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# WILL BASEL II AFFECT INTERNATIONAL CAPITAL FLOWS TO EMERGING MARKETS?

**By Beatrice Weder and Michael Wedow**

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# PREFACE

It is widely agreed that cross-border lending has faced regulatory distortions through the 1988 Basel Accord. Most importantly, short-term bank lending to the emerging markets has been encouraged by a relatively low 20 per cent risk weight, while bank credit to non-OECD banks with a residual maturity of over one year has been discouraged by a 100 per cent risk weight. This has stimulated cross-border interbank lending, which has been described as the "Achilles' heel" of the international financial system. Hence, a reform of the Basel Accord should be welcome.

Initial research at the Development Centre, however, had warned that reform proposals (Basel II) risks deepening the regulatory divide between investment-grade and many developing-country borrowers. The latter would find it hard to tap debt finance at sustainable cost and at stable terms unless they reach investment-grade status (Reisen, 2001). These warnings may have helped to make the Committee on Banking Supervision reconsider its initial Basel II proposals and to suggest certain modifications. These November 2001 modifications have been included in the present analysis by Beatrice Weder and Michael Wedow, both of the University of Mainz. By considering various assumptions about the regulatory treatment of bank lending to emerging markets, the authors estimate the effects of Basel II on interest spreads and bank credit flows. They conclude that Basel II will have only a limited impact on international capital flows.

The paper is part of OECD Development Centre's Research on "Governing Finance and Enterprises: Global, Regional and National" in the 2001-02 work programme.

Jorge Braga de Macedo
President
OECD Development Centre
22 October 2002

## RÉSUMÉ

Ce Document technique examine les conséquences des Accords de Bâle II sur les flux internationaux de capitaux vers les pays émergents. L'ampleur de ces effets dépend fortement d'un certain nombre d'hypothèses, en particulier sur les pondérations des risques choisies pour établir les notations, sur la rémunération du capital, sur la concurrence et les effets de diversion, ainsi que l'hypothèse selon laquelle les exigences de fonds propres minimales représentent une contrainte. Les auteurs mettent en évidence chacune de ces hypothèses et estiment leur impact sur l'intérêt marginal et les flux bancaires. Il en ressort que les Accords de Bâle II — y compris les « Modifications éventuelles » de novembre 2001 — n'auront qu'un impact modeste sur les flux de capitaux internationaux.

## SUMMARY

This paper investigates the consequences of Basel II for international capital flows to emerging markets. The paper shows that the magnitude of effects critically depends on a number of assumptions, including: the mapping of risk weights to ratings, assumptions about required return on capital, assumptions about competition and diversion effects and the assumption that minimum capital requirements are binding constraints. The paper provides evidence on each of these assumptions and estimates their effect on interest margins and bank flows. Overall the results suggest that Basel II — taking into account the "Potential Modifications" of November 2001 — will have only a moderate impact on international capital flows.

# I. INTRODUCTION

The Basel Committee has received hundreds of comments on the proposal for a new Basel Accord on capital requirements (Basel II). The bulk of these studies have focused on the impact of Basel II on the banking industry and on domestic lending whereas the effects on international lending have received relatively little attention. Notable exceptions are Reisen (2001) and Griffith Jones (2001), who predict dramatic increases in spreads for lower-rated countries. Experts close to the Basel process generally tend to expect only a minor impact on capital flows. Their main argument is that minimum capital requirements have not been a binding constraint on international lending since banks in practice base their decisions on economic capital considerations. This paper seeks to determine the likely impact of Basel II — taking into account the last suggestions by the Committee for further modifications to the initial proposal — on the cost of private capital flows to developing countries.

We start by comparing regulatory capital requirements for sovereign lending under the current Basel Accord with estimated capital costs under the standardised and the internal ratings based (IRB) approaches. We consider risk weights under the January 2001 proposal and under the "potential modifications" paper of November 2001. We show that the estimated capital requirements depend critically on the mapping of risk weights to ratings. Applying an updated methodology, which was proposed by Deutsche Bank (2001) and extended by Reisen (2001), we calculate spreads movements that could result after implementation of Basel II. The result from these estimates is that spreads would decrease somewhat for higher-rated countries and increase substantially for lower-rated countries. The estimated effects for lower-rated emerging markets are in the order of a three-fold increase in spreads. Based on these estimates, it seems possible that there will be substantial level effects on emerging-market lending. This model provides an upper bound for spread movements since it assumes that capital requirements are binding, required returns are constant and banks are the only source of finance.

We proceed by relaxing these assumptions. The lower bound of estimates is obtained if capital requirements are not binding and risk weights under the IRB approach accurately reflect banks' present risk weighting systems and their economic capital allocation[1]. Under these circumstances Basel II would have no further level or differentiation effects on emerging market lending. We test this proposition by estimating the effect of simulated IRB based capital costs (as a proxy for economic capital) on bank lending flows to emerging markets. We find evidence that higher risks have been negatively associated with changes in bank claims. This result supports the view that Basel II will have a moderate, though probably not negligible, impact on capital flows to emerging markets.

The remainder of the paper is organised as follows. Section II derives capital requirements under Basel II and shows how capital costs change for lending to a number of emerging markets. Section III discusses how the changes in capital requirements will affect international lending flows and margins. Section IV concludes.

# II. CAPITAL REQUIREMENTS FOR INTERNATIONAL LENDING UNDER BASEL II

The hallmark of the first Basel Capital Accord (from 1988) was simplicity. Risk weight where assigned according to very broad categories of assets. In the case of sovereign lenders, Basel I provided a simple structure of risk weights based mainly on two broad criteria: location (OECD and non-OECD) and type of borrower (sovereigns, banks and corporate borrowers). As a consequence, lending to emerging markets was subject to considerable differences in regulatory treatment: all non-OECD sovereigns received a 100 per cent risk weight whereas, for instance lending to Mexico and South Korea was subject to a zero risk weight.

The overriding goal of the proposed new Basel Accord is to bring capital requirements more closely in line with the actual risk of banks' assets. The second consultative paper of the Basel Committee (see Basel Committee on Banking Supervision, 2001*a* and *b*, January) offers a set of approaches for measuring risk of bank lending and at the same time provides more risk sensitivity through increased differentiation between different borrowers. The Basel Committee is proposing three alternative approaches: *i)* a standardised approach, which increases risk sensitivity compared with the current approach by introducing further risk buckets; *ii)* the internal ratings based (IRB) foundation approach, which gives banks the opportunity to use internal risk measurement techniques; and *iii)* the internal ratings based advanced approach, which extends the possibilities of banks to use internal risk measurement techniques. The framework should provide banks with incentives to improve their risk management techniques. Therefore banks would move away from the rigid standardised approach to one of the internal ratings based approaches. As far as internationally active banks are concerned, it is expected that they would initially apply the IRB foundation.

In the following sections, we describe the key aspects of each approach focusing on the determination of risk weights for different borrower types and rating classes.

## II.1. Risk Weights under the Standardised Approach

Table II.1 shows risk weights for the standardised approach to credit risk. This risk schedule represents a considerable refinement over the current approach since it introduces new risk buckets and assigns them according to the external rating of the borrower. The source of the ratings can be a private sector rating agency or an export credit agency.

Table II.1. **Risk Weights under the Standardised Approach**

| | Investment Grades | | | Speculative Grades | | | Unrated |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4-6 | 4-6 | 7 | |
| | AAA to AA- | A+ to A- | BBB+ to BBB- | BB+ to BB- | B+ to B- | Below B- | |
| Sovereigns | 0 | 20 | 50 | 100 | 100 | 150 | 100 |
| Banks[a] | 20 | 50 | 100 | 100 | 100 | 150 | 100 |
| Banks[b] | 20 | 50[c] | 50[c] | 100[c] | 100 | 150 | 50[c] |
| Corporate | 20 | 50 | 100 | 100 | 150 | 150 | 100 |

*a)* Sovereign rating based.
*b)* Own rating based.
*c)* If original maturity less than or equal 3 months, one rating category lower.
Source: Basel Committee on Banking Supervision (2001*b*).

