies. Thus, the value function at t, W_t is the value of investing in the risk-free bond instead of the emerging market bond as long as the manager is hired . Formally,

$$W_t = R + q_t \delta W_{t+1}^L = \qquad (5)$$
$$= R + q_t \delta \left(R + q_{t+1,t+1}^L \delta W_{t+2}^L \right) =$$
$$= R + R q_t \delta + R q_t \delta \sum_{u=0}^{\infty} \prod_{i=t+1}^{t+2+u} \delta q_{i,t+1}^L .$$

The difference between W_{t+1}^H and W_{t+1}^L is that $W_{t+1}^H$is the value of investing in the risk-free asset from period $t+1$ on given that in t the country did repay its obligation, while W_{t+1}^L is the value if in t the country did not pay back the debt. These different events imply different series future default probabilities.

If the equilibrium is stationary, as it will be the case in our model, i.e., if

$$q_t \equiv q.$$

expression (5) implies that

$$W_t = W_t^H = W_t^L = \frac{R}{1-\delta q}.$$

Thus, from (3),

$$p = \frac{(1-q)}{R} \frac{(1-\delta q)}{1-\delta(1-q)}. \qquad (6)$$

This is the pricing rule which describes the price, p, fund managers are willing to pay for the asset as a function of the equilibrium probability of default, q. It is apparent that the reputational premium changes signs at $q = 1/2$. If the probability of default is smaller than $1/2$, uninformed fund managers hold the asset for a premium while if it is larger than $1/2$ they are willing to lose money in expectations for the larger probability of reemployment. The pricing rule is decreasing in q, goes to 0 as $q \to 1$ and goes to $1/((1-\delta)R)$ as $q \to 0$. The relative position of the pricing rules of the benchmark case and the case with career concerns are shown in Figure 2.

2.2 The emerging country

In this part, we introduce an emerging country populated representative agents who – if becoming active entrepreneurs– borrow from financial markets by issuing one-period bonds to consume and produce and can ex-post decide to default.

Consider an emerging country with overlapping generations of representative agents with a population normalized to 1. A new generation is born each period and lives for two periods.

Consider the representative agent i of the generation born at time t. She has logarithmic utility over consumption in each period she lives. When she is born, she has a risky project available to invest in. The project requires a unit investment and produces a_t goods for the next period, where a_t is a productivity shock, *i.i.d.* across time, with cumulative density function $F(a_t)$. She can also decide to stay inactive and collect the reservation life-time utility $\bar{u}^i$.We analyze the determinants of the decision of entry in the next subsection. For this part let us suppose that she decides to become an active entrepreneur and invests in the project. The only heterogeneity across agents within the same generation is in their reservation utility, so, to ease the notation, we supress the index i in this subsection.

When the agent is young she chooses how much to borrow and how much to consume in that period. As the young agent does not have any income yet, she has to cover both her investment and her consumption by borrowing, i.e., her budget constraint when young is

$$p_t b_{t+1} \geq c_t + 1, \tag{7}$$

where b_{t+1} represents bonds issued by at time t, p_t represents the price the agent has to pay per dollar borrowed at time t and c_t represents consumption at time t. When the agent is old, she has the option to default on her debt b_t at a cost $D(b_t)$ in terms of utility. At this point we require only that $D(\cdot)$ is increasing and convex in b_t. If she chooses not to default she consumes the proceeds of her investment, her wealth, after she repays her debt. If, instead, she decides to default, she can consume her entire wealth. Her budget constraint when old is

$$a_{t+1} - (1 - \chi(a_{t+1}))\, b_{t+1} \geq c_{t+1}, \tag{8}$$

where $\chi(a_{t+1}) \in \{0, 1\}$ denotes the default decision. However, if she decides to default she has an utility loss $D(b_t)$, so that her objective function is

$$\log c_t + \beta \mathbb{E}\left[\log c_{t+1} - \chi(a_{t+1})\, D(b_{t+1})\right]. \tag{9}$$

