Government Guarantees Behind Banks: International Evidence from the Ratings

by

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ABSTRACT

To gauge governments' contingent liabilities behind banking systems, we employ: Sovereign ratings (SOVBD); bank's financial strength ratings (assessing solidity without external support; BFSR); bank's overall credit ratings (government support reduces default probabilities; BDCR).

We find: 1) BDCR and SOVBD are positively correlated, much more in developing countries, where sovereign guarantees may reduce banks' cost of capital; 2) our new government liability index (*LI*), decomposing BDCR into the contributions of BFSR and SOVBD, implies large potential liabilities; 3) institutional arrangements affect *LI*, moral hazard and systemic risks at banks; 4) contrary to high-income countries, only SOVBD causes BDCR in developing countries.

JEL Classification: G2, G3
Key Words: Bank Credit Ratings, Contingent Liabilities, Systemic Risk

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1. Introduction

Banking systems are special in that individual bank failure has a potential to lead to an economy-wide systemic crisis. This is perhaps one of the reasons why banks have been subject to both public supervision and private monitoring. After the 1930s' Great Depression, national banking systems around the world have experienced a period of relative tranquility and serious crises were rare. However, since the 1980s, systemic banking crises have become re-occurring events in both developed and developing countries, largely resulting from ill-conceived domestic financial liberalization, premature capital account opening, and poor risk management skills (Demirguc-Kunt and Detragiache, 1998 and Kaminsky and Reinhart, 1999). The large costs of resolving banking crises are ultimately borne by national governments because of the explicit or implicit guarantees that the national governments stand behind their banking systems.

The importance of these explicit or implicit government guarantees is well exemplified by the Japanese banking crisis during 1997–2001 if we compare how the gravity of the situation is represented differently by Moody's bank financial strength ratings (BFSRs), relating to the bank's health as a standalone concern, vis-à-vis Moody's bank deposit credit ratings (BDCRs), representing the bank's credit worthiness also in light of expected institutional support and governing its cost of capital on the market. Because of extensive declared and expected non-performing loans (NPLs), low profitability, prolonged economic stagnation, and general price deflation, the financial performance of most Japanese banks deteriorates considerably. Indeed, this has been well captured by the BFSRs of Japanese banks which are on average at the lowest level (E), indicating serious financial distress. However, despite their poor performance, the overall standing in terms of BDCRs is quite high for most Japanese banks, rather close to Japan's sovereign rating. For example, on a sample of banks from both developed and developing countries with BDCR at Aa3, the average BFSRs are 2 to 3 notches lower for Japanese banks. Thus, even though, on average, we tend to observe that higher BDCRs go along with higher BFSRs, this is not always true. In this case, it may imply that Japanese banks' BDCRs factor in substantial institutional support from their government.

Given the gap between BDCRs and BFSRs, are the evaluations of banks issued by rating agencies timely and accurately predicting individual banks' probability of distress? The answer appears to be yes at least according to Berger, Davies, and Flannery (2000). When comparing the timeliness and accuracy of (confidential) government assessments of bank condition against market evaluations of large U.S. bank holding companies, they find that supervisors and bond rating agencies both acquire information that would help the other group forecast changes in bank condition. On the contrary, supervisory assessments and equity market indicators are not strongly interrelated.

As market based ratings are useful indicators to assess the risks of banks around the world, the distinction and meaning of these two different ratings naturally raise a series of questions: As to the rating methodology, how do we interpret the gap between BDCRs and BFSRs? Does it represent the implicit guarantee that the national government stands behind the banking system? From a policy perspective, can such gap help us infer whether and to what extent the government is bearing potential liabilities to the national banking system? How does the gap between BDCRs and BFSRs correlate

with the existing early warning indicators to predict banking crises, widely used by economists and policy makers?

This paper intends to examine the issues posed above both qualitatively and quantitatively using a newly developed dataset collected from the Moody's bank ratings and hopes to shed light on our understanding of the issues of financial regulation and the role of the government behind domestic banking systems. First, we show that BDCRs are strongly and positively related to corresponding sovereign ratings and more so for emerging market economies, whereas there is little correlation between BFSRs and sovereign ratings. This discrepancy implies that sovereign guarantees may play an important role in enhancing BDCRs. Second, by decomposing BDCRs into the part deriving from BFSRs and the part related to sovereign guarantees, we identify that such guarantees engender potential liabilities for governments. Third, we devise a government liability index (*LI*) to measure the implicit guarantees from governments' standing behind their national banking systems. This index should be viewed as the market assessment of government guarantees. Fourth, we examine the relationship between the institutional environment (for example, supervisory quality and deposit insurance) in which banks operate and *LI* in an explicit attempt to uncover how much such arrangements are related to government guarantees and whether such arrangements intensify moral hazard problems and systemic risks at banks. Finally, we study which ratings (BFSRs or Sovereign ratings) tend to effect changes on the BDCRs.

The paper proceeds as follows: Section 2 survey the literature and explores the rationale as to why governments stand behind their national banking systems and argues that the potential liabilities could be large. Section 3 proposes our new index. Section 4 describes the data and rating methodology applied by Moody's. Section 5 reports our econometric results. Section 6 concludes and spells out future research directions.

2. Why and How Much do Governments Stand Behind National Banking Systems?

Even though most national banking systems are now liberalized, governments (and domestic institutions at large) still play a distinctive supporting role behind them. This is not so much because of governments' direct involvement in the position of bank shareholders. Following the drive toward privatization (Verdier, 2000) and in accordance with what the economic literature suggests (La Porta, López-de-Silanes, and Shleifer, 2002; Sapienza, 2003),[1] government ownership of banks has indeed become outmoded over the recent decades.

Rather, their supporting role behind banks stems from governments' indirect involvement as stakeholders in the functioning of the national monetary and financial system. Since the breakdown of the national payments system might cause a systemic economic crisis in the country, banks are normally shielded by way of some form of guarantee for depositors. Guarantees are built to avoid deposit runs on banks (Diamond, and Dybvig, 1983).

The actual setup of such guarantees differs considerably from country to country. Guarantees on banks may be explicit or implicit. They are explicit when deposit

[1] Lang and So (2002) may be one of the few exceptions.

insurance is provided officially (either through private or public schemes). This is the case in most developed countries (Demirguc-Kunt and Sobaci, 2000). Deposit insurance schemes generally incorporate expected state subsidies in as much as the premium paid up front by banks is not sufficient to cover losses occurring in bad scenarios. The extent of these state subsidies varies, of course, from country to country depending on the size of the premium and how this relates to the specified deposit coverage, e.g., countries with more generous deposit insurance schemes tend to have poorer bank performance and greater bank fragility (Demirguc-Kunt, and Detragiache, 2000). It is believed, however, that even well funded deposit insurance schemes do not rise to a level able to cover losses under extreme scenarios. When the crisis is so severe to exhaust the premia accrued in the deposit scheme, authorities will likely intervene either through the central bank's lending of last resort or through other government action or both.

