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Reforming Bank Capital Requirements: Implications of Basel II for Latin American Countries

T he appropriate regulation of banks is a hotly contested topic in both industrialized and developing countries. This year the Basel Committee on Banking Supervision put forward a controversial proposal to overhaul the 1988 Basel Accord that has long guided the regulation of bank capital across over a hundred countries.[1] The thirteen member countries of the Basel Committee on Banking Supervision are due to apply Basel II, as the new accord is called, by 2007. If and how other countries should apply Basel II—and therefore whether the new Accord will be successful as a standard—remains an open question. If Basel II is applied across the globe, then its details will be extremely relevant; if not, it will be important to understand why many emerging countries decided to retain Basel I despite its well-known drawbacks.[2]

1. See the Financial Stability Forum website on financial standards (www.fsforum.org).

2. Below we discuss the possibility that too many countries will adopt Basel II, in which case its role as a standard in creating peer group pressure would have been too great!

It is widely accepted that bank capital should be regulated, but how to do so remains open to debate.[3] The simple approach of Basel I divides assets into very broad risk categories and establishes an 8 percent minimum capital requirement for risky assets.[4] However, as bank risk management has become more sophisticated and as the possibilities for transforming asset risk have grown, the potential distortions created by these simple rules and the opportunities for arbitraging across them have multiplied.[5] By contrast, Basel II goes well beyond simply recasting quantitative requirements. Making capital requirements more risk sensitive and reducing regulatory arbitrage are main objectives of the new accord.[6] Basel II proposes two basic approaches: the standardized approach, which uses external credit rating agencies together with a table that maps those ratings directly into capital requirements; and the internal ratings-based (IRB) approach, in which the banks themselves estimate their customers' default probability—without relying on external rating agencies—and then use a particular formula specified in Basel II to determine capital requirements as a function of the default probability and other parameters.[7]

This paper focuses on one specific but critical issue and on a set of more general questions. We analyze whether the IRB approach as calibrated is appropriate for the Latin American context. We believe that this is the first paper to estimate credit risk across a set of emerging economies using a simple and homogeneous methodology. We find significant differences between our estimates from the region and those from the Group of Ten (G10) coun-

3. Supporters see bank capital regulation as a response to the moral hazard of an inevitable public safety net for banks (see, for example, Mishkin, 2001; Goodhart and others, 1999) or as part of a scheme to emulate the incentives for owners and managers in firms where debt holders are more sophisticated than bank depositors (see Dewatripont and Tirole, 1994, for their representation hypothesis). Members of the free-banking school disagree with bank capital regulation (for excellent reviews, see Freixas and Rochet, 1999, pp. 260–65; Berger, Herring, and Szego, 1995).

4. Lower risk categories include mortgages, contingent facilities, short-term loans to other banks, and lending to members of the Organization for Economic Cooperation and Development (OECD). See the original Basel Committee on Banking Supervision documents and the literally hundreds of comments on Basel II at www.bis.org.

5. The standard criticism is that banks have incentives to sell or securitize assets for which capital requirements do not bind and buy assets when requirements would bind. In this way, banks would transform the risk on their balance sheets to ensure that capital requirements were always binding.

6. The new Accord has three pillars: quantitative requirements, supervisory review, and market discipline. While we focus on the first pillar, we briefly discuss the other pillars in the next section.

7. See Basel Committee on Banking Supervision (2003).

tries. These differences have strong implications for the application of the IRB approach.

We also discuss Basel II implementation for Latin America and more generally across all emerging countries. Typically there are few external rating agencies in these countries, so the standardized approach would have little effect in linking regulatory capital to risk.[8] But the IRB approach may not be calibrated appropriately for emerging markets, and its implementation and supervision may stretch limited supervisory resources. Given the data on compliance with the Basel Core Principles for Effective Banking Supervision across Latin America, it may not be advisable for many countries to implement the IRB approach for a long time.

Given this situation, we suggest an innovative simplification of the IRB approach that builds on current policies regarding provisioning in some emerging countries and that may be used as a transition arrangement toward the IRB approach. We call this the centralized ratings-based (CRB) approach. Under this approach, banks would rate their clients, but the regulator would determine the rating scale and the way in which the banks' ratings map into default probabilities. The use of a centralized scale would facilitate comparison across banks and greatly ease the monitoring of banks' ratings.[9] Those requirements would also be easier to monitor, since the regulator would determine how banks' ratings would feed into capital requirements.

Countries must choose whether to stay on Basel I or, if not, which Basel II alternative to apply (here we include our proposed CRB approach). To date there is little guidance on this important decision. We therefore develop a Basel II decision tree to assist countries deciding whether to adopt Basel II and, if so, how. Our broad advice is that many countries should stay on Basel I or only adopt Basel II for a subset of banks at least for several years beyond 2007. Regulators should not move to complex rules too quickly sim-

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8. This may also be the case for smaller and regional banks in G10 countries. These banks are unlikely to be systemic, however, whereas systemic banks in emerging countries will typically have mostly nonrated assets. See Ferri, Liu, and Majnoni (2001) for a discussion on the global pattern of ratings.

9. Bank ratings could be compared directly in the case of banks lending to the same corporate client. Bank ratings for similar types of loans (to companies in the same economic sector, business line, or region) could also be compared and outliers investigated. Some G10 regulators informally acknowledge that even where the IRB approach is likely to be employed, supervisors will compare banks' internal ratings of important corporate clients (as they do today) and for that purpose will no doubt map ratings into a centralized scale.

ply because of peer group pressure or pressure from the large international banks. We also argue that countries in the region should seriously consider the CRB approach, and we suggest ways in which this may be made compatible with Basel II for the purpose of assessing standards.[10]

The paper proceeds as follows. In the next section we provide a highly synthetic account of the new Accord. The paper then introduces our methodology for testing the calibration of the proposed requirements for the IRB approach and also presents and discusses these results. We go on to consider broader questions regarding Basel II implementation. The closing section concludes with a discussion of policy.