We do not take a stand on the exact source of the cost of default. Since the seminal paper of Eaton and Greskovitz (1981), it is recognized that repayment of sovereign debt depends more on the willingness of the country to repay than on its ability to repay. Thus, there must be some type of cost to default, otherwise countries would never repay. The theoretical literature on sovereign default has identified and explored the effectiveness of many possible sources of this cost ranging from partial or full exclusion from financial markets and other economic or political sanctions (Eaton and Greskovitz, 1981, Bulow and Rogoff, 1989), loss of reputation (Grossman et al., 1988, Atkeson, 1991, Cole and Kehoe, 1996), worsening terms of borrowing in the future (Chang and Sundaresan, 2001, Kovrijnykh and Szentes, 2006). For our purposes, the only important point is that the default is costly enough to support an equilibrium, regardless of the source of this cost. Later, we charecterize the type of cost functions which satisfy this criterion.

For each generation the problem is the same. Thus, from now on we will drop the time t subscripts whenever this will not cause any confusion and we will use a prime to denote time $t+1$. The problem for the representative agent is to maximize (9), subject to (7) and (8). We rewrite the problem as

$$\begin{aligned} V\left(c\left(p\right), b'\left(p\right), p\right) &= \max_{c,b',\chi} \log c + \int_0^\infty \log\left[a_{t+1} - \left(1 - \chi\left(a_{t+1}\right)\right) b_{t+1}\right] dF\left(a'\right) - \\ &\quad - \int_0^\infty \chi\left(a_{t+1}\right) D\left(b_{t+1}\right) dF\left(a'\right) \\ &\quad s.t.\ pb' = c + 1. \end{aligned} \tag{10}$$

Let us first consider the default decision of an old agent. For any given realized shock, a', and debt, b, she will default if

$$\log a' - D\left(b'\right) - \log\left(a' - b'\right) > 0.$$

Note, that the left hand side is decreasing in a', thus there will be a threshold $\hat{a}\left(b'\right)$ that the agent repays if the shock $a \geq \hat{a}\left(b'\right)$ and does not repay otherwise. At the threshold the agent has to be indifferent. This result is summarized in the following lemma.

Lemma 1 *For given cost function, $D\left(b'\right)$, there exists a threshold $\hat{a}\left(b'\right)$ such that $\chi\left(a'\right) = 1$ if $a' \leq \hat{a}\left(b'\right)$ and $\chi\left(a'\right) = 0$, otherwise, with*

$$\hat{a}\left(b'\right) = \frac{\exp\left\{D\left(b'\right)\right\}}{\exp\left\{D\left(b'\right)\right\} - 1} b'. \tag{11}$$

If we substitute back the budget constraint and the default decision $\chi\left(a'\right)$ into problem (10), it becomes a maximization problem over the borrowing decision only. Hence, the optimum is characterized by the first order condition

$$\frac{p}{\left(pb' - 1\right)} - \int_{\hat{a}\left(b'\right)}^\infty \frac{1}{\left(a' - b'\right)} dF\left(a'\right) - F\left(\hat{a}\left(b'\right)\right) \frac{dD\left(b'\right)}{db'} = 0, \tag{12}$$

where $\hat{a}(b')$ solves equation (11). Equation (12), together with (11), characterizes the optimal amount of bonds supplied by the country for any given price p, that is $b'(p)$. Then, we can plug this back into equation (11) and derive the equilibrium probability of default for any given price p, that is $F(\hat{a}(b'(p)))$. We will refer to the latter relation as the country optimal repayment rule.

Note that until now we did not make any restrictions on the cost function $D(\cdot)$, except that it has to be increasing and convex. It turns out that not all cost functions $D(\cdot)$ support an equilibrium with a non-trivial default decision. Intuitively, if the marginal cost of additional default is not large enough compared to the advantage of additional borrowing, agents always want to borrow more and default more often. Thus, there is no finite b' which would solve the problem (10). To make this statement more precise, first we define the total marginal cost of borrowing from the first order condition (12).