On the contrary, government guarantees on banks are implicit in countries where a deposit insurance scheme is not present. It is expected, in fact, that when a serious crisis hits the banking system the government will usually step in and provide coverage on deposits. For example, this was the case during the Asian crisis in Indonesia, Korea, and Thailand, where governments offered a blanket guarantee on deposits to stymie a widespread bank run.

Obviously, ceteris paribus, the government is bearing larger-sized guarantees when these are only implicit. Nevertheless, the extent of government guarantees on banks is affected also by factors other than the existence of a deposit insurance scheme and its features. First, it descends directly from the health of national banks. Second, the quality of regulation, supervision and enforcement are all expected to have a significant impact. Third, the size of government guarantees is also determined by the magnitude of the macroeconomic shocks to which national banks are exposed.

Healthy banks are unlikely to need external support. Seeing their good performance and soundness, markets give these banks a good valuation. Thus, there is no need of government guarantees for them. On the contrary, markets should give a bad valuation to shaky banks. Such adverse valuation will, however, not materialize if shaky banks enjoy government guarantees. In a sense, government support may distort the price signaling mechanism across banks in the market. Nonetheless, the exposure of the government through its explicit and/or implicit guarantees to national banks determines hidden liabilities in the public budget, which may or may not be adequately factored in when evaluating the probability of default of the sovereign itself. Other things being equal, the amplitude of these liabilities is negatively correlated with the health of the national banking system.

In turn, given the health status of domestic banks, government guarantees to banks decrease in the quality of regulation, supervision and enforcement in the country. At this juncture, better institutions should reduce the likelihood that weak banks will run into crises and that, in the event, these crises will not be managed promptly and effectively. The legal tradition of the country is certainly important in this respect (La Porta, et al. 1997, 1998) but does not provide a fully satisfactory explanation. In fact, in their extensive cross country survey on the effectiveness of regulation and supervision, Barth, Caprio, and Levine (2001a; 2001b) reach the conclusion that appropriate policies promoting private monitoring of banks improve bank performance and stability. It goes

without saying that these policies are certainly not exclusive to countries with legal systems of English origin, the legal tradition that La Porta, et al. (1997, 1998) associate with more developed financial markets.

Finally, given bank health and the quality of institutions, the size of the underlying guarantees provided by the government to national banks increases with the country's exposure to foreign exchange shocks. As argued by the literature on the twin crises (e.g., Kaminsky and Reinhart, 1999) banking and exchange rate crises tend to manifest together. The underlying idea is that, for various reasons, national exchange rates artificially pegged to the international hard currency are likely to expand the exposure of the economy to un-hedged foreign exchange risks.[2] Exposure to these risks is a major source of macroeconomic fragility for the country, passing through the banking system. When the exchange rate peg becomes untenable, the country will be forced into devaluation and the banking system will, in fact, be in serious trouble. To this end, it is largely irrelevant whether the build up of these risks is directly at banks or it rests with the corporate sector: Even in the latter case, the distress in the corporate sector will damage the banks. In turn, the extent of bank distress will dictate the burden for the government in healing the damage. Furthermore, the twin crises hypothesis has an additional implication, which is important for us. Namely, the causality chain may go from the banks to the exchange rate, rather than the other way around, as depicted above. In practice, it is possible that the fragility of the banking system precipitates a crisis of confidence in the country that, in turn, brings about attacks on the exchange rate and an exchange rate crisis. In a sense, a frail banking system may become unsustainable in spite of the government support it enjoys and the burden for the government to stand behind national banks will terribly increase if the banking vulnerability triggers the exchange rate crisis. The exchange rate crisis will, in fact, complicate the issue by damaging the macroeconomy and destabilizing public finances through a further channel other than the cost of salvaging banks.

For all the reasons above, it is important to try to measure the hidden liabilities the government is bearing because of its obligation to stand behind the national banking system. In the next section, we propose a novel methodology to assess such government liabilities.

3. A new Approach to Measure Government Liabilities on Banks

Since 1995, a new rating scale, named bank financial strength ratings (BFSRs), has been published by Moody's to grade the financial strength of a bank as a standalone concern, thus disregarding any external support. BFSRs are published in addition to overall bank deposit credit ratings (BDCRs), where BDCRs take into account not only banks' own financial performance but also other institutional factors such as the macroeconomic environment, the quality of supervision, and the implicit or explicit deposit insurance setup. Two main questions arise at this juncture: (i) Is there a gap

[2] In addition, markets for hedging exchange rate risk may be quite shallow. Interestingly, examining the consequences of the Asian crisis on corporations, Allayannis, Brown, and Klapper (2002) find that the use of synthetic local currency (hedged foreign currency) debt is associated with the biggest drop in market value. The authors argue this is possibly due to currency derivative market illiquidity during the crisis.

between BDCRs and BFSRs? (ii) And, if yes, how much credit enhancement can we attribute to the institutional factors mentioned above? We now intend to address these questions in depth.

To be sure, Poon, Firth, and Fung (1999) have already started analyzing the determinants of BFSRs and whether they are correlated with BDCRs. As to their determinants, using a logit regression, they find that BFSRs may be correctly classified using bank-specific accounting and financial data alike (in decreasing order of importance): Loan provision ratios, the dimensions of risk, and profitability. In addition, while sovereign ratings do not figure as a significant determinant, BDCRs help correctly classify almost 70 per cent of the BFSRs.

In this paper, we will show that indeed the rating criteria of BDCRs are much broader than those for BFSRs, as vindicated by the empirical test of Poon, et al. (1999) on Moody's bank rating methodology. Reportedly, BDCRs are determined according to the so-called seven "pillars" in Moody's bank deposit credit rating assignment exercise (see Appendix 1): 1) Operating environment; 2) Ownership and governance; 3) Franchise value; 4) Recurring earning power; 5) Risk profile; 6) Economic capital analysis, and 7) Management priorities and strategies. We dwell on each of these rating categories in turn.

On the operating environment, Moody's bank analysts are required to examine the factors of the overall macroeconomic and industry status, the regulatory environment, and the institutional support enjoyed by banks. Thus, macroeconomic factors embodied in the sovereign rating and institutional features specific to the banking sector should figure prominently in BDCRs.