Basel II: A Synthetic Account

At first sight, the Basel II documentation is daunting. While the Accord itself is less than 300 pages, fully understanding those 300 pages requires studying several hundred pages of supporting documents. The Accord specifies a set of new alternative approaches for minimum capital requirements (Pillar 1: Quantitative Requirements), states how those requirements should be supervised (Pillar 2: Supervisory Review), and finally defines what banks should reveal to the market regarding the risk of their assets and how (including whether) they satisfy regulatory requirements (Pillar 3: Market Discipline). The idea is that the three pillars are complementary and mutually reinforcing.[11]

The Basel Core Principles for Effective Banking Supervision already encapsulate Basel I and much of the second pillar of Basel II.[12] Moreover, for the simpler Basel II approaches, the third pillar (on market discipline)

10. Countries may be concerned about how banking regulations and supervision will be assessed by the International Monetary Fund and the World Bank, in the context of the Financial Sector Assessment Programs (FSAPs).

11. The definition of capital has not changed from Basel I, but the new Accord includes important changes in the level of consolidation that banking supervisors should apply (scope of application) and for the first time introduces rules on lending to affiliated companies (related lending).

12. The Core Principles refer to supervision. They cover what banks should report to the supervisor, but not what banks should disclose to the market (Basel II, pillar 3). Strictly speaking, following Basel I is neither necessary nor sufficient for a country to be compliant with the sixth Core Principle (on capital adequacy). In practice, however, Basel I is normally considered a necessary condition, and the Financial Stability Forum deems it one of the critical financial standards that countries should implement (see www.fsforum.org).

is reduced to the bank's obligation to publish its capital requirement and its actual level of capital. Thus what is really new in Basel II are the various Pillar 1 alternatives regarding actual capital requirements. We therefore focus on the first pillar in this paper.[13]

Pillar 1 contains three main approaches: the simplified standardized approach, the standardized approach, and the internal ratings-based (IRB) approach, which breaks down into two options (the foundation IRB and the advanced IRB approaches). Pillar 1 also covers alternatives for the measurement of basic credit risk, credit risk mitigation techniques, securitization risk, and operational risk.[14] With regard to the first three alternatives, Basel II attempts to improve on the treatment in Basel I; in the case of the fourth alternative, this is the first time that an actual quantitative requirement for operational risk has been included in the Basel recommendations. The alternatives are illustrated in table 1. In practice, a relatively simple approach for underlying credit risk assessment would normally be combined with simple approaches for the other topics. The simplified standardized approach, for example, explicitly combines the simplest approaches for credit risk evaluation, credit risk mitigation, securitization risk, and operational risk. At the other extreme, the advanced internal ratings-based approach would normally be accompanied by advanced approaches elsewhere, in particular the advanced measurement approach for operational risk.

One potentially important issue for emerging economies is that the new capital requirements are calibrated so that, on average, the capital requirement for a standard G10 bank would remain around 8 percent under the standardized approach, and capital requirements for an average G10 bank would fall under the IRB approach. This implies that under the standardized approach, the increase in the new requirement for operational risk would be roughly offset by the reduction in requirements for credit risk, given the ratings distribution in a typical G10 country. In the case of a developing country with low ratings penetration, the proportion of unrated claims on bank balance sheets is likely to be much higher than for G10

13. This does not imply that the second pillar is unimportant. Compliance with the Core Principles is weak in developing countries, and the second pillar's tighter definitions on aspects of the supervisory process highlight the importance of making progress in these areas.

14. Credit risk mitigation techniques mainly refer to contracts that use securities as guarantees, such as repurchase agreements (repos) and credit derivatives; they do not refer to real guarantees such as mortgages, for which there are rules under basic credit risk evaluation. Securitization risk covers both investment in a securitized instrument and the retained risk of originating a securitization of assets on a bank portfolio.

T A B L E 1 . Different Options Proposed in the First Pillar of Basel II

Approach	Basic credit risk measurement technique	Credit risk mitigation	Securitization risks	Operational risk
Simplified standardized	Export credit agencies (www.oecd.org, trade directorate, ECA page)	Simple: risk weight of collateral substitutes that of claim	SSA banks can only invest (cannot offer enhancements or liquidity facilities). Risk weight = 100 percent.	Basic indicator: Capital = 15% gross income
Standardized	Export credit agencies or credit rating agencies (such as S&P, Moody's, Fitch)	Simple: same as simplified standardized approach. Comprehensive: exposure amount reduced subject to claim and collateral haircuts.	Standardized: uses export credit agency ratings (only investing banks can use below BB+)	Basic indicator, or standardized approach where bank capital = weighted sum of gross income across activities.
Internal ratings-based Foundation	Banks' internal ratings for default probability and Basel II formula sets capital requirement (loss given default 45% for senior and 75% for subord).	Comprehensive, loss given default adjusted given reduction in exposure and capital requirement given by Basel formula.	IRB approach: Investing banks may use bank ratings according to a standard scale. Originators may use supervisory formula.	More sophisticated banks will be expected to graduate to the advanced measurement approach where capital require-ment is given by own risk measure-ment system.
Advanced	Banks set internal rating (default probability), Loss given default exposure at default and maturity. Capital requirement still given by Basel formula.	Own model determines Loss given default and exposure at default; capital requirement given by formula.	As for Foundation IRB approach.	As for Foundation IRB approach.

banks, and the distribution of rated claims will probably also be different.[15] This implies that the operational risk requirement may approximate a simple add-on, increasing overall capital requirements. While this may not be undesirable, it may be an impediment to the implementation of Basel II in some countries.

15. Local supervisors may also employ "local ratings" (that is, ratings conducted according to a national or local scale rather than an international scale). However, the three major rating agencies (Fitch, Moody's, and Standard and Poor's) all warn customers that local ratings are not necessarily comparable across countries. This raises an important issue for the use of the standardized approach as a financial standard.

This paper focuses on Pillar 1—namely, the measurement of underlying credit risk. Given the fundamental problem of asymmetric information between the regulator and the regulated institution, banks will generally have superior measures of clients' risks than will the regulator. However, if the underlying motive for regulation is moral hazard, then it is clearly problematic to allow the bank itself to use its own estimates of client risk or its own assessment of a portfolio of such risks.[16] The solution to this conundrum in the new Accord is to use either external credit rating assessments or bank ratings subject to supervision of the rating methodology and a specific formula that maps those ratings into capital requirements.