Definition 1 *The total marginal cost of borrowing for a given level of debt b is*

$$h(b') \equiv \int_{\hat{a}(b')}^{\infty} \frac{1}{(a'-b')} dF(a') + F(\hat{a}(b')) \frac{dD(b')}{db'}$$

where $\hat{a}(b')$ is defined by (11).

In the following lemma, we state the necessary requirement on $D(b)$ which make the second order condition of our problem to hold.

Lemma 2 *For a given p and $D(b')$ the second order condition of problem (10) holds if and only if*

$$\frac{\partial h(b')}{\partial b'} > -(h(b'))^2 \tag{13}$$

holds for the equilibrium $b'(p)$ defined by (12).

Proof. The proof is in the appendix. ■

Note that if the total marginal cost of borrowing is increasing in b,

$$\frac{\partial h(b')}{\partial b'} > 0 \tag{14}$$

(13) holds. In the appendix, we show a simple, parametrized example with uniformly distributed shocks and logarithmic cost function where this condition holds for any value of the parameter.

Finally, the next lemma establishes two important properties of the equilibrium. First, we show that as borrowing becomes more expensive, i.e., p decreases, the representative agent will default with a higher probability. The repayment rule is downward sloping in the price-probability of default space. Second, we show that – under a weak condition – each agent borrows more, when the bond price, p, increases, i.e., when borrowing becomes less expensive.

Lemma 3 *1. The probability of default chosen by the emerging country, $F(\hat{a}(p))$, depends negatively on the price of borrowing, p.*

2. If and only if

$$\frac{\partial h(b)}{\partial b} b' > -h(b) \tag{15}$$

holds, the amount of capital borrowed, $pb'(p)$ depends positively on the price of borrowing .

Proof. The proof is in the appendix. ■

Note that increasing total marginal cost of borrowing, (14) is sufficient to make (15) to hold. In this sense, the condition is weak.

The intuition behind these results is straightforward. From one side, the income effect makes the agent poorer and, from the other side, the substitution effect makes the agent willing to substitute away from "young consumption" towards "old consumption". Given that there is a fixed financing requirement of the investment project, as p decreases, increasing b' is going to reduce c' for sure, given that the amount borrowed does not affect the productivity of the agent. It follows that young consumption decreases for both effects and, hence, the amount borrowed $pb'(p)$ decreases, that is, as emerging market spreads increase, capital flows out from the country. Moreover, we show that the income effects dominates on old consumption and make $b'(p)$ to increase and the default probability with it. As borrowing is more expensive, the equilibrium default probability increases.

2.3 Aggregate activity

In the previous part we derived the optimal consumption and bond holdings of any representative agent who decides to become an active entrepreneur. In this part we discuss their decision to entry.

We assume that agents differ in their reservation utility $\bar{u}^i$ for staying inactive. In particular, we assume that in each generation, the distribution of $\bar{u}^i$ is given by the cumulative distribution function $G(\bar{u})$ with a support including the positive real line. The next Proposition shows that the mass of agents deciding to become entrepreneurs and the aggregate capital they borrow increases with p.Thus, as borrowing becomes more expensive, i.e. p decreases, economic activity decreases and foreign capital flows out from the country.

Proposition 2 *The mass of active entrepreneurs, $\xi(p)$ increases with p. Thus, the aggregate output, $\xi(p) a_t$ is increasing with p for any given realizations of a_t and, if (15) holds, the aggregate capital borrowed from abroad, $\xi(p) pb'(p)$ is also increasing in p.*

Proof. From the envelope theorem

$$\frac{\partial V(b(p), c(p), p)}{\partial p} = \lambda b' = \frac{b'}{c} = \frac{b'}{pb' - 1} > 0.$$

Thus,

$$\xi(p) \equiv G(V(b(p), c(p), p)),$$

and

$$\frac{\partial \mu(p)}{\partial p} = g(V(b(p), p)) \frac{b'}{pb' - 1} > 0.$$

Together with the second part of Lemma 3, this implies the Proposition. ■

We will refer to $\xi(p)$ as the entry rule.