Banks determine the required minimum capital of lending by applying the risk weight that corresponds to the borrower's rating and then multiply the risk weight by the usual 8 per cent minimum requirement of capital[2]. Given the large number of borrowers without ratings, the Basel Committee introduced a further bucket for unrated borrowers[3].

In case banks constitute the borrower, there are two options for the determination of risk weights. Under option 1, banks will be assigned a risk weight at least one category below that of the sovereign of the country where the bank is located. Generally the maximum risk weight will be 100 per cent with the exception of banks in countries with ratings below B- where the risk weight will be equal to 150 per cent. The second option will allow banks to pierce the sovereign rating ceiling. Risk weights will be assigned on the base of the external rating of the bank itself. Further refinement with regard to the maturity exposure has been introduced under option 2. Under this option, a risk weight, one category more favourable is applied for claims with an original maturity of up to three months, subject to a floor of 20 per cent[4]. However, in practice the sovereign rating will mostly remain the ceiling of ratings in emerging markets[5].

## II.2. Risk Weights under the IRB Approach

The second approach proposed by the Basel Committee in its consultative paper of January 2001 reflects the large advances made by many banks in the area of credit risk measurement. Whereas the standardised approach relies on external ratings to determine risk weights, the IRB approach focuses on banks' internal measures of credit risk. What this means in practice is that the Committee provides the formulae for the calculation of risk weights while banks feed their own estimates for a set of parameters into the equation to determine risk weights. This mechanism allows banks to use their own judgement on borrowers when considering credit risk.

There are two levels of sophistication within the IRB approach: the foundation approach and the advanced approach.

In a first step under the foundation approach benchmark risk weights are calculated according to the equation:

$$BRW\,(PD) = 976.5 * N\,(1.118 * G\,(PD) + 1.288) * (1 + 0.047 * (1 - PD/PD^{0.44}) \qquad (1)$$

where *BRW* indicates the benchmark risk weight, *PD* the probability of default, *N(x)* denotes the cumulative standard normal distribution function and *G(x)* denotes the inverse cumulative standard normal distribution function. Risk weights are then obtained by applying:

$$RW = \min [(LGD/50)* BRW (PD) \text{ or } 12.5*LGD] \quad (2)$$

where *RW* stands for the risk weight and *LGD* denotes loss given default.

Equation (1) highlights the requirements for the foundation approach: Banks will have to provide their own estimates for the probability of default for each type of borrower and internal rating class in order to determine benchmark risk weights. In its "Range of Practice" Discussion Paper (Basel Committee on Banking Supervision, 2000), the Basel Committee recognised that currently only few banks can make robust data for *LGD* rates available. For this reason, under the foundation approach, the Basel Committee has preset the parameters for *LGD*[6].

In contrast, under the advanced approach, banks have the task to provide estimates for the probability of default, loss given default and the maturity dimension of its lending. These are then fed into an expanded version of equation (2), which includes a multiplicative scaling factor for the maturity *M*:

$$RW= \min [(LGD/50)*BRW (\text{PD})* (1+b (PD)*(M-3)) \text{ or } 12.5* LGD] \quad (3)$$

### II.3. Potential Modifications to the IRB Approach

In November 2001, the Basel Committee published potential modifications to the January calibration. According to the "Potential Modifications" paper (Basel Committee on Banking Supervision, 2001*c*) capital requirements will be calculated by the following equations:

$$R = 0.1 * (1- EXP(-50 * \text{PD}))/(1- EXP(-50)) + 0.2 * (1- (1-EXP(-50 * \text{PD}))/(1- EXP(-50))) \quad (4)$$

$$BRW_{Mod}=625* N[(1- R)^{-0.5} *G (PD) + (R/ (1- R))^{0.5} * G(0.999) * (1 + 0.047 * ((1- PD) / PD^{0.44}) \quad (5)$$

where *R* stands for the asset correlation, *M* stands for the maturity factor BRW stands for the benchmark risk weight and *EXP* stands for the natural exponential function.

The modified calibration (equation 5) should be compared with equation (1). The November calibration differs in several aspects from the January proposals. First the scaling factor 976.5 is lowered to 625 and to cover some of the elements the higher scaling factor dealt with, the confidence level is raised from 0.995 to 0.999. A second difference is that the January calibration implicitly incorporated the assumption that asset correlation is equal to 0.2 for all asset classes. The November modification on the other hand assumes that asset correlation declines with the probability of default: that is 20 per cent is used for the lowest probability of default and 10 per cent for the highest. Finally, the November calibration maintains the maturity adjustment for all exposures in the foundation IRB approach based on the assumption of an average 3-year maturity.

## II.4. Assigning Probabilities of Default to Rating Classes

A crucial element for attempting to assess the IRB approach is the assignment of default rates to rating classes. The existing literature has mostly used corporate default rates published by Moody's Investor Service (Moody's) or Standard and Poor's (S&P) in order to gain an idea of the resulting risk weights and capital requirements by risk classes. Nevertheless, the derived risk weights vary significantly across studies. Table II.2 shows various default rates and the implied risk weights using the November calibration.

Table II.2. **Default Rates (PD) and Risk Weights (RW)**[7]

| | Probability of Default (%) | | | Risk Weights (%) | | |
|---|---|---|---|---|---|---|
| Ratings | Moody's 1-Year Average PD | S&P's 1-Year Average PD | Moody's 3-Year Average PD | Moody's 1-Year RW | S&P's 1-Year RW | Moody's 3-Year RW |
| Aaa/AAA | 0 | 0 | 0 | 0 | 0 | 0 |
| Aa1/AA+ | 0 | 0 | 0 | 0 | 0 | 0 |
| Aa2/AA | 0 | 0 | 0.06 | 0 | 0 | 25.9 |
| Aa3/AA- | 0.06 | 0.03 | 0.17 | 25.9 | 18.1 | 44.2 |
| A1/A+ | 0 | 0.02 | 0.3 | 0 | 14.7 | 58.6 |
| A2/A | 0 | 0.05 | 0.16 | 0 | 23.6 | 42.9 |
| A3/A- | 0 | 0.05 | 0.22 | 0 | 23.6 | 50.3 |
| Baa1/BBB+ | 0.07 | 0.12 | 0.53 | 28.1 | 37.1 | 76.3 |
| Baa2/BBB | 0.06 | 0.22 | 0.61 | 25.9 | 50.3 | 81.1 |
| Baa3/BBB- | 0.39 | 0.35 | 1.62 | 66.3 | 63 | 119.1 |
| Ba1/BB+ | 0.64 | 0.44 | 3.81 | 82.8 | 70.1 | 163.9 |
| Ba2/BB | 0.54 | 0.94 | 4.95 | 76.9 | 97 | 183.6 |
| Ba3/BB- | 2.47 | 1.33 | 11.68 | 138.7 | 110.8 | 284.6 |
| B1/B+ | 3.48 | 2.91 | 15.59 | 157.9 | 147.3 | 330.8 |
| B2/B | 6.23 | 8.38 | 20.03 | 204.9 | 238.5 | 374.9 |
| B3/B- | 11.88 | 10.32 | 26.71 | 287.1 | 266.4 | 428.7 |
| CCC | 18.85 | 21.32 | 34.51 | 363.9 | 386.3 | 478.1 |

*Source:* Moody's Investor Service (2000); Standards & Poor's (2001); own calculations.