Since rating penetration is typically low in developing countries, the standardized approach will buy very little in terms of linking regulatory capital to risk. This argument implies that many regulators may well be interested in considering the IRB approach or our proposed CRB approach. Countries may also adopt a mixed approach whereby some banks remain on Basel I or adopt the standardized approach while more sophisticated or larger banks adopt the IRB approach. The United States may provide something of a model in which very few banks will be forced to adopt the IRB approach, some others may be permitted to adopt the IRB model, and the vast majority of banks will remain on Basel I. When we translate the U.S. model to an emerging market, we find that if the regulator's aim is for regulatory capital in the financial system as a whole to reflect risk more closely, then the proportion of assets that will be covered by the IRB approach will be relatively large (that is, the banks that adopt the IRB model are likely to be few in number but large in size). These arguments suggest that the calibration of the IRB approach is an important issue for emerging economies considering whether and how to adopt Basel II. This is the topic of the next section.

On Basel II Calibration: Methodology

The new capital Accord's internal ratings-based approach suggests a formula for calculating a bank's capital requirement as a function of three basic variables: default probability, exposure at default, and loss given

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16. Assessing credit portfolio risk implies assumptions not only on individual default probabilities, but also on the multivariate distribution of those default probabilities. For simpler assumptions on distributions, this implies assumptions on the mean and variance-covariance matrix of default probabilities.

default.[17] The expected loss for a single claim is the multiplication of the three variables if expressed in appropriate units. However, the provisions a bank holds are typically identified with expected losses, and capital is identified with a value-at-risk (VaR) concept. A regulator might then ask a bank to hold provisions and capital to cover a specified percentage of the distribution of losses to ensure the continued solvency of the bank except in highly extraordinary circumstances.

This is illustrated in figure 1, where the segment OB represents the total value at risk associated with a specific probability of occurrence, that is, the level of losses that corresponds to a certain percentile of the distribution function of expected losses (99 percent in the figure). A regulator might then ask a bank to hold general provisions to cover the expected loss represented by the segment OA, where A is the mean of the loss distribution, and to hold capital to cover the unexpected loss represented by the segment AB (that is, the difference between the total value at risk defined with respect to a particular percentile of the distribution and the mean or expected loss). The calibration of the Basel II IRB formula employs a value at risk of 99.9 percent with a horizon of one year. Hence a bank is only expected to use up its capital in one year with a probability of 0.1 percent, or once every 1,000 years.[18]

The inputs for the Basel II IRB formula are the parameters for a single loan or claim, and the output is the capital requirement for that instrument. Subject to an underlying assumption regarding the correlation of asset risks, this single-instrument approach should approximate the result of a portfolio credit risk model. An econometric methodology is typically employed to estimate individual instrument default probabilities, and these estimates are then fed into a model with other parameter estimates to obtain the loss distribution curve for the portfolio.[19] Simplifying assumptions are employed in both estimating the parameters and developing the model.

Commonly used models include Moody's KMV option-based model, the McKinsey macroeconomic simulation model, the CreditMetrics model

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17. See Altman and Saunders (1997) for a useful discussion.

18. This assumes that draws from the distribution are independent over time.

19. This may be for a particular bank or a specific business line of a bank. As we directly mimic the portfolio of a bank, we do not discuss further the important issue of aggregation. Suffice to say that the Basel II IRB formula is by business line (sovereign, commercial, and retail) and is calibrated with particular assumptions regarding asset correlations in each sector. The results are simply added, implying an assumed perfect positive correlation between business lines.

Figure 1.   Loan Loss Probability Distribution Stemming from Credit Risk
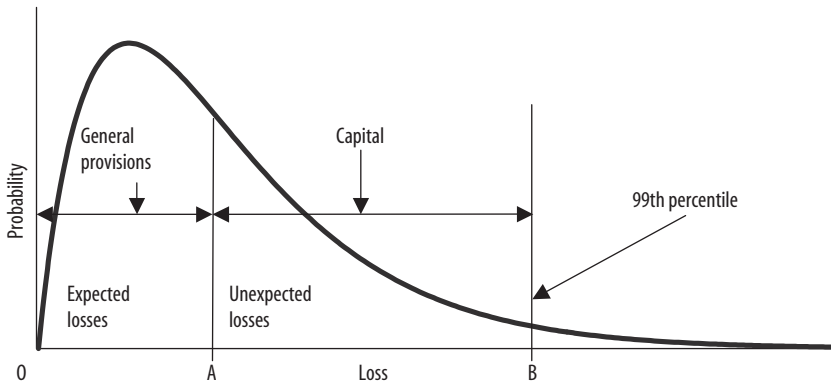
from J. P. Morgan's RiskMetrics division, and the Credit Suisse First Boston's CreditRisk+ model. The latter of these models is arguably the simplest to implement, but even here implementation relies on key additional assumptions such as the number of risk factors, the estimation of factor volatilities and loadings, and the correlation of default probabilities.[20] Moreover, the estimation of each model relies on a set of quite specific data requirements and assumptions that make cross-country and even cross-institution comparisons problematic. These model-based methodologies of estimating the credit loss distributions of a loan portfolio are thus subject to both estimation risk of the parameters of a single instrument and model risk (in that the assumptions of the portfolio model may be incorrect). Furthermore, the Basel II IRB formula introduces approximation risk. Capital requirements are calculated on each single instrument model and then they are simply added across all instruments. The aggregated single instrument formula yields the appropriate loss distribution for the portfolio only for a particular correlation of risks between instruments. If actual correlations differ substantially from this assumption, then this approximation to the risk of a portfolio may cease to be valid.

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20. See Balzarotti, Falkenheim, and Powell (2002) and Balzarotti, Castro, and Powell (2004) on the implementation of CreditRisk+ in Argentina. See Márquez and others (2003) for the case of Mexico and Foglia (2003) for a discussion and model-based estimates of credit risk using Italian credit registry data.