2.4 Equilibrium

An equilibrium is a sequence of consumption and borrowing decisions $\{c_t, b_{t+1}\}$, a sequence of default decisions $\{\chi_t\}$ and a sequence of prices $\{p_t\}$ and a a sequence of entry decisions $[\xi_t(p)]$ such that agents in the emerging country, international investors and funds managers maximize their utility and markets clear.

From the financial side of the model, we have derived the pricing rule under career concerns (6), where q_t represents the default probability of the country. We also derived the endogenous probability of default of a representative entrepreneur in the emerging country as a function of the price of borrowing, that is, the repayment rule $F(\hat{a}(p))$. Hence, the equilibrium price is determined by

$$p = \frac{(1 - F(\hat{a}(p)))}{R} \frac{(1 - \delta F(\hat{a}(p)))}{1 - \delta(1 - F(\hat{a}(p)))}, \tag{16}$$

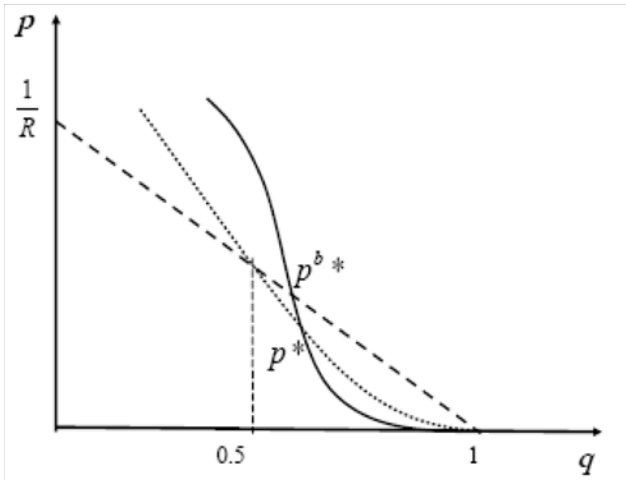

Figure 2: The solid curve shows the default rule. The dashed curve and the dotted curve show the pricing rule in the benchmark case and the career concerns case respectively. The equlibrium price in the benchmark case is at the intercept of the solid curve and the dashed curve. The equilibrium price in the case with career concerns is at the intercept of the solid curve and the dotted curve.

where $F(\hat{a}(p))$ is implicitly defined by equation (11) and (12). If equation (16) has a fixed point, p^*, then p^* is an equilibrium price.

In the benchmark case with no career concerns, the equilibrium price, p^{b*} is defined by the fixed point of

$$p = \frac{1 - F(\hat{a}(p))}{R}. \tag{17}$$

The equilibrium prices p^* and p^{b*} are the intercepts of the repayment rule and the corresponding pricing rule in the price, default probability space as it is depicted on Figure and 2.

We provide a simple and intuitive sufficient condition for the existence of the equilibrium. For this condition, let us define

$$q_{\min} = F\left(\hat{a}\left(b'\left(\frac{1}{R}\right)\right)\right),$$

the probability of default if the bond price were $\frac{1}{R}$. Probability $q_{\min}$ is the lower bound on the probability of default as the realized return on the risky emerging market bond when the country pays back its debt cannot be higher then the return on the riskless bond. For the sufficient condition, we prove the following lemma in the appendix.

Lemma 4 *The slope of the repayment rule increases without bound in absolute terms as $p \to 0$:*

$$\lim_{p \to 0} \frac{\partial F\left(\hat{a}\left(b'\left(p\right)\right)\right)}{\partial p} = -\infty.$$

Proof. The proof is in the appendix. ■

Then the sufficient condition for the existence of the equilibrium is the following.