Note that there are important differences in risk weight progression mainly in the middle section. For instance a BBB rated country would receive a 25.9 per cent risk weight according to the calibration with Moody's 1-year PDs, a 50.3 per cent risk weight according to the calibration with S&P's 1-year PDs and a 81.1 per cent risk weight if a 3-year PD was applied.

Note also that there are some discontinuities in *PD*s from one risk class to the next, that is *PD*s do not always increase in the next higher risk class. The most striking example is the AA- class which always receives a higher probability of default than the next lower A+ class. This leads to some peculiar discontinuities in the risk weights, which banks would presumably smooth out when mapping *PD*s into risk classes. In the empirical analysis set out below, there was no need to smooth out this discontinuity since none of the countries in our sample had an AA- rating at the time.

The more general question is whether corporate *PD*s should be used for sovereign lenders. The Basel Committee argues that a sovereign of a given rating class should be equally risky as a corporate borrower[8]. In other words, different borrower types of the same rating grade should have comparable probabilities of default. Average default rates of sovereign lenders are not as readily available as corporate default rates but Standard and Poor's (2001) gives some information about 1-year sovereign default rates. These show significant differences to corporate default rates. The sovereigns have more "mass", that is higher default rates in the middle and tail section. For instance, a BB-rated sovereign has a 2 per cent default probability whereas a corporate of the same rating class has only a 1 per cent default probability. The differences are even more extreme in the CCC class, where sovereigns have a 100 per cent default probability[9], whereas the CCC corporate has a PD of about 20 per cent.

Table II.2 in part explains the differences in results of previous studies. For instance, Kupiec (2001*a*) uses 1-year average historical default rates by Standard and Poor's (2001) whereas Reisen (2001) uses 3-year average, cumulative default rates from Moody's Investor Service (2000). Powell (2001) uses the mapping provided by Jackson (2001), which resembles the 1-year default schedule. Deutsche Bank appears to be using 1-year default rates from Moody's but obtains much higher risk weights than we do by using equation (1).

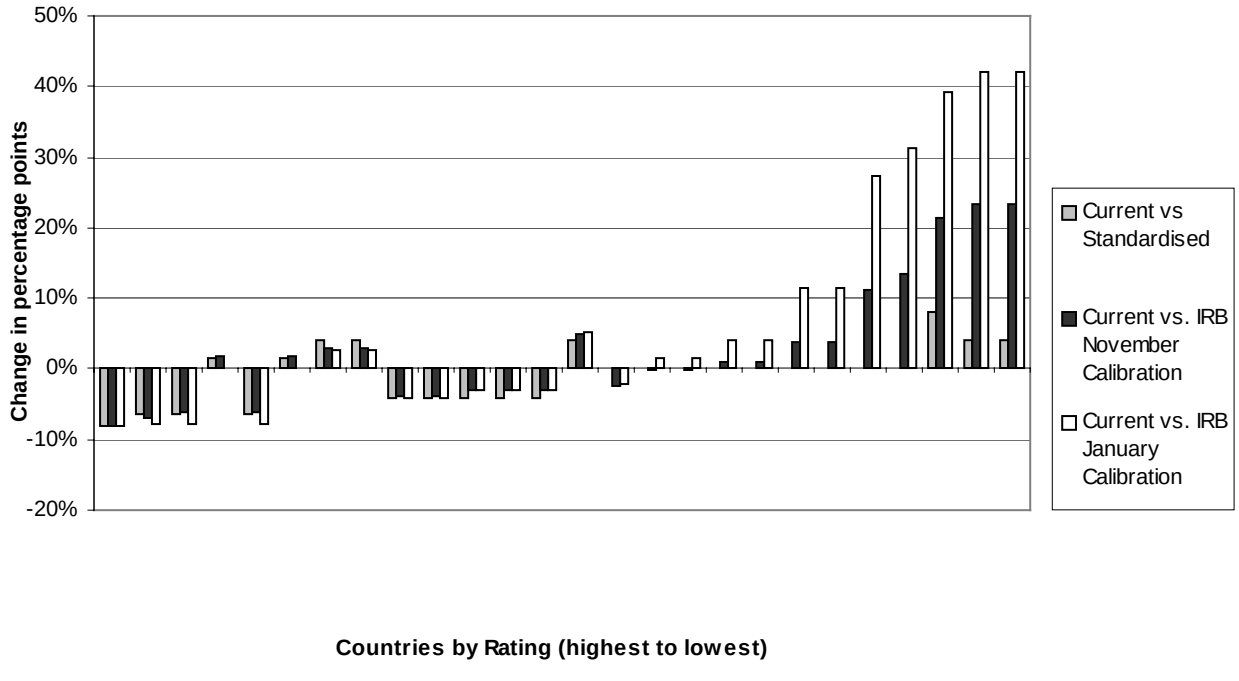
In the remainder of this paper, we use risk weights based on probabilities of default rates over a 1-year time horizon provided by S&P[10]. This choice yields a conservative (i.e. low) estimate of capital requirements for the following reasons: First, S&P's corporate default rates presumably lie below sovereign default rates therefore our risk weights for international lending are likely to be too low. Second, we apply the sovereign rating to all borrowers in a particular emerging market. Since the sovereign rating usually constitutes the ceiling for bank and corporate ratings, the risk weight is again biased downward.

### II.5. Capital Requirements under Basel I and Basel II by Emerging Markets

We now turn to show how capital requirements affect bank lending to emerging markets if bank lenders adopt the standardised or the IRB foundation approach. We consider 26 emerging market countries, we use S&P's credit ratings for long-term debt to map countries into different risk buckets and S&P's average cumulative 1-year corporate probabilities of default to assign risk weights.

Figure 1 shows the results for 26 emerging markets both for the January and November calibration. Table A1 in Appendix shows the current and estimated requirements per country.

Figure 1. **Change in Regulatory Capital Requirements**




When applying the standardised approach, capital requirements fall for 9 countries and increase for 8 countries. For the remainder, there is no change in capital requirements since their risk weight of 100 is equal to their treatment under Basel I. The increase in capital requirements for the Czech Republic, Hungary, Mexico, Poland, South Korea and Turkey is mainly due to the abolition of the zero-risk weight treatment of OECD countries.

The changes are largest when comparing the present approach with the IRB approach under the January 2001 calibration. In that case, required capital for lending for instance to Ecuador, Indonesia and Turkey would rise by more than 40 per cent. The lower risk countries have lower capital requirements under IRB than under the standardised approach but the largest difference between the standardised and the IRB approach lies in a much sharper progression for higher risks. Moreover, applying a less conservative schedule of 3-year default probabilities results in a much larger number of countries with sharp increases in required capital (see Figure A1 in Appendix).

However, the November 2001 calibration yields a much less dramatic increase in regulatory capital requirements than the January proposals. This is a result of the assumption of a lower asset correlation for higher risks. If this proposal was adopted, capital requirements for countries like Turkey, Ecuador and Indonesia would increase by about 20 per cent. One of the largest increases would occur for bank lending to Turkey, which would go up by 21 per cent compared with a maximum increase under the January proposal of 39 per cent.

One issue in the debate about the new accord arises from the differences between capital requirements under the standardised and the foundation IRB approach that might lead to some regulatory arbitrage: countries with low risk and thus high ratings will prefer to borrow from IRB banks while the high risk counties would prefer to borrow form standardised banks. Note that these arguments assume that minimum capital requirements are generally binding. Nevertheless, as emphasised by Kupiec (2001*b*), regulatory arbitrage may have the undesired effect of cumulating lower risk loans in standardised banks that presumably have a lower capability of risk assessment. The disproportional increase of IRB risk weights under the January calibration of the sub-investment group creates an incentive mechanism, which might induce large banks with sophisticated credit risk measurement techniques to concentrate their lending to better borrowers probably located in the OECD, while smaller banks have an incentive to turn to riskier borrowers with which they have less experience.