In this paper we take a quite different approach: we adopt a bootstrapping technique that essentially enables us to mimic the shape of the loss distribution function of any specified loan portfolio.[21] This approach minimizes the impact of estimation errors and maximizes the degree of comparability across countries. Even without an underlying model, bootstrapping techniques can be used to simulate the frequency distribution of credit losses. The resampling approach is very flexible and lends itself to many alternative simulation exercises aimed, for example, at measuring the exposure to credit losses of portfolios characterized by different loan sizes, maturities, ratings, geographic locations, or economic sectors.

The empirical exercises performed in this paper are for Argentina, Brazil, and Mexico. In each of the three countries, the central bank maintains a public credit registry that contains information on a very large number of loans in the financial system.[22] Each financial system requires a clear amount of capital plus provisions every year to confront total credit losses. However, that observation tells us little about the required capital and provisions for an average bank in that year. Conditional on the overall macroeconomic conditions, the losses suffered by an average bank depend on the sensitivity of the bank's loan portfolio performance to the prevailing economic conditions and the idiosyncratic risk of the portfolio. The Basel II IRB approach assumes that the correlation structure of a bank portfolio is known and summarizes credit loss correlations as sensitivities to a single factor, but credit risk correlations are not known with certainty and a single factor model can at best be thought of as an approximation to a more complex reality.

The technique we employ generates conditional loss distribution functions based on overall economic performance, the correlation of credit losses, and any residual idiosyncratic risks in a large number of sample portfolios. We then use these distributions to measure the expected and unexpected losses. In other words, conditional on the overall performance of the financial system over the period of analysis, our results provide a measure of the level of expected and unexpected losses of a bank of average size with

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21. Here we are following Carey (2002). Also see Carey (1998) for further analysis of credit risk in G10 portfolios.

22. See Miller (2003) for details on public credit registries around the world; see Powell and others (2004) for an empirical analysis of the value of public credit registries in Argentina, Brazil, and Mexico and a discussion of their use for predicting credit losses.

a loan portfolio randomly drawn from the universe of loans within the financial system.[23]

We limit our empirical analysis to only one specific year owing to changes in definitions, the scope of coverage, and data quality across the credit registers from the three countries. Our findings should therefore be regarded as illustrative of a methodology that needs to be repeated over several years to achieve its full empirical relevance. This point is shown in greater detail in figure 2, which shows a sequence of conditional distributions estimated at different points in time (namely, t_1, t_2, and t_3, which represent a sequence of good-bad-good years over a hypothetical economic cycle) and the unconditional distribution resulting from pooling the data from all the conditional distributions. Our estimates reflect the events of the chosen year and thus cannot be taken as representative of the unconditional distribution. However, we chose a year close to the cyclical trough for each country (the period t_2 in the characterization of figure 2), so our estimates may properly reflect those observations that carry a greater weight in shaping the right tail of the unconditional distribution of credit losses. For instance, the Argentine data are for 2001. In that year, a recession led to a fall of GDP equal to 4.4 percent in real terms and a deepening crisis. Bank deposits were frozen in December 2001, and there was considerable economic and political uncertainty that resulted in the removal of the president amid riots. Over the same period, Mexico experienced a stagnation of economic activity with zero GDP growth and a reduction of the ratio of bank credit to GDP to 11.9 percent, the lowest value of the last decade. In Brazil, a slowdown in economic activity brought GDP growth down to only 1.3 percent and led to a contraction of bank credit in real terms. To summarize, while the results naturally reflect a period in time, the snapshot captures economic stress in all three countries.

23. Our one-point-in-time distributions might be thought of as distributions across idiosyncratic risk or, alternatively, of distributions of correlations of asset risk within our sample portfolios. For a one-factor model, the systemic risk of a portfolio might be approximated by average correlations as portfolio size increases. In practice, however, asset correlations may differ substantially across bank portfolios if asset correlations depend on many factors, including sector, loan, and borrower characteristics, and if portfolios are lumpy in terms of their exposures across these factors. Indeed, one common explanation of why one bank may fail during a recession whereas another does not is based on differences in exposure to systemic factors rather than pure idiosyncratic risk. The Basel II IRB formula assumes that there is a single systemic factor, that bank portfolios have zero idiosyncratic risk, and that asset correlations are identical for companies of the same size (and decrease with company size), but correlations are always assumed to be known and stable.

Figure 2. Conditional and Unconditional Credit Loss Distributions
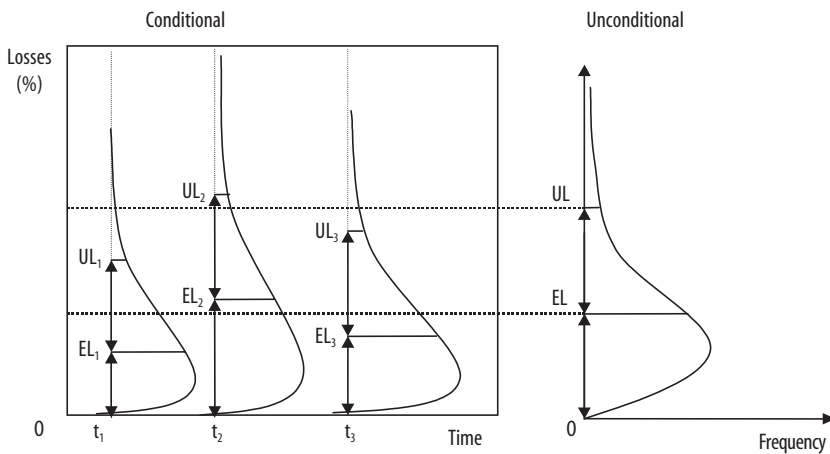
The first step of the procedure consists of extracting from the public credit registry a large pool of performing loans to the nonfinancial corporate sector at a particular date. This pool reflects the overall risks of lending to the corporate sector in each particular country. Second, we define default as the event of payments that are over ninety days past due.[24] Third, we classify loans into two categories according to whether they maintain their initial status or default over the following twelve months. Fourth, from this pool of loans, we randomly sample a predefined number of loans (in our case 500), intended to mimic the loan portfolio of a medium-sized bank.[25] Given a predefined recovery ratio, we compute the value of the losses of the sampled portfolio, expressing this as a fraction of the face value.[26] Fifth, we replicate the last step a large number of times (20,000 in

24. This follows the typical definition of a nonperforming loan according to international best practices and to one of the criteria set out by the Basel Committee on Banking Supervision.