The second "pillar" considers the type of ownership such as state, cooperative, or public, together with the corporate governance issues related to privatization and shareholder value creation. The board shareholder structure and the type of members should also be taken into account.

In the category of franchise value, both system driven (regulatory protection, rules, and geographic presence) and institutional driven (technology, product mix, and staffing levels) determinants of the franchise value are considered. In addition, other factors to care about are the expected size effects and the activities of the franchise.

Regarding whether banks possess recurring earning power, the focus is on various basic financial ratios such as return to assets, leverage, and cost-income ratios.

In analyzing banks' risk profile, credit risks such as sector and geographic concentration of loans, NPLs, loan loss provision, credit risk management, market risks and management, and liquidity management are the key components.

In fact, the last two are the most relevant categories to come up with BFSRs. Finally, economic capital analysis (examining banks' capital adequacy ratios), and consideration of the management priorities and strategies are the remaining two key categories in the overall bank rating assignment.

Thus, from the rating strategy, it is easy to tell that BFSRs have a much narrower focus than the overall banking rating process. They concentrate on credit risk assessment based on banks' financial performance and risk profiles alone, without any recourse to

the institutional support that the banks are able to draw. As such, the BFSR may not indicate whether a bank will necessarily go under, an event which ultimately depends on how much institutional support that bank can rely on.

Accordingly, both empirical inferences from data and our understanding of the bank rating methodology put forward by Moody's help us distinguish the relationship between BDCRs and BFSRs. We can then devise the following equation to disentangle banks' financial strength from the factors relating to institutional support.

$$B_{ijt} = \underbrace{F_{ijt}}_{\text{Bank risk}} + \underbrace{(B_{ijt} - F_{ijt})}_{\text{Risk mitigation due to potential institutional support}} \quad (1)$$

By definition, we have

Where B_{ijt} is the overall bank deposit credit rating (BDCR); F_{ijt} is the bank financial strength rating (BFSR) and, by construction, the difference between the two is the risk mitigation due to potential institutional support. Further, calling B_{jt} the country ceiling for bank deposits (in foreign currency), we define L_{ijt} as the implicit government liabilities to domestic banks, which can be computed as: $L_{ijt} = B_{ijt} - F_{ijt}$. Scaling the equation by B_{jt}, the country ceiling for bank deposits, we have the following equation:

$$\frac{B_{ijt}}{B_{jt}} = \frac{F_{ijt}}{B_{jt}} + \frac{L_{ijt}}{B_{jt}} \quad (2)$$

Thus, the contingent government liability index (*LI*) can be defined as $\frac{L_{ijt}}{B_{jt}}$. Note that *LI* is a measure of contingent government liability whose materialization depends upon the probability a bank failure event will actually occur in the future. By this definition, *LI* excludes the case where the government and/or the banks are already in the state of default.

In addition, given the time dimension in equation (2), we can further express it in terms of its rate of change. Using the hat algebra and totally differentiating both sides of equation (2) yields:

$$\hat{b}_{ijt} = \frac{f_{ijt}}{b_{ijt}} \hat{f}_{ijt} + \frac{l_{ijt}}{b_{ijt}} \hat{l}_{ijt} \quad (3)$$

Where $f_{ijt} \equiv \frac{F_{ijt}}{B_{jt}}$, $\hat{f}_{ijt} \equiv \frac{\dot{F}_{ijt}}{F_{ijt}}$ (and similarly for l and b). This equation shows that the change in BDCR can be decomposed into changes due to banks' BFSR and to contingent *LI*, after adjusting for their shares with respect to BDCR, respectively.

Figure 1 illustrates the contingent liability index of the banking systems around the world while. The figure contrasts the country average value of *LI* for 1996 (a tranquil period before the East Asian and other crises; on the vertical axis) with that for 2000 (capturing a situation of turmoil in international financial markets; on the horizontal axis):[3] Points on (above/below) the 45-degree line identify countries whose situation is stable (improves/worsens) between the two years. Some comments are in order. First, we notice that 8 of the 75 countries included have a value of *LI* for 2000 above 0.5. Clearly, the situation worsens for all of these countries but for Tunisia, the only country in the group laying above the 45-degree line. Interestingly, *LI* deteriorates markedly in three of the countries more severely hit by the 1997-98 Asian financial crises (Malaysia, Taiwan-China, Thailand). In addition, the situation worsens noticeably (by -0.15 or more) in other 8 countries: Four of them are experiencing economic transition (Czech Republic, Hungary, Poland, Slovakia), Japan is the only one from the list of the high-income OECD countries and the other four are Bahrain, China, Mexico, Saudi Arabia. Second, the figure shows that *LI* is consistently below 0.2 for a group of 8 countries, in alphabetic order: Australia, Belgium, Canada, Chile, Netherlands, Spain, United Kingdom and USA. Fourth, the two countries highest on the left experience the largest reduction in *LI* between 1996 and 2000: These are Finland (-0.32) and Italy (-0.17). The Finnish case is also joined by considerable improvement in two other Scandinavian countries: Denmark (-0.13) and Sweden (-0.08).

Figure 2 plots the weighted index as of 2001 for all countries in the sample. We can observe that in general, developing countries tend to have high values of *LI*, whereas the high-income countries tend to have very low *LI*, with the notable exception of Japan, which is having an on-going banking sector problem.

4. The Empirical Analysis

4.1 Estimation Model

Following Ferri and Liu (2003), we assume that, for profit reasons, Moody's attempts to capture a bank's risk in its rating assignment as accurately as possible. This is because, to generate continuous business, the rating agency relies on its accuracy at predicting default and thus its reputation capital. This motivation can be formalized by minimizing the squared distance between a bank's true default risk, R_{it}^{t}, and its assigned bank rating, R_{it}^{f}. The rating agency's utility function can be expressed as follows:

[3] In practice, we computed these country-level *LI* as the weighted average (by total assets) over all the banks from the country. In addition, it is worth stating that individual bank's *LI* was calculated on the basis of the value of its BDCR and BFSR at the end of the reference year.