# III. ESTIMATING THE EFFECTS ON EMERGING MARKETS FINANCES UNDER IRB

This section discusses a range of models to estimate the effect of the IRB approach on emerging markets financing.

## III.1. The Upper Bound for Spread Changes

We start by replicating and updating the analysis of Reisen (2001), which can be considered to give an upper bound for the expected spread changes. The reason why this estimate is a likely upper bound is that it makes a number of strong assumptions: *i)* it assumes a constant required return on capital; *ii)* it does not allow for diversion effects; *iii)* it assumes that capital requirements were binding, i.e. economic capital equals required capital. In the following subsections, we relax these assumptions and discuss their implications on spreads and flows to emerging markets.

Reisen (2001) adopts a methodology proposed in Deutsche Bank (2001) to estimate the change in spreads for the different risk categories. Assuming LIBOR flat funding and an average Libor spread for each risk category, risk adjusted returns to capital can be calculated for the current capital cost structure. Then a breakeven change of the spread is calculated that holds the return to capital constant.

The procedure used for the calculation of spreads in Table III.1 differs from Reisen (2001) insofar as we use 1-year instead of 3-year probabilities of default and directly apply equation (6) to obtain risk weights (instead of approximating the risk weight by fitting a curve).

Table III.1 highlights the different results obtained depending on the underlying probabilities of default.

The first column shows the assumed Libor Spread for each rating class. The second column shows the associated risk weights for each approach (using the November calibration) and the third, the implied capital requirement. The fourth column gives the risk-adjusted return to capital. Finally, the fifth column shows how the spreads would have to change if the return to capital was to be held constant. For the purpose of comparison, the last column shows the resulting spread changes if the January calibration is used.

Table III.1. **Estimated Impact on Sovereign Spreads**
(with constant returns to capital & binding capital requirements)

| Rating | Regulatory Capital Approach | Assumed Libor Spread (%) | Risk Weight (Modified Proposal) [a] | Capital Required per $100 (Modified Proposal) | Risk-Adjusted Return [b] (%) | Est. Spread Change (Modified Proposal) (b.p.) [c] | Pro Memoria Est. Spread Change (Jan. 2001 Proposal) |
|---|---|---|---|---|---|---|---|
| A+ | Current | 0.5 | 100 | 8.00 | 6.25 | - | |
| | Standardised | 0.5 | 20 | 1.60 | 31.25 | -40 | -40 |
| | IRB (foundation) | 0.5 | 14.71 | 1.18 | 42.49 | -42.65 | -44 |
| A | Current | 0.5 | 100 | 8.00 | 6.25 | | |
| | Standardised | 0.5 | 20 | 1.60 | 31.25 | -40 | -40 |
| | IRB | 0.5 | 23.57 | 1.89 | 26.52 | -38.22 | -40 |
| A- | Current | 0.5 | 100 | 8.00 | 6.25 | | |
| | Standardised | 0.5 | 20 | 1.60 | 31.25 | -40 | -40 |
| | IRB | 0.5 | 23.57 | 1.89 | 26.52 | -38.22 | -40 |
| BBB+ | Current | 1 | 100 | 8.00 | 12.50 | | |
| | Standardised | 1 | 50 | 4.00 | 25.00 | -50 | -50 |
| | IRB | 1 | 37.04 | 2.96 | 33.75 | -62.96 | -67 |
| BBB | Current | 1 | 100 | 8.00 | 12.50 | | |
| | Standardised | 1 | 50 | 4.00 | 25.00 | -50 | -50 |
| | IRB | 1 | 50.32 | 4.03 | 24.84 | -49.68 | -52 |
| BBB- | Current | 1 | 100 | 8.00 | 12.50 | | |
| | Standardised | 1 | 50 | 4.00 | 25.00 | -50 | -50 |
| | IRB | 1 | 63.03 | 5.04 | 19.83 | -36.97 | -36 |
| BB+ | Current | 4 | 100 | 8.00 | 50.00 | | |
| | Standardised | 4 | 100 | 8.00 | 50.00 | 0 | 0 |
| | IRB | 4 | 70.11 | 5.61 | 71.32 | -119.56 | -103 |
| BB | Current | 4 | 100 | 8.00 | 50.00 | | |
| | Standardised | 4 | 100 | 8.00 | 50.00 | 0 | 0 |
| | IRB | 4 | 97.02 | 7.76 | 51.54 | -11.92 | 81 |
| BB- | Current | 4 | 100 | 8.00 | 50.00 | | |
| | Standardised | 4 | 100 | 8.00 | 50.00 | 0. | 0 |
| | IRB | 4 | 110.81 | 8.86 | 45.12 | 43.24 | 198 |
| B+ | Current | 7 | 100 | 8.00 | 87.50 | | |
| | Standardised | 7 | 100 | 8.00 | 87.50 | 0 | 0 |
| | IRB | 7 | 147.34 | 11.79 | 59.39 | 331.38 | 991 |
| B | Current | 7 | 100 | 8.00 | 87.50 | | |
| | Standardised | 7 | 100 | 8.00 | 87.50 | 0 | 0 |
| | IRB | 7 | 238.54 | 19.08 | 36.68 | 969.78 | 2 380 |
| B- | Current | 7 | 100 | 8.00 | 87.50 | | |
| | Standardised | 7 | 100 | 8.00 | 87.50 | 0 | 0 |
| | IRB | 7 | 266.43 | 21.31 | 32.84 | 1 165 | 2 731 |
| CCC | Current | 7 | 100 | 8.00 | 87.50 | | |
| | Standardised | 7 | 150 | 12.00 | 58.33 | 350 | 350 |
| | IRB | 7 | 391.59 | 31.33 | 22.34 | 2 041.13 | 3 675 |

*a)* For the IRB approach the risk weights are obtained by making use of 1-year probabilities of default provided by Moody's Investor Service (2001).

*b)* Assumes Libor flat funding. Risk-adjusted return on capital is 100/regulatory capital required per $100 times the spread over Libor, quoted as excess over Libor.

*c)* Indicates the amount of spread movement needed (in basis points) to produce the risk-adjusted return achieved under the current Basel I environment. Breakeven spread change is the difference in risk-adjusted return between current and standardised or respectively between current and IRB approach times capital required per $100 in the standardised, respectively the IRB approach.

*Source:* Authors' own calculation based on the methodology described in Deutsche Bank, "New Basel Capital Accord", 17 January 2001, http://research.gm.db.com/.

This model leads to predict substantial changes in spreads in all rating classes. Even with the November calibration, spreads for lower-rated borrowers would widen significantly. For example, a single-B rated borrower such as Venezuela would see its risk weight more than double under the IRB foundation approach. This implies that lending banks would have to keep regulatory capital of $19 per $100 leading to a reduction of risk-adjusted return of capital from 87.5 to 36.7 per cent. In order to maintain the initial risk-adjusted return of 87.5 per cent, the spread over Libor would need to rise by 970 basis points. On the other hand, sovereign borrowers above double B- to triple B would all be assigned lower risk weights under the IRB approach and thus require lower spreads over Libor to maintain the same risk-adjusted return.