25. Modifying the sampling procedures would enable the selection of predefined risk profiles and the analysis of different risks embedded in bank portfolios (see Carey, 2002).

26. We assume a predefined recovery ratio of 50 percent of the face value of a defaulted loan. The Basel Committee on Banking Supervision employs a loss given default of 45 percent for the foundation IRB approach. Our conversations with the central banks indicated that this might be somewhat low for emerging markets, so we selected the figure of 50 percent for the purposes of our calibration exercises. The bootstrapping methodology would be considerably more precise if data on loss given default were available at the individual loan level.

this case) to generate a frequency distribution of credit losses. This frequency distribution simulates the actual distribution of credit losses faced by banks in that financial system at that time. Finally, we use the frequency distribution of credit losses to calculate a number of statistics in a reasonably homogeneous way across countries. In particular, we calculate the expected and unexpected losses up to different statistical tolerance values across the different portfolios. We compare these estimates in each country against current regulations (inspired by Basel I), the actual provisions and capital of banks, and a simulated capital requirement using estimated default probabilities and following the Basel II IRB formula.

Having described the methodology, we reiterate the caveat that the results reflect a snapshot of a particular country in a particular year. The results cannot and should not be interpreted as average values representing credit risk exposure over different time horizons or over the full business cycle. Moreover, the results are dependent on the universe of loans collected by the public credit registry. For Argentina and Mexico, we are confident that this universe of commercial loans is representative of the financial system as a whole, but in the case of Brazil, we could only access the universe of larger corporate loans, for reasons explained below.[27] Our results should thus be interpreted as tentative and conditional on the time and loan universes obtained. Nevertheless, they are highly suggestive, tend to back up other evidence, and could provide the catalyst for similar studies in other countries or in the same countries over longer time periods.

Calibrating Basel II for Emerging Countries: The Results

This section first discusses the data that we use for the analysis and then details the results of the bootstrapping sampling methodology described above. Finally, we draw the main implications of our results for emerging economies.

Description of the Data

Figures 3 to 5 illustrate, for the three countries, the frequency distribution of three variables involved in the experiment. Panel A reports the frequency distribution of the size of individual loans, which are extracted from the pub-

27. The Basel II formula was calibrated on commercial loans, so we feel that this choice is appropriate.

Figure 3. Argentina: Relevant Frequency Distributions from the Resampling Exercise

A. Frequency distribution of bank loan size

B. Frequency distribution of 20,000 sampled portfolios

C. Frequency distribution of credit losses
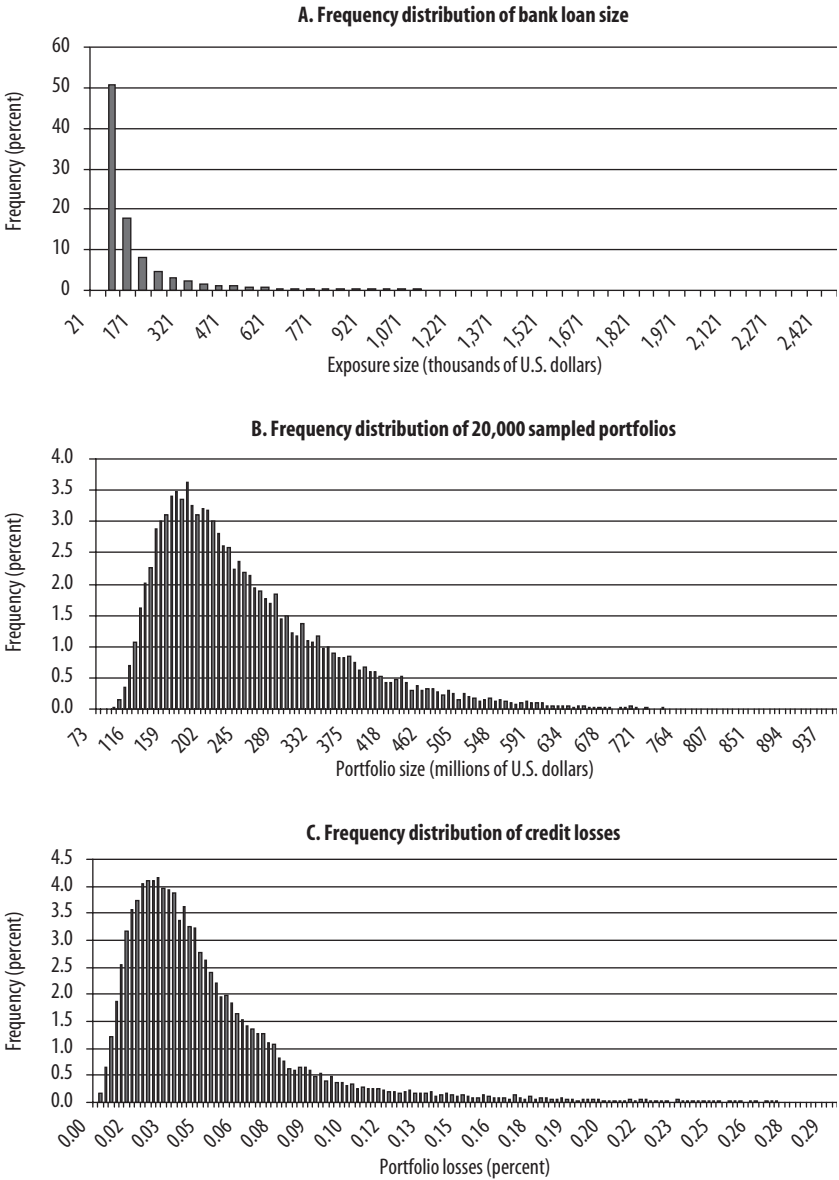
Source: Central Bank of the Argentine Republic.