Proposition 3 *If*

$$\frac{1-q_{\min}}{\frac{\delta(2q_{\min}-1)}{1-\delta q_{\min}}+1} \geq 1 \tag{18}$$

holds, and (13) holds for all $p \in \left(0, \frac{1}{R}\right)$ then the equilibrium exists both with and without career concerns.

Proof. The Proposition is a simple consequence of Lemmas 2, the monotonicity of the repayment rule proved in Lemma 3 and the fact that (18) implies that the curve of the repayment rule is above the curve of the pricing rule with career concerns at the point $\left(q_{\min}, \frac{1}{R}\right)$, .and Lemma 4 implies that the repayment rule is below the pricing rule for p close to 0. ■

Given the equilibrium price, the entry rule defines the mass of active entrepreneurs in each period which implies the aggregate level of economic activity and the aggregate level of borrowing.

3 Comparative statics and discussion

In this section, we want to understand the properties of the equilibrium and analyze some comparative statics. In particular we are interested in exploring the reaction of the equilibrium both to shocks to financial markets and to shocks to the fundamentals of the emerging market economy.

To understand the main characterization of the equilibrium, it is useful to focus on Figure 2 and in Proposition 2.3. First, notice that, depending on the parameters, two regimes are possible. In the equilibrium with career concerns, the reputational premium might be negative, i.e., the emerging market bond yield might be too low, or positive, i.e., the emerging market bond yield might be too high compared to its risk. Furthermore, the regime is determined jointly by the fundamentals of the country and the state of the financial market. Regardless of the fundamentals of the country, i.e., the repayment rule, the financial market, i.e., the pricing rule, might be such that the equilibrium is in any of the regimes. Similarly, regardless of the state of the financial market, fundamentals might be such that the equilibrium is in any of the regimes. From Proposition 2.3, it is clear that when reputational premium is positive, both foreign investment and economic activity is reduced compared to the benchmark case with no career concerns. The opposite is true when reputational premium is negative. The following Proposition states the formal determinants of the regime. The proof is straightforward from Figure 2, so it is omitted.

Proposition 4 *In equilibrium,*

1. *if* $F\left(\hat{a}\left(b'\left(\frac{1}{2R}\right)\right)\right) < \frac{1}{2}$ *the reputational premium is negative,*
2. *if* $F\left(\hat{a}\left(b'\left(\frac{1}{2R}\right)\right)\right) > \frac{1}{2}$ *the reputational premium is positive.*

This result is consistent with the empirical evidence highlighting that emerging market bond prices fluctuate more than what is accounted for by changes in probability of default. On one hand, Broner, Lorenzoni and Schmukler (2007) argues that the premium over the expected repayment on emerging market bonds is especially high during crises times. On the other hand Duffie et al. (2003) document that the implied short spread of Russian bonds was very low during the first 10 month of 1997. Moreover, their estimation shows that in one short interval in 1997 bond prices were so high that the implied default adjusted short spread was negative. This is inconsistent with any risk-aversion based explanation, but consistent with our model.

Our result is also consistent with the observation that business cycles are very volatile in emerging countries and spreads are countercyclical (e.g. Neumeyer and Perri, 2005, Uribe and Yue, 2006).

Let us consider some parameters change that can move the economy from one regime to the another. It is useful to categorize the possible shocks into two groups, the demand-side shocks, that is, those which affect the economy through the pricing rule, and the supply-side shocks, i.e., those which affect the economy through the default-rule.

The most important demand side shock is the change of the risk-free rate, R. From equations 1 and 6 it is easy to see that both the pricing rules with and without career concerns get flatter as R increases. Both continue to cross the q axis at 1, but both are simultaneously pushed down in a way that the proportion of implied prices for each q does not change with the change in R :

$$\frac{p^b}{p} = \frac{(1-\delta(1-q))}{1-q\delta}.$$

As a thought experiment, let us suppose that the economy was in the regime with negative reputational premium. This corresponds to a situation where investing in emerging market bonds seems to be extremely popular among fund managers, even if the expected return on these bonds is negative. If in this situation, the riskless rate increases sufficiently, the resulting equilibrium might be similar to the one depicted in Figure 2, where the reputational premium turns into positive. This implies that bond prices decrease extensively and – Proposition 2.3 – capital flows out from the country and production shrinks. Both changes are excessive compared to a world without career concerns. For the outside observer, this phenomenon looks like as if the "risk-appetite" of fund managers went up, and this is why there is a flight-to-quality. However, in our story, all fund managers were and remained risk-neutral.