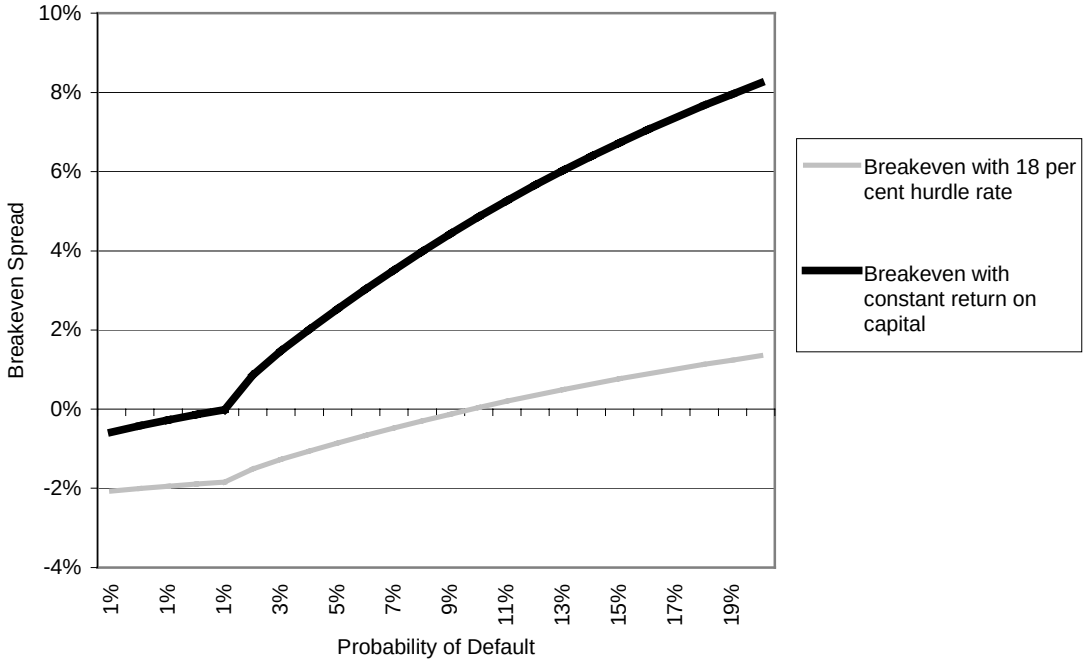
The last column shows the estimated spread changes using risk weights of the January 2001 proposal. It brings into evidence how much the modified proposal already dampens the estimated spread changes for higher risks. Applying this risk-weighting schedule to the example above leads to an estimated spread increase of 2 380 basis points.

### III.2. Applying a Hurdle Rate Instead of Constant Returns

The most obvious critique of the methodology applied above is that it assumes that lenders require constant break-even returns. The large estimates of spread changes for the IRB approach are mainly the consequence of the assumption that banks price by keeping the returns constant (and the capital requirements are binding, i.e. banks do not keep higher capital under the current approach than mandated). Recall that in the example above, a B-rated asset yields over 85 per cent, which is much higher than banks could probably require. In reality, banks appear to use hurdle rates on required returns.

For instance, Powell (2001) suggests that 18 per cent is an average required return on capital and shows that adopting this assumption lowers the spread changes significantly. Figure 2 gives a comparison of the two approaches for various probabilities of default. The grey line shows breakeven spreads applying an 18 per cent hurdle rate and the black line shows the spreads using the constant return methodology. Hence, applying a hurdle rate for the required returns on capital yields a much flatter spread curve.

Figure 2. **Comparison of Breakeven Spreads for Various Default Probabilities**
Using constant returns or a 18 per cent hurdle rate (November calibration)




*Notes:* Assumed Libor spread of 400 bp, Libor funding at 3.5 per cent and capital requirement as per the modified proposal.

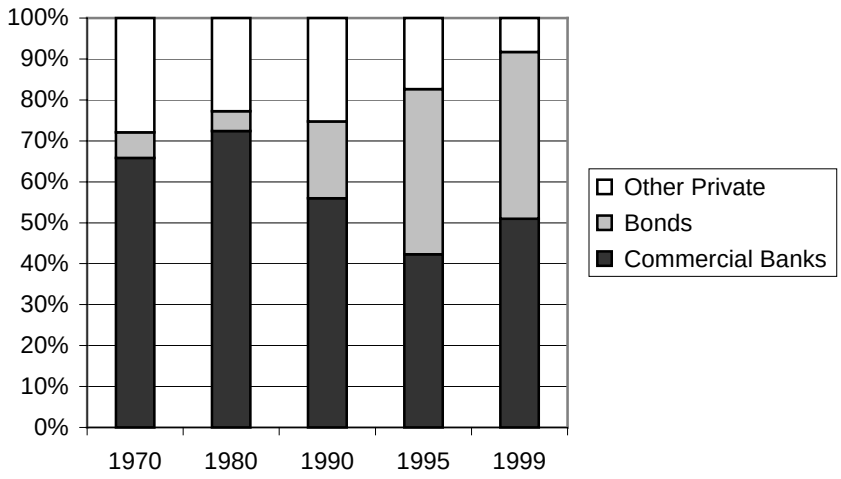
In other words, relaxing the assumption of a constant risk adjusted return to capital dampens the effect on spreads considerably.

### III.3. Allowing for Competition and Regulatory Arbitrage Effects

Next we drop the assumption that commercial banks are the sole source of lending and that all regulators will adopt the IRB approach. Relaxing both assumptions will lower the estimates for spread changes even more, though it is difficult to estimate the size of such regulatory arbitrage effects.

Deutsche Bank (2001) takes this “market share” argument into account. In their study, they introduce an adjustment, which takes into account that not all investors are bound by Basel II. Accordingly, they multiply the spread change with the share of commercial banks. This reduces the initial estimates to half. Figure 3 shows a similar situation the developing country debt: about 50 per cent is owed to commercial banks.

Figure 3. **Debt Outstanding Bonds, Banks and Other Private Creditors,**
All Developing Countries, Percentage of Total Debt to Private Creditors




*Source: Global Development Finance* (World Bank, 2000*b*).

However, price competition between loan and bond markets may not only dampen spread movements, it may also have flow effects. Without further exploration about the market structure, we prefer to state qualitatively that competition from other sources of finance may lead to some diversion and thus dampen the effect of higher capital costs for emerging markets.

Another consideration is that not all banks may be required to adopt IRB. Although it is expected that most large international banks will be using IRB, regulatory arbitrage could exist across banks of countries that are not required to adopt IRB. For instance, it is conceivable that most emerging markets and some offshore centres choose the standardised approach. This would lower the capital cost of their bank lending to the higher credit risks and improve their competitive position vis-à-vis IRB banks. Kupiec (2001) argues that the Accord will foster the development of stable banking clienteles in which banks using the IRB approach will choose to hold the safest loan portfolios and banks using the standardised approach will hold the riskier portfolios. From the point of view of banks, this tilts the “playing field”. From the point of view of low-rated emerging markets, the regulatory arbitrage of financing towards standardised banks may dampen the effect on prices and flows.

### III.4. Allowing for Economic Capital and Non-Binding Constraints on Regulatory Capital

The strongest argument against a large impact of the new capital regulatory capital requirement is that they should be more closely in line with economic capital. Economic capital is defined as the capital reserved by banks according to their own risk management systems. If banks have held higher capital than required under the present accord the requirement was not binding.

Assuming that banks were already basing their pricing and loan decisions on economic capital allocations, which were in line with the IRB proposal, there might be no additional effect on prices or flows of making these allocations required. In other words, expecting a dramatic broadening of the credit spread on speculative grade debt under IRB implies that these debts have earlier been under-priced.

This appears to be the position taken by a number of insiders and observers. In their view, the fact that capital flows have fluctuated widely in the nineties, even though capital requirements did not change, provides evidence of a non-binding constraint. Moreover, the differentiation of inflows among emerging markets is interpreted as another sign that banks allocated capital according to economic risk considerations rather than regulatory requirement. In the words of one observer: "Turkey has received fewer loans than Singapore not because of differences in capital requirements but because of differences in risk."