Figure 4. Brazil: Relevant Frequency Distributions from the Resampling Exercise

A. Frequency distribution of bank loan size

Frequency (percent)

Exposure size (thousands of U.S. dollars)

B. Frequency distribution of 20,000 sampled portfolios

Frequency (percent)

Portfolio size (milions of U.S. dollars)

C. Frequency distribution of credit losses

Frequency (percent)

Portfolio losses (percent)
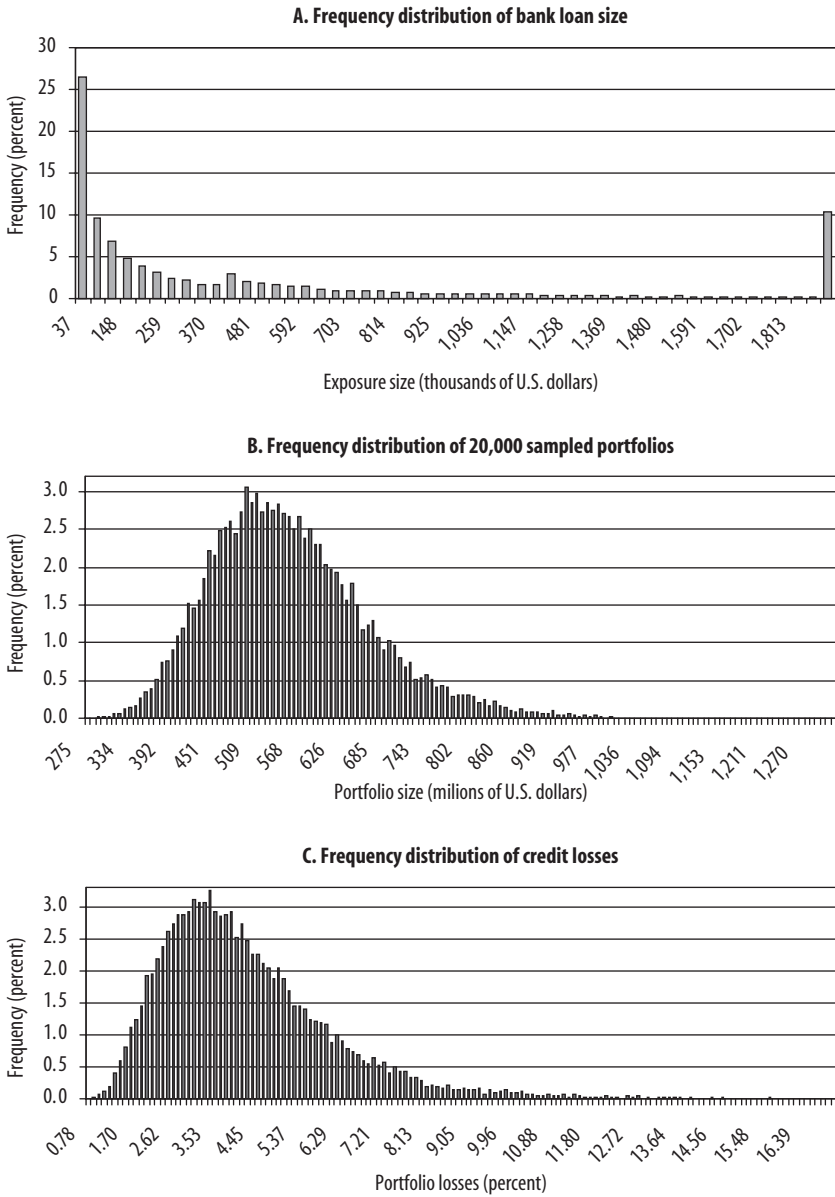
Source: Central Bank of Brazil.

Figure 5. Mexico: Relevant Frequency Distributions from the Resampling Exercise

A. Frequency distribution of bank loan size: Large banks

■ Exposure size (thousands of U.S. dollars)

B. Frequency distribution of 20,000 sampled portfolios: Large banks

■ Portfolio size (millions of U.S. dollars)

C. Frequency distribution of credit losses: Large banks

■ Portfolio losses (percent)
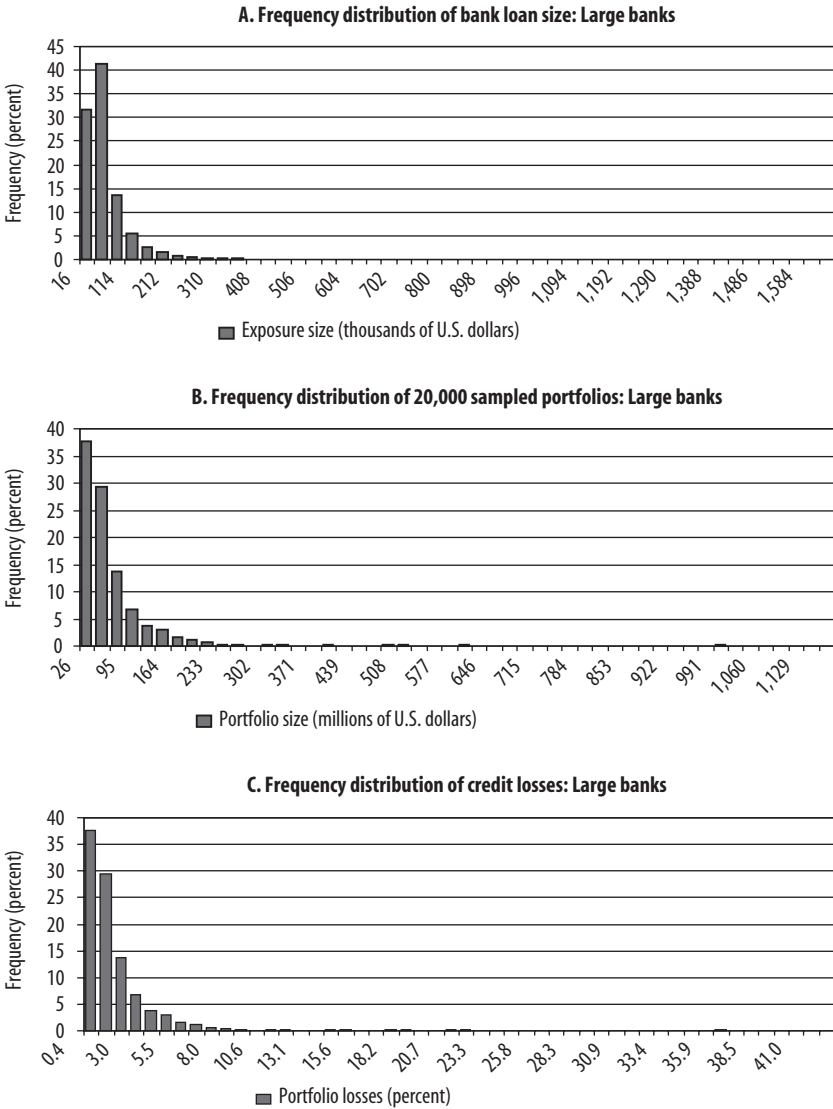
Source: Bank of Mexico.