Note also, that a demand-side shock must affect all emerging markets regardless of their fundamentals. Consistently with our story, Singleton and Pan (2006), analyze the changes of bond spreads of Korea, Turkey and Mexico in the period 2001-2006 and find that one of the largest co-movement in spreads occurred in May, 2004, due to concerns on U.S. monetary policy tightening.

Alternatively, the economy can move from one regime to the other because of supply-side shocks. When the fundamentals of the emerging country deteriorates, the default probability may increase for any given price, and the repayment rule would shift to the right. For example, think of a shock to the technology of the emerging country. Next Proposition shows that if the fixed cost of investment becomes higher, so the efficiency of the technology deteriorates, then the country defaults with higher probability for any given price.

Proposition 5 *If the fixed investment cost increases, the default probability increases for any given price.*

Proof. See the Appendix. ■

This Proposition shows that an increase in the investment cost makes the repayment rule shift to the right. As it can be seen in Figure 2, this can move the country from a negative premium regime to a positive premium regime. This would correspond to similar excessive spread, capital flow and output responses we described before. The only difference is, that such change can be country specific.

4 Conclusion

In this paper, we have introduced a model of financial crisis where international investors hire fund managers to invest their capital either in the bonds issued by an emerging economy or in a riskless asset. Looking at the past performance, investors try to figure out the information of their fund managers. This leads to career concerns that affect the funds' investment decisions, generating a "reputational premium". When the probability of default is sufficiently high, the funds prefer to invest in safe bonds even at a lower expected return to reduce the probability of being fired. As the economic conditions, both of the financial market or of the emerging country, change, the reputational premium can switch sign. This can generate an overreaction of the market leading to excess volatility of spreads, capital flows and output, without introducing any change in the investors' risk-appetite of in the aggregate level of liquidity.

In this version of the model we have abstracted from interesting investment decisions on the side of the emerging country. An interesting direction for future research is to model the feed-back of the financial markets on the investment decision of the emerging economy, which will affect, in turns, her default probability and back the financial market. This can potentially generate an amplification mechanism that slows down the recovery of emerging economies after financial crisis.

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Appendix

A.1 Proof of Lemma 2

Observe that (12) can be rewritten as

$$\frac{p}{(pb'-1)} = h(b')$$

and

$$\frac{\partial\left(\frac{p}{(pb'-1)}\right)}{\partial b'} = -\left(\frac{p}{(pb'-1)}\right)^2.$$

Thus, the second order condition of our problem is

$$-h^2(b') - \frac{\partial h(b')}{\partial b'} < 0.$$

A.2 Proof of Proposition 3

We derive both parts of the Lemma from the first order condition

$$\frac{p}{pb'-1} - h(b') = 0.$$

For the first part, let us apply the implicit function theorem on the first order condition which

$$\frac{db(p)}{dp} = -\frac{\frac{\partial \frac{p}{pb'-1}}{\partial p}}{\frac{\partial\left(\frac{p}{pb'-1} - h(b')\right)}{\partial b}} < 0$$

as the denominator is the second order condition. Then the fact that $\hat{a}(b')$ is increasing in b' implies the claim.