The proposition that economic capital rather than regulatory capital has been the binding constraint can be tested if one is willing to make the following assumptions:

*1)* Internal economic capital can be approximated with capital requirements under the IRB approach. This seems a reasonable assumption since it constitutes the overriding goal of the new Basel Accord.

*2)* Banks' internal ratings and default probabilities can be approximated by external ratings. This assumption also seems plausible for the case of sovereigns since banks are unlikely to have superior information to credit rating agencies.

We proceed as follows. First we calculate a proxy for economic capital by using sovereign ratings over the period 1993-2001 for 25 emerging markets[11]. We then take data for international bank lending provided by the Bank of International Settlements (BIS) to estimate the effect of our economic capital proxy on bank lending. Figure A2 in Appendix shows the change in international claims of BIS reporting banks by regions.

Since our working assumption is that increases in our economic capital proxy reflect actual increases in risk and in economic capital cost, we can now address the question whether banks have reacted to these variables. In theory, increases in capital cost should lead to higher margins and/or stock adjustments. In Van Rijckeghem and Weder (2002), we present evidence from new syndicated loans that interest margins did widen somewhat but that new issuance was very strongly affected.

In order to control for country specific effects and for other variables that may influence bank lending, we now turn to panel data. We estimate the following model:

$$\Delta Claims_{it} = \alpha_i + \beta \Delta CC_{it} + \gamma \Delta Z_{it} + \varepsilon_{it} \qquad (6)$$

where $\Delta Claims_{it}$ is growth rate of claims of BIS reporting banks in country $i$[12], $\Delta CC_{it}$ is the growth rate of simulated economic capital cost (as simulated by the IRB approach) for country $i$ and $\Delta Z_{it}$ stands for a set of control variables. We include the creditor country interest rate as a measure of returns on alternative investments, the lagged growth rate as a proxy for returns and the inflation rate and the current account balance as a proxy for macroeconomic and currency risk. The macroeconomic control variables are lagged by one period to reduce problems of endogeneity. A negative and significant $\beta$ would be consistent

with the view that in practice banks have behaved similarly as under IRB capital requirements. We estimate the model for all BIS reporting banks, for the US, Japanese and German banks.

The panel consists of 25 emerging markets and includes half-yearly data from 1993-2001[13]. The choice of interval is dictated by the availability of BIS data: for the earlier period BIS data is available only in 6-month intervals. Table III.2 shows the results of panel estimation.

Column (1) shows the results for total lending of BIS reporting banks. The US interest rate enters with the expected sign and is significant and the same is true for GDP growth. The inflation rate has the expected sign but is not significant. The lagged current account balance is negative and significant, which is consistent with persistence in BOP flows and contradicts the interpretation of the current account as an indicator of currency risk. The economic capital variable enters with a negative sign and is significant at the 1 per cent level. This is consistent with the interpretation that banks have adjusted their claims in response to capital cost.

Table III.2. **Impact of Capital Cost on Flows**
Dependent Variables: Growth Rate of Bank Outstanding Claims (consolidated data)
of BIS reporting banks to 25 emerging markets
Estimation Period: 1993-2001

| | All BIS Reporting Banks | US Banks | German Banks | Japanese Banks |
|---|---|---|---|---|
| | Fixed Effect | Pooled OLS | Pooled OLS | Fixed Effect |
| Economic Capital[a, b] | -1 352.66 | -370.8 | -114.72 | -95.11 |
| | (-2.43) | (-1.1) | (-2.1) | (-1.26) |
| Creditor Country Interest Rate [b] | -798.46 | -153.6 | -175.75 | -125.37 |
| | (-1.07) | (-0.33) | (-1.55) | (-0.92) |
| GDP Growth (lagged) [b] | 1 787.3 | 582.32 | 125.5 | -509.64 |
| | (0.43) | (0.23) | (0.31) | (-0.91) |
| Inflation (lagged) [b] | -4 115.43 | -9 698.08 | 1 417.88 | 894.03 |
| | (-0.31) | (-1.17) | (1.05) | (0.5) |
| Current Account Balance (lagged) [b] | -0.07 | 0.73 | -0.05 | -0.09 |
| | (-0.19) | (3.09) | (-1.31) | (-1.68) |
| R-sq. | 0.07 | 0.08 | 0.07 | 0.06 |
| F-Test for Individual Effects | 2.2 | n. a. | n. a. | 5.01 |
| Observations | 127 | 127 | 127 | 124 |

*a)* Capital costs are calculated using IRB capital requirements.
*b)* t-Statistics in parenthesis.
*Sources:* GDP, inflation, US interest rate [3-year government bond yield] and current account data from IMF International Financial Statistics (IFS, 2000); ratings and probabilities of default from Standard and Poor's (2001); bank lending are total claims of BIS reporting banks to 25 emerging markets from BIS (2001).

Columns (2) to (4) displays the results of the change in bank lending to emerging markets for the US banks, German banks and Japanese banks. Higher (lower) economic capital is associated with a decrease (increase) in the claims of these banking systems. Interestingly there are differences between banking systems. While the coefficients on economic capital are significant for the German banks, they are insignificant for the US and for the Japanese banks. These differences would be worth exploring further. On average, however, this is evidence in favour of the view that minimum capital requirements have not been the binding constraint on international bank lending.

Obviously the evidence from these estimates has to be interpreted with caution. For a start, the model does not explain the change in bank claims very well; the R-squared is only 7 per cent for total bank lending to emerging markets. Second, it may be inaccurate to approximate economic risk capital with IRB capital requirements — even if this is the declared aim of Basel II. Finally, it may be inappropriate to approximate banks internal sovereign ratings with S&P's sovereign ratings. We feel fairly comfortable with this assumption since contacts in the banking industry have suggested that the correlation between external and internal ratings is very high for the case of sovereigns. Also, it does not appear that, on average, banks have been better to predict financial crises than external rating agencies.

# IV. CONCLUSIONS

Our aim was to assess whether Basel II will have an impact on international bank lending flows to emerging markets. The previous literature obtained very large estimates of spread changes using a model with binding minimum capital requirements and constant required return on capital. We discuss these assumptions and show that they provide an upper bound for possible spread changes. Relaxing them substantially lowers the expected impact of the new accord. Moreover, the new calibration from November 2001 reduces the estimated spread change even under the upper bound model: using the November calibration, we obtain only moderate increases in spreads for low-rated countries and all countries rated BB and higher would see spreads narrowing. Thus the November re-calibration of Basel II, which was driven mainly by the concerns of higher lending cost for small- and medium-sized companies, as a by-product also decreased the regulatory impact on lower-rated emerging markets.

The key question in assessing the probable impact, though, is whether banks' actual capital allocations already have been in line with the new regulatory capital allocations. We proposed to test this by estimating how bank lending flows have reacted to a simulated measure of capital costs using the IRB methodology. Our results support the view that in practice banks have already adjusted claims according to a risk concept similar to the one proposed under Basel II. Based on these results, we conclude that on average the level effects of Basel II on lending to emerging markets should be minor.

Future research should be directed at gathering bank level data on economic capital allocations for emerging market lending. This would allow for a more direct test of the proposition that IRB capital is in line with economic capital and would yield more powerful results than the indirect tests we apply in this paper.

One remaining issue for emerging markets, which we did not explore in this study, is the question of pro-cyclicality. Even if bank flows already respond to changes in economic capital cost, it is possible that the volatility of flows will increase further if ratings are explicitly used to determine capital costs. The correlation in lending behaviour could increase as a consequence of all international banks using the same model and presumably very similar ratings (which seems a reasonable assumption in the context of sovereign ratings). Add to this the fact that sovereign ratings are likely to remain more volatile than corporate ratings because of the unpredictable nature of emerging markets crises and the anecdotal evidence that banks tend to adjust their internal ratings more quickly than rating agencies. The theoretical literature on currency and financial crises has shown that such crises can be self-fulfilling and to some degree will remain unpredictable. Monfort and Mulder (2000) show that crisis events are one of the most important determinants of sovereign ratings (rather than the other way around). Taken together this means that Basel II, even if it has little level effects, may lead to an increase in the volatility of international lending to emerging markets.