lic credit registries and which represent the universe from which our samples of 20,000 loans are drawn; panel B shows the frequency distribution of the dollar value of the 20,000 randomly selected portfolios; and panel C shows the distribution of credit losses of the 20,000 randomly selected portfolios as a fraction of the face value of the respective portfolios.

A visual inspection of the charts shows clear differences among the three samples. Mexico has the lowest concentration in terms of loan size, and about 80 per cent of all the loans extracted from the credit register are smaller than U.S.$100,000. The same figure for Argentina is about 60 percent. We adopted a different sampling procedure for Brazil because of the huge size of the credit market and following advice from the Central Bank. Specifically, we included only those companies whose gross exposures with the financial system were above U.S.$300,000, and hence the only smaller loans included are those to companies that had other larger loans outstanding (about 40 percent of loans were less than U.S.$100,000). We were advised that this sampling methodology would capture the major credit risks in the Brazilian financial system. The charts for Argentina and Mexico thus show considerably more skewed distributions for both the value and credit losses of the portfolios than the comparable distribution computed for Brazil. As a supplement to the visual information provided by the charts, table 2 summarizes a set of descriptive statistics of the distribution of the 20,000 randomly sampled portfolios.

T A B L E   2 .   Simulated Loan Portfolios: Descriptive Statistics[a]
Millions of U.S. dollars

Country and period	No. observations	Mean	Median	Mode	Standard deviation	Minimum	Maximum
Argentina (Dec 2000 to Dec 2001)	70,017	242	215	182	104	72	943
Brazil (Oct 2001 to Oct 2002)	41,784	551	538	510	110	275	1,306
Mexico (Dec 2000 to Dec 2001)	188,165	85	62	33	89	16	1,477

Source: Authors' calculations.

a. Data refer to the twelve-month period indicated for each country. The number of observations are the number of bank loans to nonfinancial entities above a minimum amount, which were extracted from the national credit registers of each country at the beginning of the twelve-month period. The criteria underlying the selection of loans from the credit registers differ slightly across countries. For Argentina and Mexico, a loan refers to the overall position of a single borrower with the banking system as a whole. For Argentina, the positions selected are those equal to or larger than U.S.$21,000. For Mexico, we include both loans equal to or larger than U.S.$20,000 (which are reported on a compulsory basis) and smaller loans that are reported on a voluntary basis. For Brazil, the minimum size is U.S.$300,000, but positions with different banks that concur to define the total exposure are treated as distinct individual loans. The descriptive statistics (mean, median, mode, standard deviation, minimum, and maximum) refer to the distribution of the value of the 20,000 portfolio of 500 loans each, randomly sampled from the pool of loans described above. Exact sources and definitions of each variable can be found in the main text.

Table 3. Capital and Provisions: Unexpected and Expected Losses Estimations Based on Simulation Results[a]

Percent

Country and period	Default probability	Expected loss	Unexpected loss			
			95%	99%	99.9%	Basel (Jan 2004)
Argentina (Dec 2000 to Dec 2001)	9.60	4.80	7.30	14.80	21.80	14.93
Brazil (Oct 2001 to Oct 2002)	8.32	4.16	3.51	6.07	10.46	14.15
Mexico (Dec 2000 to Dec 2001)	2.70	1.35	4.44	16.58	31.64	9.68
United States (1989–91)[b]	3.00	1.50	1.62	2.55	3.91	10.07
United States (1929)[b]	6.24	3.12	2.54	3.80	5.36	12.70

Source: Authors' calculations and Carey (2002).

a. Expected loss is given by the mean value of the simulated distribution of credit losses. Simulations are based on the random extraction without replacement of 500 loans from the pool of loans registered in the credit register of each country, to simulate a standard bank loan portfolio. The extraction is repeated 20,000 times (this time with replacement) to obtain 20,000 portfolios. The distribution of credit losses for each portfolio provides the 20,000 observations used to simulate the distribution of credit losses. Unexpected losses at different levels of probability represent the value of credit losses (as a percentage of the face value of the portfolio) corresponding to the percentile on the right tail of the distribution minus the expected loss given by the mean value of the distribution. Basel unexpected losses indicates the value of unexpected losses computed according to the algorithm proposed by the Basel Committee on Banking Supervision (2004b). The value of default probabilities used in the algorithm is given by twice the value of the expected loss, assuming the same 50 percent loss given default used in the simulation exercise.

b. Results for the United States are from Carey (2002), who simulates credit losses based on a loan portfolio that mimics the risk exposure of a medium-sized bank in the United States and the default probability values observed at times of systemic distress, such as the moderate recession of 1989–91 and the severe 1929 recession.

The Main Results

Table 3 presents the main results of the bootstrapping exercise for each country, including the value of expected losses and the value of unexpected losses associated with different percentile levels of the right tail of the simulated distribution of credit losses. Here we refer to the total losses (equal to the sum of the expected and unexpected components) as the value at risk. For the three countries considered, expected losses proved to be in an interval between 1 percent and 5 percent. If we assume provisions to cover this amount, the amount of capital necessary to provide protection for unexpected losses up to 99 percent of the distribution is about 15 percent for both Argentina and Mexico. The capital that would be required to cover 99.9 percent of the distribution is significantly higher, at 21 percent for Argentina and 31 percent for Mexico. In the case of Brazil, the results suggest that capital of just over 6 percent is required for the 99 percent confidence limit and 10.5 percent for the 99.9 percent confidence value.[28]

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28. These lower values may reflect the fact that the loan size for Brazil is significantly greater than that for Argentina and Mexico.