$$U_{it} = -[R_{it}^{f} - R_{it}^{t}]^2 \quad (4)$$

Where R_{it}^{t} consists of two components: One related to the bank's idiosyncratic risks (financial or credit risk) and the other related to the overall macroeconomic risk, as captured by the sovereign risk, R_{it}^{s}. The subscript *i* represents banks and *t* represents the time horizon of the sample. Hence, R_{it}^{t} can then be formulated as follows:

$$R_{it}^{t} = \alpha R_{it}^{c} + \beta R_{it}^{s} \quad (5)$$

Where R_{it}^{c} is the bank's idiosyncratic risk and R_{it}^{s} is the aggregate risk of the country where the bank is located. For the sake of simplicity, we assume that the aggregate country risk can be fully captured by the sovereign risk rating. As discussed in the previous section, R_{it}^{c} can be in fact captured by the BFSRs, as the measure itself is derived from a bank's financial performance indicators. Substituting equation (5) into Equation (4), we have the following equation:

$$U_{it} = -[R_{it}^{f} - (\alpha R_{it}^{c} + \beta R_{it}^{s})]^2 \quad (6)$$

Maximizing the utility function with respect to the rating agency's rating, R_{it}^{f}, we can derive the following first order condition:

$$R_{it}^{f\,*} = \alpha R_{it}^{c} + \beta R_{it}^{s} \quad (7)$$

Our objective is to estimate equation (7) in a way to identify the weight of the BFSRs (R_{it}^{c}) and that of sovereign ratings (R_{it}^{s}) in the bank's overall credit rating so as to ascertain whether such weight varies across developed and developing countries. This leads us to rewrite the equation (7) further as follows:

$$R_{it}^{f\,*} = \alpha_1{}^{LDC} R_{it}^{c} + \beta_1{}^{LDC} R_{it}^{s} + \alpha_2{}^{DC} R_{it}^{c} + \beta_2{}^{DC} R_{it}^{s} + \varepsilon \quad (8)$$

Where LDC and DC stand for developing economies and high-income OECD economies. The latter group excludes the newly entered OECD emerging market economies (Czech Republic, Hungary, Korea, Mexico, Poland, Slovakia, and Turkey).

In addition to examining the relationship among the BDSRs, BFSRs, and their corresponding sovereign ratings, we also undertake some further statistical analysis such

as whether there is a causal relationship if case there is a downgrading of these three ratings and what will be the direction of causation among them.

Finally, we investigate the characteristics of the government liability index to see whether a set of key institutional indicators (such as ownership of banks, deposit insurance, supervisory power, and institutional quality) may help explain this market-based banking sector risk index.

4.2 The Data and Descriptive Statistics

The data were collected painstakingly from the *Bankscope* database. Although the database contains most of the major banks in any country in the world, the dataset is limited by whether these banks are rated by Moody's. As a result, we have a smaller collection of banks in the sample compared to the number of banks in the *Bankscope* database. In the end, we have 777 banks from 77 countries across the globe. Since Moody's only started issuing bank financial strength data in 1995 with a small number of banks initially, we commence the collection of data from 1996 and the data period ends in 2001. With regards to the distribution of the banks across country, we notice that the US, Japan, the UK, Germany, and Italy are the top 5 countries in the sample with a share of 38 percent of banks. The high-income OECD countries account for 455 banks with a share of 59 percent of total banks. The developing economies thus account for 41 percent of the sample with Latin American and East Asian economies dominating the sub-sample of banks from developing countries (Table 1).

In order to do some econometric analysis, the alphabetic rating scales have to be converted to numerical ones. We take a convention by adopting the transformation scales used in Ferri and Liu (2003) and rescale also the BFSRs to make them correspond more closely with the regular bank ratings. Such conversions are reported in Table 2.

4.3 Econometric Results

1. *Bank Deposit Credit Rating (BDCRs) and Their Determinants:* We first present the results of Equation (8) in which the contributions of BFSRs and sovereign rating (SOVBD) to BDCRs are examined in detail. Four sets of regression specifications are carried out as presented in Table 3. The first two equations are more closely mirrored to Equation (8), where we examine whether there is a difference between developing countries and high-income economies in terms of the contributions of BFSRs and SOVBDs in explaining BDCRs. We obtain the following results. First, the contribution of sovereign ratings to bank ratings in LDCs is much larger than that in high-income OECD countries, whereas the bank financial strength ratings behaved exactly the opposite. That is, in developing economies, a bank's individual financial strength matters less than the sovereign rating, which in turn may indicate that banks in developing countries enjoy much more institutional support from the government than that obtained by banks in high-income economies. Or, put it differently, BDCRs capture more of the information content of the sovereign ratings, whereas the idiosyncratic bank information, as represented by its financial performance, matters less in the assignment of credit ratings for banks in developing economies. This result also corroborates similar evidence

found by Ferri and Liu (2003) on the information content of industrial firm ratings. However, when the equation is run using random effects (Equation 2 of Table 3), the same results are still found for developing economies only. The result for the banks of high-income countries becomes similar to that of developing countries. That is, sovereign ratings also matter more than banks' idiosyncratic information as represented by BFSR. The difference is that the coefficient of the BFSRs for the high-income OECD economies is much larger than that in developing economies.

Since our data sample contains 777 banks from 77 countries, country and regional difference may help explain the different results reached for high-income OECD economies. Thus, the inconclusive results obtained above lead us to look at the same issue but further decomposing developing and high-income countries by geographic region. For developing countries, we create two more dummy variables that represent country groups of East Asia and Latin American economies. For high-income economies, we further divide the sample by looking at USA, Japan and other high-income economies separately. We then run both fixed-effects (Column 3) and random-effects (Column 4) panel regressions to see whether the results found in Columns 1 and 2 still hold.

The fixed effect regression results show that for developing countries, if we only look at East Asia and Latin America, similar results still hold but the regional differences are quite obvious. For East Asian developing economies, although the sovereign ratings are very important, individual bank information also matters in explaining the overall bank credit rating. The coefficient of BFSRs for the East Asian group increases to 0.36 from 0.23, a coefficient obtained when the developing countries are lumped together. For Latin American banks, the sovereign rating disproportionately dominates the contribution to the bank rating, whereas the individual bank information only plays a negligible (though statistically significant) role as indicated by the tiny value of the coefficient (0.06). For all high-income OECD groups we find that both BFSRs and SOVBDs are important. Nevertheless, as expected, the contribution of the sovereign rating is larger for Japan than for other high-income OECD countries.[4] The last column in Table 3 uses a random-effect panel regression technique to examine the same issue. For the East Asian and Latin American region, similar results are also obtained here. The result for Latin America is slightly stronger in the sense that the bank individual information is not that important and the sovereign ratings take over all the explanatory power of the BDCRs. One change is that the result for the US is more in line with our intuition. The individual bank effect is more important than the sovereign effect, which we deem more reasonable. For banks in Japan and in other high-income OECD countries, the magnitude of the contribution is similar for BFSRs and SOVBDs.