# APPENDIX

Figure A1. **Changes in Regulatory Capital Requirements**
Current versus Standardised and versus IRB using the January 2001 Calibration
using a 3-year PD to calculate the IRB risk weights

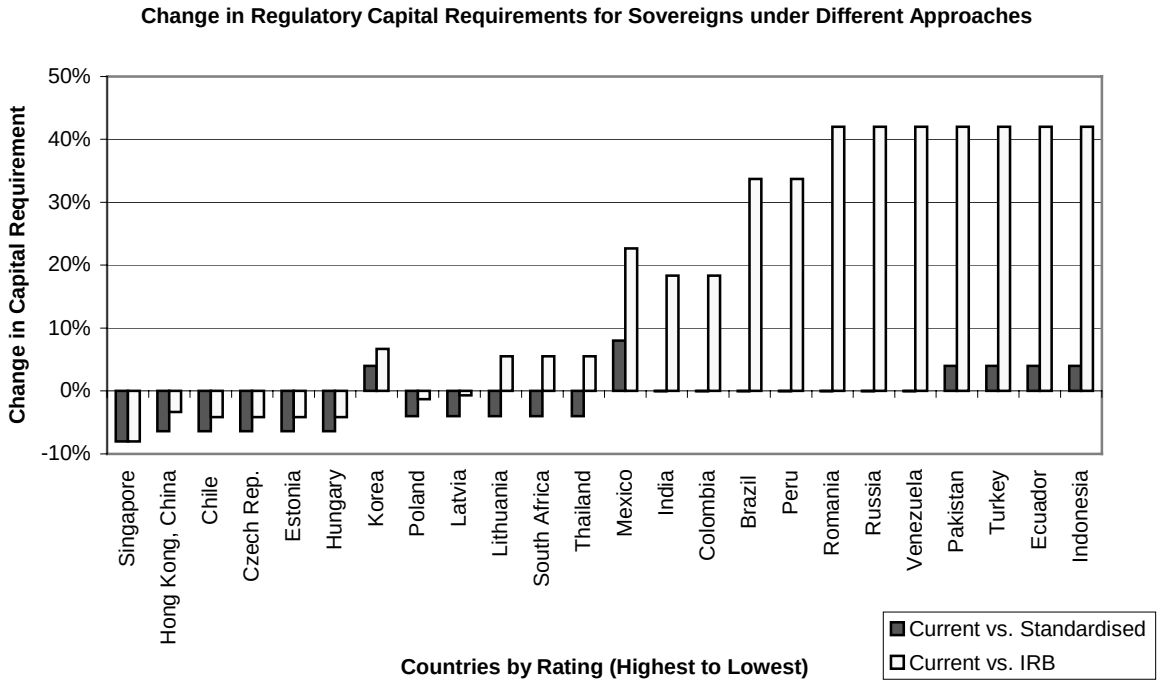


Figure A2. **Change of Consolidated Claims of BIS Reporting Banks by Regions**
(Change in International Claims, in $ millions)

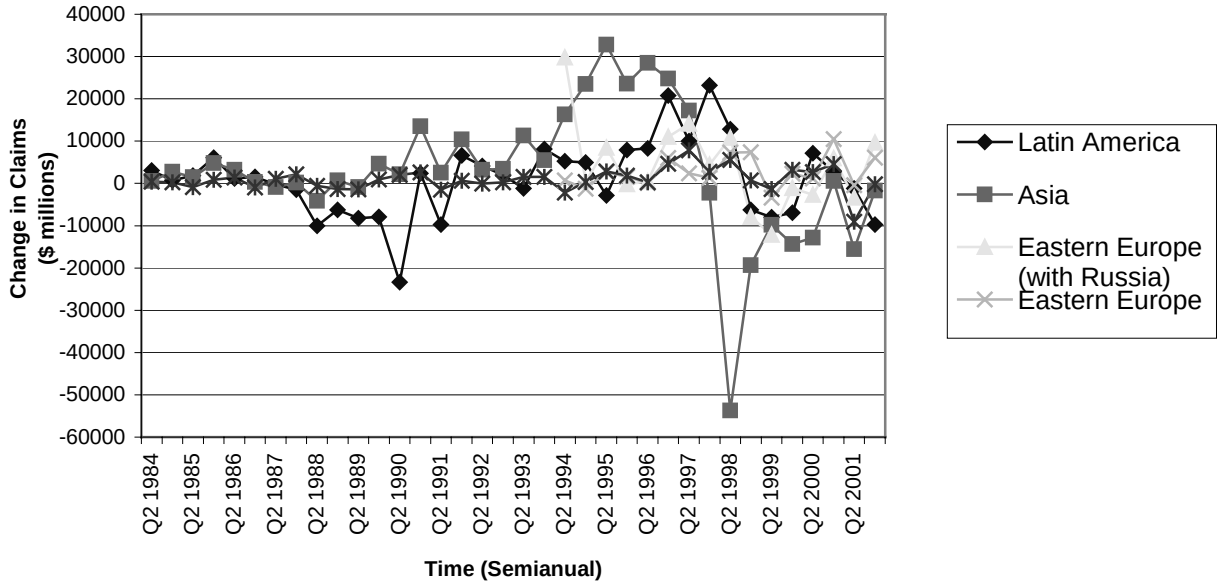


Table A1. **Capital Requirements by Emerging Market**
according to November Calibration

| | Rating S&P 7 December 2001 | Basel I Capital Requirement (%) | Basel II Capital Requirement (Standardised Approach) (%) | Basel II Capital Requirement (IRB Approach)[a] (%) |
|---|---|---|---|---|
| Singapore | AAA | 8 | 0 | 0 |
| Hong Kong | A+ | 8 | 1.6 | 0 |
| Chile | A- | 8 | 1.6 | 0 |
| Czech Rep | A- | 0 | 1.6 | 0 |
| Estonia | A- | 8 | 1.6 | 0 |
| Hungary | A- | 0 | 1.6 | 0 |
| Korea | BBB+ | 0 | 4 | 2.24 |
| Poland | BBB+ | 0 | 4 | 2.24 |
| Latvia | BBB | 8 | 4 | 2.07 |
| Malaysia | BBB | 8 | 4 | 2.07 |
| Lithuania | BBB- | 8 | 4 | 5.3 |
| South Africa | BBB- | 8 | 4 | 5.3 |
| Thailand | BBB- | 8 | 4 | 5.3 |
| Mexico | BBB- | 0 | 4 | 5.3 |
| Philippines | BB+ | 8 | 8 | 6.62 |
| India | BB | 8 | 8 | 6.15 |
| Colombia | BB | 8 | 8 | 6.15 |
| Brazil | BB- | 8 | 8 | 11.09 |
| Peru | BB- | 8 | 8 | 11.09 |
| Russia | B+ | 8 | 8 | 12.63 |
| Romania | B | 8 | 8 | 16.39 |
| Venezuela | B | 8 | 8 | 16.39 |
| Pakistan | B- | 8 | 8 | 22.97 |
| Turkey | B- | 0 | 8 | 22.97 |
| Ecuador | CCC+ | 8 | 12 | 29.11 |
| Indonesia | CCC | 8 | 12 | 29.11 |
| Argentina | SD | .. | .. | .. |

*a)* Using 1-year PDs.
*Source:* S&P, own calculations.