For the second part, observe that we need

$$\frac{\partial pb}{\partial p} = b - p\left(-\frac{\partial b}{\partial p}\right) > 0.$$

This is implied by the following chain of equations

$$\begin{aligned}
\left(-\frac{\partial b}{\partial p}\right)\frac{p}{b} &= \frac{\frac{1}{(1-pb')^2}}{\frac{p^2}{(1-bp)^2} + h'(b)}\frac{p}{b'} = \frac{\frac{1}{p^2}h^2(b)}{h^2(b) + \frac{\partial h(b)}{\partial b}}\frac{p}{b'} = \frac{\frac{1}{p}h^2(b)}{h^2(b) + \frac{\partial h(b)}{\partial b}}\frac{1}{b'} = \\
&= \frac{1}{\frac{h(b)}{(h(b)b'-1)}}\frac{h^2(b)}{h^2(b) + \frac{\partial h(b)}{\partial b}}\frac{1}{b'} = \frac{h^2(b)b' - h(b)}{h^2(b)b' + \frac{\partial h(b)}{\partial b}b'} < 1
\end{aligned}$$

under (15).

A.3 Proof of Proposition 5

Imagine that the fixed cost of Investment is now I generically different from 1. The equilibrium condition becomes

$$f(b', I) = \frac{p}{(pb'-I)} - \int_{\hat{a}(b')}^{\infty} \frac{1}{(a'-b')} dF(a') - F(\hat{a}(b'))\frac{dD(b')}{db'} = 0.$$

Using the implicit function theorem it is straightforward to show that

$$\frac{db'}{dI} = -\frac{\frac{\partial f\left(b',I\right)}{\partial I}}{\frac{\partial f\left(b',I\right)}{\partial b'}} > 0$$

given that

$$\frac{df}{dI} = \frac{p}{\left(pb' - I\right)^2} > 0$$

and $\partial f\left(b', I\right)/\partial b' < 0$ by Lemma 2. Hence, from equation (11) we get that $d\hat{a}\left(b'\right)/dI > 0$ and hence $dF\left(\hat{a}\left(b'\right)\right) > 0$, completing the proof.

A.4 An example for a cost of default function which supports an equilibrium

Let us suppose that

$$a'\tilde{\ }U\left[\left(1-\lambda\right)\bar{a}, \bar{a}\right]$$

and

$$D\left(b'\right) = \frac{1}{1-\beta}\ln\frac{\bar{a} + \frac{\lambda}{(1-\lambda)}b'}{\left(\bar{a} - b'\right)}$$

for some $\lambda \in (0,1)$. This implies

$$\begin{aligned} \hat{a}\left(b'\right) &= \left(1-\lambda\right)\bar{a} + \lambda b' \\ h\left(b'\right) &= \frac{1}{\bar{a}\left(1-\lambda\right)}\ln\frac{1}{1-\lambda} + \frac{b'}{\left(\bar{a}-b'\right)\left(\bar{a} - \bar{a}\lambda + \lambda b'\right)}. \end{aligned}$$

Condition (14) is .

$$\frac{\partial h\left(b'\right)}{\partial b'} = \frac{\left(b'^2\lambda + \bar{a}^2\left(1-\lambda\right)\right)}{\left(\bar{a}-b'\right)^2\left(\bar{a}\left(1-\lambda\right) + b'\lambda\right)^2} > 0$$

A.5 Proof of Lemma 4

Our starting point is the first order condition

$$\frac{p}{pb' - 1} = h\left(b'\right).$$

As $p \to 0$, b must increase without bound to make the left hand side positive, so $F\left(\hat{a}\left(b\right)\right) \to 1$. Furthermore, as $D\left(b'\right)$ is convex it implies that $h\left(b'\right) \to \infty$, so $pb' \to 1$. Then, using the L'Hôpital rule

$$1 = \lim_{p\to 0} b'\left(p\right)p = \lim_{p\to 0}\frac{p}{\frac{1}{b'(p)}} = \lim_{p\to 0}\frac{1}{-\frac{1}{b^2(p)}\frac{\partial b'(p)}{\partial p}},$$

which, together with $b' \to \infty$ implies

$$\lim_{p\to 0}\frac{\partial b'\left(p\right)}{\partial p} = -\infty,$$

which implies the lemma.