2. *Causality:* We adopt an error correction model (ECM) in the spirit of Harvey (1981) and Hendry (1995). The error correction specification of the model allows us to capture not only the short-term dynamics of the relationship between private sector and sovereign ratings but also the long-term structure of such relation. The model that we estimate has the following specification:

[4] However, the same applies to the US and this is difficult to explain.

$$\Delta BDCR_{i,t} = \alpha + \beta \Delta SOVBD_{i,t} + \gamma BDCR_{i,t-1} + \delta SOVBD_{i,t-1} + \lambda \Delta BFSR_{i,t} + \mu BFSR_{i,t-1} + LDC^* \Delta BFSR_{i,t} + LDC^* \Delta SOVBD_{i,t} + \varepsilon_{it} \quad (9)$$

where $BDCR_{i,t}$ is the bank rating for bank i at time t; $SOVBD_{i,t}$ is the sovereign rating in firm i's country at time t, α is the constant term, $|\beta|$ and $|\lambda|<1$ and ε is the error term. Changes in the variables are indicated by Δ. The coefficient of the long-term relationship is given by $-\delta/\gamma$ and $-\lambda/\gamma$. The short-term (or immediate) impact of the sovereign rating on the individual firm rating is given by β and λ. In order to investigate the impact of sovereign upgrades and downgrades on individual banks in particular groups of countries, we also include a multiplicative dummy for developing countries.

The results are reported in Table 4. We can see that for the sample as a whole, both changes of BFSRs and of SOVBDs effect positive changes on the overall bank rating. In general, a 1 percent change in BFSRs and SOVBDs will effect 0.2 and 0.3 percent changes in BDCRs. However, if we split the sample by examining these changes on BDCRs for LDCs, the results are quite different. Changes of sovereign ratings (either upgrades or downgrades) have a stronger impact on the bank ratings in LDCs, while, on the contrary, changes of BFSRs (either upgrades or downgrades) do not have much impact on BDCRs. Such results indicate that a sovereign rating change can cause immediate changes in the bank credit rating while a bank financial strength rating does not necessarily bring about a change in the bank credit rating in the LDCs. In this sense, sovereign ratings are more important in determining the overall banking sector credit rating.

3. *Characteristics of the Contingent Liability Index:* Finally, we turn to examining the characteristics of the contingent government liability index. Results are presented in Table 5. *LI* is negatively related to the equity ratio of the bank, that is, the higher the equity a bank has, the lower the liability a government tends to have. In terms of other qualitative indicators, government ownership is positively related to *LI*, indicating that government ownership tends to associate with larger fiscal liabilities, which corroborates with both theory and empirical findings elsewhere. Private ownership of banks is negatively related to *LI*, indicating private ownership of banks leads to less government guarantees and, therefore, potentially smaller government liabilities to private banks. Explicit deposit insurance is negatively related to *LI*, although the coefficient is not significant at the 90 percent confidence level. Banking supervisory power is generally positively related to *LI*, but is not statistically significant. Institutional quality is negatively related to *LI*, which indicates that the higher the institutional quality, the lower the liabilities the government tends to have on its banks. When looking at *LI* in terms of geographic regions, we find that the US and other high-income OECD economies (excluding Japan) have a negative correlation with *LI*, which testifies that the banks in these economies are rather sound and thereby the governments bear relatively little contingent liabilities to the banking sector. However, the same story cannot be told in the case of Japan. *LI* is positively and statistically significantly related to the Japan dummy, which reflects what Japan is currently going through: A serious bank sector problem as the banks in Japan are struggling with large amounts of NPLs and low profitability. As a result, the banking system is in bad shape, requiring large government

support at both the institutional level and financial level. The same can also be said for the banking sectors in most of the East Asian economies.

5. Conclusions

This paper tried to study three questions: First, using rating data from Moody's, we investigated the contributions of BFSRs (bank's financial strength ratings, grading solidity without external support) and SOVBDs (sovereign ratings in the country where the bank belongs) in explaining BDCRs (bank's overall credit ratings, where government support reduces default probabilities). We found that the contribution weights are quite different for high-income OECD countries and LDCs. BFSRs do not contribute much to BDCRs in LDCs whereas SOVBDs play a large role in these countries. The results for high-income OECD countries are quite different: here, BFSRs are just as important as SOVBDs in explaining overall bank credit ratings. Second, we looked at the causality links among these three variables. We showed that both BFSRs and SOVBDs can cause changes in BDCRs in developed countries. However, for LDCs, only sovereign ratings can effect changes in overall bank credit ratings, while BFSRs do not cause changes in BDCRs. Third, we studied the properties of the newly developed government contingent liability index (*LI*). We found that *LI* is negatively related to the size of equity of banks, private ownership, and institutional quality. On the contrary, it is positively related to the extent of state ownership of banks and regional dummy variables such as the developing East Asian economies and Japan, thus highlighting the on-going banking problems there.

This research can be further extended to verify how good an indicator the *LI* index is by using it as an early warning indicator for banking sector problems or crises. This market-based indicator will show whether rating agencies can spot early signs of problems of a particular bank or of the banking system of a particular country. Further verification of this new indicator will certainly help policy makers and investors alike have better early warning indicators on the bank system health around the globe.

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Figure 1. The Contingent Liability Index of the Banking Systems Around the World