Table A2. **Correlation Matrix**

| | Change in Total Bank Lending | Change in Economic Capital | Change in US Interest Rate | GDP Growth (lagged) | Change in Inflation (lagged) | Change in Current Account Balance |
|---|---|---|---|---|---|---|
| Change in Total Bank Lending | 1 000 | | | | | |
| Change in Economic Capital | -0.22 | 1 000 | | | | |
| Change in US Interest Rate | -0.05 | -0.05 | 1 000 | | | |
| GDP Growth (lagged) | 0.05 | -0.05 | -0.15 | 1 000 | | |
| Change in Inflation (lagged) | -0.06 | 0.15 | 0.02 | 0.24 | 1 000 | |
| Change in Current Account Balance (lagged) | -0.07 | 0.19 | -0.15 | -0.02 | 0.34 | 1 000 |

*Source:* *World Development Indicators* (World Bank, 2000*a*), Moody's Investor Service (2001), BIS (2001).

Table A3. **Default Rates (PD) and Risk Weights (BRW)**
Corresponding to January 2001 Calibration
(%)

| Ratings | Moody's 1-Year Average PD | S&P's 1-Year Average PD | Moody's 3-Year Average PD | Moody's 1-Year BRW | S&P's 1-Year BRW | Moody's 3-Year BRW |
|---|---|---|---|---|---|---|
| Aaa/AAA | 0 | 0 | 0 | 0 | 0 | 0 |
| Aa1/AA+ | 0 | 0 | 0 | 0 | 0 | 0 |
| Aa2/AA | 0 | 0 | 0.06 | 0 | 0 | 21.4 |
| Aa3/AA- | 0.06 | 0.03 | 0.17 | 21.45 | 14.1 | 40.7 |
| A1/A+ | 0 | 0.02 | 0.3 | 0 | 11.1 | 58.3 |
| A2/A | 0 | 0.05 | 0.16 | 0 | 19.1 | 39.2 |
| A3/A- | 0 | 0.05 | 0.22 | 0 | 19.1 | 47.9 |
| Baa1/BBB+ | 0.07 | 0.12 | 0.53 | 23.5 | 32.8 | 83.6 |
| Baa2/BBB | 0.06 | 0.22 | 0.61 | 21.4 | 47.9 | 91.4 |
| Baa3/BBB- | 0.39 | 0.35 | 1.62 | 68.8 | 64.3 | 169 |
| Ba1/BB+ | 0.64 | 0.44 | 3.81 | 94.3 | 74.3 | 283.3 |
| Ba2/BB | 0.54 | 0.94 | 4.95 | 84.3 | 120.2 | 329.5 |
| Ba3/BB- | 2.47 | 1.33 | 11.68 | 218.8 | 149.5 | 521.6 |
| B1/B+ | 3.48 | 2.91 | 15.59 | 268.6 | 241.5 | 598.6 |
| B2/B | 6.23 | 8.38 | 20.03 | 374.9 | 440.1 | 625 |
| B3/B- | 11.88 | 10.32 | 26.71 | 525.9 | 490.2 | 625 |
| CCC | 18.85 | 21.32 | 34.51 | 625 | 625 | 625 |

*Source:* Moody's Investor Service (2001), Standard and Poor's (2001), own calculations.

Table A4. **Impact of Capital Cost on Flows**
Dependent Variables: Growth Rate of Bank Outstanding Claims (consolidated data), of BIS reporting banks to 25 emerging markets
Estimation Period: 1993-2001

| | All BIS Reporting Banks | US Bank | German Banks | Japanese Banks |
|---|---|---|---|---|
| | Pooled OLS | Pooled OLS | Pooled OLS | Pooled OLS |
| Economic Capital[a, b] | -676.3 | -164.3 | -52.9 | -59.6 |
| | (-5.59) | (-2.66) | (-2.57) | (-2.47) |
| Creditor Country Interest Rate [b] | -184.3 | -51.5 | -150.1 | -85.1 |
| | (-0.53) | (-0.29) | (-1.7) | (-0.97) |
| R-sq. | 0.08 | 0.02 | 0.02 | 0.02 |
| Observations | 343 | 343 | 353 | 329 |

*a)* Capital costs are calculated using IRB capital requirements.
*b)* t-Statistics in parenthesis.
*Source:* US interest rate (3-year governments bond yield) data from *World Development Indicators* (World Bank, 2000*a*); ratings and probabilites of default from Standard and Poor's (2001); bank lending are total claims of BIS reporting banks to 25 emerging markets from BIS (2001).

# NOTES

1. See Blum and Hellwig (1995) for the macroeconomic implications of regulatory capital costs.

2. Hence, a sovereign rated BBB would be assigned a risk weight of 50 and a risk weighted minimum regulatory capital requirement of 4 per cent.

3. Given the lower risk weights in the unrated bucket, critics have pointed out that borrowers will have no incentive to obtain ratings and that there exists an incentive for regulatory arbitrage towards riskier but unrated borrowers.

4. Altman and Saunders (2001) have argued that the assigning identical risk weights to investment grade and speculative grade borrowers will lead banks to skew their portfolio towards lower-rated loans, i.e. regulatory capital arbitrage. They have also pointed out that several risk weights for the rating categories are too low, a point which will become clearer in comparison with the risk weights under the IRB approach. For example see Table II.2.

5. In principle, country ceilings can be pierced. See Reisen 2002.

6. In the consultative document from January 2001, the Basel Committee expressed its belief that a LGD rate of 50 per cent for senior unsecured claims and 75 per cent for unsecured subordinated claims represents conservative figures for most banks and countries. For recognised collateral (C) equal to or above 30 per cent of the nominal exposure (E), LGD will be equal to (1-(0.2*(C/E)/140))*50), subject to a floor of 40 per cent. With regard to maturity, if there is no explicit maturity dimension provided by banks all exposures will be treated as having an average maturity of three years. Hence, the risk weight would only depend on PD and LGD.

7. The estimates in Table II.2 were calculated under the assumption that the underlying assets are senior unsecured claims that is for an LGD rate of 50 and an average maturity of three years as suggested in the Committee's January (2001) consultative document. These estimates should be compared with Table 3A in Appendix, which contains benchmark risk weights applying the January 2001 calibration. A comparison between the results of the two calibrations reveals that risk weights under the November calibration are significantly lower for higher risk countries and slightly higher for lower risk countries. Equation (1) specifies that the lower result of RW=LGD/50*BRW (PD) or 12.5 *LGD applies. However, for senior unsecured debt a LGD rate of 50 is suggested by the Committee limiting the upper bound to 625.

8. Basel Committee on Banking Supervision (2001*a*), "The Internal Ratings-Based Approach", Consultative Document, January, paragraph 368.

9. Note that these are *ex post* default rates, based on a very small sample of default. This is why corporate default rates are generally used in the literature, even for sovereign lenders.

10. Basel Committee on Banking Supervision (2001*a*), "The Internal Ratings-Based Approach", Consultative Document, January, paragraph 65.

11. Note that not all countries in the sample had ratings by the first half of 1993 and thus no data points could be assigned for these countries.

12. A change in claims is not necessarily associated with a flow. It may, for example, result from change in valuation or in the exchange rate. See Van Rijckeghem and Weder (2002) for a detailed discussion of problems with interpretation of the BIS data as flows. However, in the present context, where we are not interested in modelling BOP flows but rather the reactions of banks, the difference in stocks is the correct concept.

13. The countries in the panel are: Argentina, Brazil, Chile, Colombia, Czech Republic, Ecuador, Estonia, Hungary, India, Indonesia, Latvia, Lithuania, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Romania, Russia, South Africa, South Korea, Thailand, Turkey and Venezuela.

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