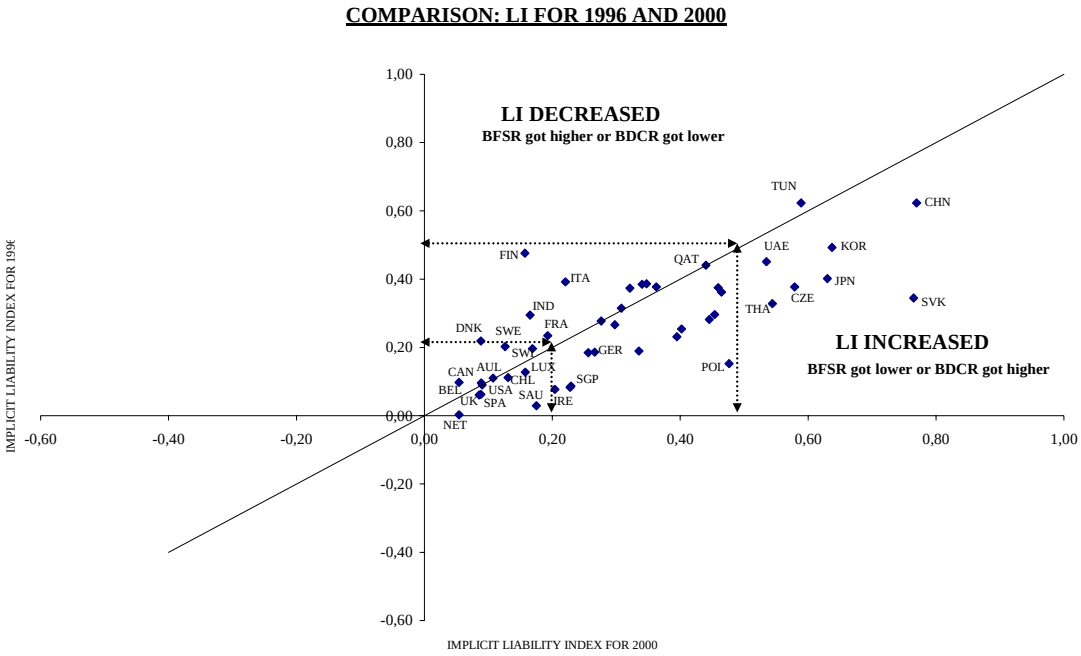

Figure 2: Contingent Liabilities Index of Government Guarantees of the Banking System (2001)

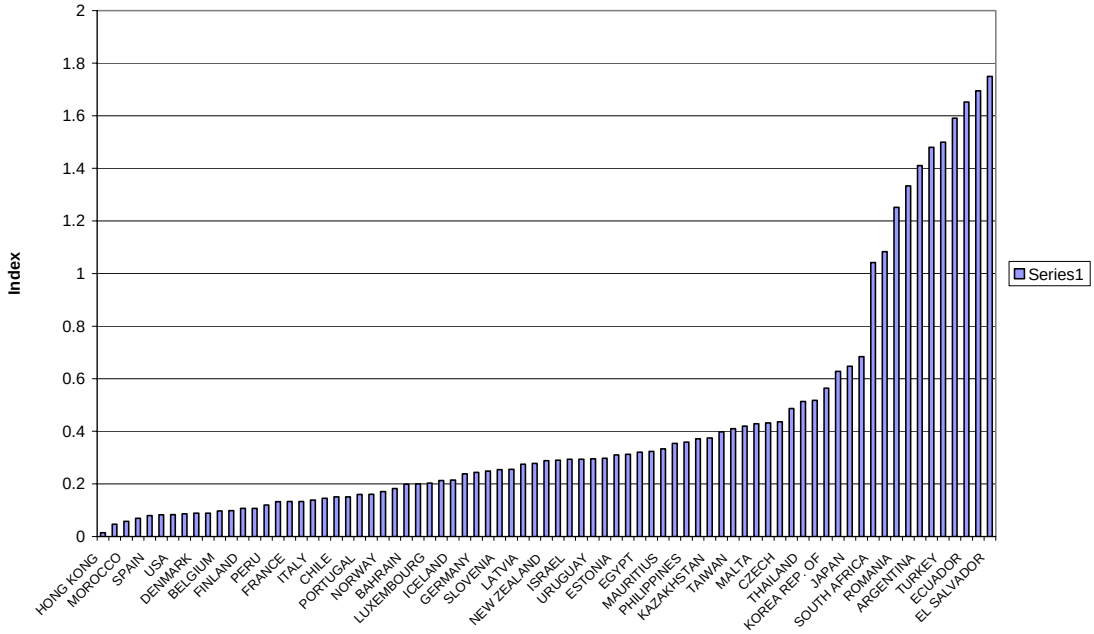

Table 1: Countrywise distribution of banks

Country Name	No. of Banks	%
ARGENTINA	10	1.29
AUSTRALIA	12	1.54
AUSTRIA	8	1.03
BAHRAIN	7	0.90
BELGIUM	4	0.51
BERMUDA	3	0.39
BOLIVIA	1	0.13
BRAZIL	23	2.96
CANADA	7	0.90
CHILE	9	1.16
CHINA-PEOPLE'S REP.	24	3.09
COLOMBIA	5	0.64
CROATIA	1	0.13
CYPRUS	3	0.39
CZECH REPUBLIC	4	0.51
DENMARK	4	0.51
ECUADOR	2	0.26
EGYPT	7	0.90
EL SALVADOR	1	0.13
ESTONIA	3	0.39
FINLAND	4	0.51
FRANCE	25	3.22
GERMANY	35	4.50
GREECE	7	0.90
HONG KONG	13	1.67
HUNGARY	6	0.77
ICELAND	2	0.26
INDIA	8	1.03
INDONESIA	8	1.03
IRELAND	13	1.67
ISRAEL	5	0.64
ITALY	27	3.47
JAPAN	51	6.56
JORDAN	3	0.39
KAZAKHSTAN	3	0.39
KOREA REP. OF	13	1.67
KUWAIT	8	1.03
LATVIA	2	0.26
LEBANON	3	0.39
LIECHTENSTEIN	1	0.13
LUXEMBOURG	8	1.03
MALAYSIA	6	0.77
MALTA	2	0.26
MAURITIUS	2	0.26
MEXICO	8	1.03
MOROCCO	4	0.51
NETHERLANDS	8	1.03
NEW ZEALAND	2	0.26
NORWAY	9	1.16
OMAN	4	0.51
PAKISTAN	4	0.51
PANAMA	2	0.26
PERU	4	0.51
PHILIPPINES	9	1.16
POLAND	10	1.29
PORTUGAL	7	0.90
PUERTO RICO	2	0.26
QATAR	3	0.39
ROMANIA	3	0.39
RUSSIAN FEDERATION	5	0.64
SAUDI ARABIA	10	1.29
SINGAPORE	6	0.77
SLOVAKIA	3	0.39
SLOVENIA	3	0.39
SOUTH AFRICA	7	0.90
SPAIN	24	3.09
SWEDEN	4	0.51
SWITZERLAND	7	0.90
TAIWAN	12	1.54
THAILAND	10	1.29
TUNISIA	8	1.03
TURKEY	16	2.06
UNITED ARAB EMIRATES	4	0.51
UNITED KINGDOM	43	5.53
URUGUAY	2	0.26
USA	135	17.37
VENEZUELA	6	0.77
TOTAL	**777**	
Note: High-Income OECD countries 25 Number of Banks: 459 (59%)		

Table 2: Moody's Rating Symbols

BDCR in Letter Grade	Numeric Conversion	BFSR In Letter Grade	Numeric Conversion	Rescaling
Aaa	**100**	**A**	**13**	**100**
Aa1	**95**	**A-**	**12**	**92.5**
Aa2	**90**			
Aa3	**85**			
A1	**80**	**B+**	**11**	**85**
A2	**75**	**B**	**10**	**77.5**
A3	**70**	**B-**	**9**	**70**
Baa1	**65**			
Baa2	**60**	**C+**	**8**	**62.5**
Baa3	**55**	**C**	**7**	**55**
Ba1	50	C-	6	47.5
Ba2	45			
Ba3	40	D+	5	40
B1	35	D	4	32.5
B2	30	D-	3	25
B3	25			
Caa1	20	E+	2	17.5
Caa2	15			
Caa3	10	E	1	10
Ca	5			
C	0			

Note: Below Baa3 are speculative grade. Above them are investment grade.

Table 3: Bank Deposit Credit Rating and Its Determinants (Dependent Variable, BDCR)

Independent Variables	Equation 1 (FIXED)	Equation 2 (RANDOM)	Equation 3 (FIXED)	Equation 4 (RANDOM)
Constant		7.9		30.3
		(12.2)*		(19.0)*
LDC*BFSR	0.23	0.17		
	(17.7)*	(13.1)*		
LDC*SOVBD	0.7	0.68		
	(62.24)*	(62.27)*		
HIINCOME*BFSR	0.27	0.35		
	(24.5)*	(33.4)*		
HIINCOME*SOVBD	0.08	0.5		
	(3.7)*	(52.78)*		
LDC-EASTASIA*BFSR			0.36	0.33
			(18.0)*	(15.7)*
LDC-EASTASIA*SOVBD			0.62	0.59
			(38.8)*	(34.1)*
LDC-LATIN*BFSR			0.06	0.01
			(1.89)***	(0.25)
LDC-LATIN*SOVBD			0.85	0.83
			(27.32)*	(24.5)*
USA*BFSR			0.33	0.35
			(12.4)*	(11.8)*
USA*SOVBD			0.76	0.26
			(4.6)*	(7.2)*
JAPAN*BFSR			0.27	0.26
			(10.2)*	(9.5)*
JAPAN*SOVBD			0.16	0.28
			(1.72)***	(6.0)*
OTHERHIINCOME*BFSR			0.25	0.27
			(14.12)*	(14.3)*
OTHERHIINCOME*SOVBD			0.08	0.27
			(3.2)*	(12.1)*
NO. OF OBSERVATIONS	3750	3750	3750	3750
R-SQUARE ADJUSTED	0.63	0.74	0.53	0.73

Note: Numbers in parenthese are t statistics. Superscript symbol *, **, *** indicate statistical significant level at 99%, 95% and 90%, respectively.

Legend:
BFSR: Bank Financial Strengthen Ratings
SOVBD: Sovereign Ratings
LDC: Dummy Variable for Developing Countries
HIINCOME: Dummy Variable for High Income OECD Countries
LDC*EASTASIA: Dummy Variable for Developing Economies in East Asia
LDC*LATIN: Dummy Variable for Latin American Developing Countries
USA: Dummy Variable for United States
JAPAN: Dummy Variable for Japan
OTHERHIICOME: Dummy Variable for High Income OECD Countries Excluding Japan and USA

Table 4: Error Correction Model Results (Dependent Variable = Change of BDCRs)

Independent Variable	RANDOM EFFECT
Constant	2.25
	(3.12)*
BDCR(T-1)	-0.59
	(-32.3)*
DBFSR	0.2
	(13.2)*
BFSR(T-1)	0.11
	(9.6)*
DSOVBD	0.26
	(7.13)*
SOVBD(T-1)	0.4
	(30.0)*
LDC*DBFSR	0.03
	(1.46)
LDC*DSOVBD	0.31
	(7.92)*
No. of Observations	2974
R-Square Adjusted	0.75

Note: Numbers in parenthese are t statistics. Superscript symbol *, **, *** indicate statistical significant level at 99%, 95% and 90%, respectively.

Legend:
BFSR: Bank Financial Strengthen Ratings
SOVBD: Sovereign Ratings
LDC: Dummy Variable for Developing Countries
DBFSR: First difference on BFSR
DSOVBD: First difference on SOVBD
(T-1): Stands for one period lag

Table 5: Characteristics of Contingent Government Liability Index (Dependent Variable, LI)

Independent Variables	Coefficients
Constant	5.8
	(9.89)*
Log(Equity)	-0.12
	(-5.1)*
Government Ownership	0.12
	(2.03)*
Private Ownership	-0.25
	(-5.64)*
Deposit Insurance	-0.06
	(1.60)
Supervisory Power	0.04
	(1.17)
Institutional Quality	-0.45
	(-3.25)*
LDC*EASTASIA	0.09
	(2.10)*
LDC*LATIN	-0.44
	(-7.2)*
USA	-0.4
	(-7.5)*
JAPAN	0.51
	(8.65)*
HIINCOME-OECD	-0.38
	(-8.39)*
No. of Observations	3086
R-Squares Adjusted	0.24

Note: Numbers in parenthese are t statistics. Superscript symbol *, **, *** indicate statistical significant level at 99%, 95% and 90%, respectively.

Legend:

Log(equity): Bank equity in log form
LDC: Dummy Variable for Developing Countries
LDC*EASTASIA: Dummy Variable for Developing Economies in East Asia
LDC*LATIN: Dummy Variable for Latin American Developing Countries
USA: Dummy Variable for United States
JAPAN: Dummy Variable for Japan
HIINCOME-OECD: Dummy Variable for High Income OECD Countries

Appendix: *On the Moody's rating methodology: The Seven "Pillars" of Bank Analysis*

(First Panel: Pillars 1 – 3)

Operating environment (1)	Ownership & governance (2)	Franchise value (3)
a. Overall macro/industry status i. ***Sovereign*** (the overall state of the country's economy) (SOVEREIGN) ii. Trends in savings allocation/The deg. of *banking dis-intermediation.* iii. Outside the US where the economy is highly bank-disintermediated, especially in the EU zone, the new *competitive environment* for European banks for savings allocation. iv. Bank consolidation 1. Remedy for possible *over-capacity* 2. However so far most often unsuccessful in some countries (Japan, especially).	a. Can be a positive or negative factor for the ratings	a. *System-driven* franchise value i. In today's deregulated markets, such a franchise from protection, geographic presence and regulatory rules (specialized lenders, for example) is no longer warranted.
b. Regulatory environment i. The *quality* of regulation 1. The ability of regulators 2. Capacity and willingness to intervene 3. The mix of regulatory methods (from market discipline to direct intervention) ii. The outlook for *changing* regulatory trends 1. Less important in developed, but critically important for banks in emerging markets. i. The bank's own relationships with the regulators	b. Three main categories of banks according to ownership in Europe (in the US, most of the rated banks are bank holding companies with listed shares) i. Public sector-owned ii. Cooperative or mutualist iii. Quoted-share	b. *Institution-driven* franchise value i. The *efficiency* of the bank, driven by 1. Technology 2. Product mix 3. Staffing levels ii. The strength of its *financial fundamentals* iii. *Management talent*, strategy, vision and operating coherence
c. Institutional support i. Recall, not an element for financial strength ii. Could be explicit/implicit iii. As a result of financial liberalization, the solidity and predictability of institutional support for banks have been eroded. iv. More so for smaller entities, but "too big to fail" institutions are still likely to be helped v. The political, social and economic costs related to such a rescue, however, are increasingly higher and less palatable for the society. vi. Resistance to bank rescues by the European Commission vii. Correlation between the deg. Of consolidation/bank intermediation/activist government attitude and the strength of "too big to fail" philosophy.	c. *Privatization* is not an automatic downgrading factor. i. The likelihood of privatization is often taken into account at an early stage for the long-term ratings ii. State-owned banks tend to be less efficient iii. However, also means the removal of state support, which in some cases can result in lower ratings.	c. ***Asset size*** is not a reliable indicator of strong franchise (look at the largest Japanese banks!) (ASSET SIZE)
	d. Savings disintermediation leads to an evolving shareholder base of the bank, meaning a secular shift in bank's governance from management power to shareholder power.	d. Size *does* count, however, when it comes with market strength, having noted that ***markets share*** is a better indicator of credit strength than mere asset size (SIZE*SHARE)
	e. *Shareholder value-creation* is now commonplace for a bank's strategy.	e. A large and reliable share in a stable activities such as retail is a critical strength for a bank. (SHARE)
	f. *A bank's governance goes a long way to explain its longer-term strategies and management philosophies*.	f. Other business franchises: i. Retail banking 1. Moody's sees that banks that cannot offer new, disintermediated, products will witness erosion in their franchise 2. The new IT-based operation favors the larger banks, which can leverage these fixed (IT) costs to a broader client base. ii. Wholesale banking 1. Investment-banking activities are increasingly more important for banks, as; 2. Corporations are increasingly attracted to the equity and fixed-income markets for funding. iii. Asset management 1. To preserve the savings balances of their traditional clients under their management; 2. To obtain fees and commissions. iv. Insurance activities by banks (Bancassurance)

Source: Moody's Rating Methodology Handbook (2000).

On the Moody's rating methodology: The Seven "Pillars" of Bank Analysis
(Second Panel: Pillars 4 – 7)

Recurring earning power (4)	**Risk profile (5)**	**Economic capital analysis (6)**	**Management priorities & strategies (7)**
a. ***REP*** (Recurring Earning Power, pre-provision income % avg. assets)	a. Credit risks i. Loan Portfolio 1. Geographical/Business Sector Concentration 2. Borrower Concentration 3. NPL (NPL/TOTAL LOANS): 3.a Could be misleading for banks with rapidly growing loans; 3.b Environmental conditions for write-offs. 4. Loan Loss Provision ii. Other sources of credit risks 1. Fixed-Income investments 1.a Being replaced by higher-return investments, thus adding the bank's credit risk. 2. Interbank/Counterparty Risk: 2.a Entrance of emerging-market banks; 2.b Complex transactions – esp. derivatives; 2.c Hedge Funds 3. Equity Investments: 3.a Moody's assigns a higher risk coefficient to direct investments in companies which also have large credits from the same bank.	a. *No automatic correlations* between a bank's *level* of regulatory capital and its ratings.	a. Management culture
b. ***ROE*** is less valid when there were large revenues from off-balance sheet activities.	b. Credit Risk Management i. A bank's senior management approach to managing and controlling credit risk. ii. The way the credit-approval process is organized. iii. Credits to individuals/businesses: consistency of applying internal scoring/rating systems. iv. Now credit risk is closer to market risk. v. Statistics-based credit risk management 1. Default-probability models 2. *RAROC* (Risk-Adjusted Return On Capital)	b. ***BIS ratio***	b. Possible negative correlation between franchise strength and growth / diversification strategies
c. ***NIM*** (Net Interest Margins) i. The deposit component (market funding rate minus average/marginal deposit rates) ii. The loan component (average/marginal loan yield minus market funding rate).	c. Market risks i. In general linked to banks' trading activities. 1. Derivatives transactions, esp. the OTC instruments (eg. interest rate swaps, currency swaps and various forms of options/futures) 2. Larger/diversified bank have more capacity to absorb trading-loss shocks than less diversified trading houses or specialized investment banks.	c. ***Tier-1 ratio***	c. M&A
d. Fees/Commissions: compensate narrower NIM. i. Commercial/Retail Banking ii. Investment Banking iii. Asset Management iv. Bancassurance	d. Market Risk Management i. VaR (Value-at-Risk) ii. Stress Testing	d. ***Economic capital***: No official definition, but meaning that a bank's true economic own funds must be *permanent and readily available*. i. The managers' own willingness to cushion loan losses in an asset-cleanup process taken into account. ii. Though regulatory capital can be bolstered by, e.g., asset securitization, issuance of preferred/hybrid shares, these are not necessarily true economic capital.	
e. Trading Income: highly volatile, especially proprietary transactions. i. Income volatility is viewed negatively by shareholders, creditors and investors, and can hurt their reputation.	e. Liquidity Management. i. ***Expected cash inflows/outflows*** (CASHFLOW) ii. ***Primary liquidity*** (readily available/fully marketable liquid assets) iii. Alternative liquidity (based on the bank's ability to borrow from the market) iv. External regulation/support for Bank Liquidity v. Swinglines (for outside-US banks)		
f. "Profit maximization" principle does not simply hold. Earnings stability has acquired a higher premium.	f. ALM.		
g. Cost side: i. *The cost-income ratio* (expenses divided by revenues) ii. Decline in variable costs, the increase in fixed costs. iii. Efficiency of the branch network. iv. Staff expenses.	g. Agency risks.		
	h. Reputation/Legal risks		
	i. Operational risks, etc…		

Source: Moody's Rating Methodology Handbook (2000).