Table 4. Capital and Provisions in Argentina: Unexpected and Expected Losses Estimations Based on Loan Universes with Different Minimum Exposure Thresholds

Percent

Minimum size of individual borrower's loan exposure	Default probability	Expected loss	Unexpected loss		
			95%	99%	99.9%
U.S.$20,000	9.6	4.8	7.3	14.8	21.8
U.S.$300,000	8.2	4.1	3.6	5.6	8.0

Source: Authors' calculations.

a. Expected loss is given by the mean value of the simulated distribution of credit losses. Simulations are based on the random extraction without replacement of 500 loans from the pool of loans registered in the credit register of each country, to simulate a standard bank loan portfolio. The extraction is repeated 20,000 times (this time with replacement) to obtain 20,000 portfolios. The distribution of credit losses for each portfolio provides the 20,000 observations used to simulate the distribution of credit losses. Unexpected losses at different levels of probability represent the value of credit losses (as a percentage of the face value of the portfolio) corresponding to the percentile on the right tail of the distribution minus the expected loss given by the mean value of the distribution. Basel unexpected losses indicates the value of unexpected losses computed according to the algorithm proposed by the Basel Committee on Banking Supervision (2004b). The value of default probabilities used in the algorithm is given by twice the value of the expected loss, assuming the same 50 percent loss given default used in the simulation exercise.

The results for Brazil reflect the fact that the category of commercial loans is restricted to borrowers with consolidated borrowing of more than U.S.$300,000. To test the effect of this different definition of the loan category, we report a summary of the results for the Argentine bootstrapping with the same restriction as Brazil (see table 4). In this case, the capital that would be required for Argentine banks is reduced to 5.6 percent (for 99 percent unexpected losses) or 8 percent (for 99.9 percent unexpected losses), which is actually somewhat lower than the estimated requirements for Brazil. These results suggest that Brazil's risks are roughly in line with those of Argentina when we take into account the different definition of the loan universe. They also call into question the adjustment made for lending to small and medium-sized enterprises in Basel II, which reduces capital requirements for this sector. In other words, the reduction in required capital, which reflects the additional diversification of risks, appears to be more than outweighed by increased default probabilities in our sample of emerging economies.

We compared our results with the level of capital that would be generated using the estimated probability of default and the formula proposed by the Basel Committee for the foundation IRB approach.[29] The Basel for-

29. We used the formula for assessing the capital requirement for the corporate portfolio as described in the Basel Committee's third consultative paper (Basel Committee on Banking Supervision, 2003) and revised in January 2004 (Basel Committee on Banking Supervision, 2004b).

Table 5. Capital and Provisions: Unexpected and Expected Losses Estimations Based on Standard and Poor's Observed Average Default Frequency

Percent

Country and period	Rating	Default probability	Expected loss	Basel unexpected loss (Jan 2004)
Argentina (Dec 2000 to Dec 2001)	CCC	27.87	13.94	19.57
Brazil (Oct 2001 to Oct 2002)	BB+	1.38	0.69	8.07
Mexico (Dec 2000 to Dec 2001)	BBB+	0.37	0.19	4.75

Source: Authors' calculations, based on data from Standard and Poor's.

a. Rating represents the lowest value of domestic currency sovereign rating expressed by Standard and Poor's over the time period considered. This is only partially true in the case of Argentina, where we have conventionally selected a rating of CCC, although formal rating was suspended in November on the eve of the government default. The default probability is computed on the basis of the historical average one-year default frequency on Standard and Poor's–rated corporate bonds; loss given default is assumed equal to 50 percent. Basel unexpected loss refers to the value of unexpected loss computed according to the algorithm proposed by the Basel Committee on Banking Supervision (2004b) and using the default probability value corresponding to the value of expected losses over loss given default.

mula applied to simulated default probabilities generates capital requirements of 14.9 percent, 14.1 percent, and 9.7 percent for Argentina, Brazil, and Mexico, respectively (see the last column of table 3). These are considerably lower than our simulations at the 99.9 percent level of confidence for Argentina and Mexico and higher than the 11.5 percent requirement that we computed for Brazil.

We also compared our results to those of a similar exercise conducted by Carey, which was intended to mimic the risk exposure of a representative U.S. bank in the period 1989–91 and also in a period of high stress for the financial system (namely, 1929).[30] These results are included in table 3. The expected loss for a U.S. bank in 1929 was about 3.1 percent, which falls between our estimates of 1.4 percent for Mexico and 4.2 percent for Argentina and Brazil. However, the estimates of unexpected loss for the United States in 1929 are significantly below our estimates for the three emerging countries at each statistical confidence level. Finally, our results can also be compared to the capital requirements generated by the Basel formula, using a one-year default probability appropriate to the Standard and Poor's sovereign rating in domestic currency (see table 5).[31] The results for expected and unexpected losses are also given. Table 6 provides details on the domestic currency sovereign ratings across the whole region, as well as the simulated Basel II IRB capital requirements.

30. See Carey (2002).

31. The default probabilities are estimated by Standard & Poor's based on their historical data of defaults by rating category, including corporate claims.

Table 6. Capital and Provisions in Latin American Countries Based on Standard and Poor's Ratings

Percent

Standard and Poor's classification	Country	Expected loss	Basel unexpected loss (Jan 2004)	Sum of expected and unexpected losses
AAA	-	0.00	0.34	0.34
AA	Chile	0.00	0.61	0.62
A	Barbados, Mexico, and Trinidad and Tobago	0.02	1.56	1.59
BBB	Colombia	0.17	4.75	4.91
BB	Belize, Brazil, Costa Rica, El Salvador, Guatemala, Panama, and Peru	0.62	8.07	8.69
B	Bolivia, Jamaica, Suriname, Uruguay, and Venezuela	2.71	12.54	15.25
CCC	Ecuador, Paraguay, and Dominican Republic	12.54	19.57	32.11

Source: Authors' calculations.

a. Country classification refers to Standard and Poor's domestic currency sovereign rating as of December 2003. The expected loss is the product of the default probability and the loss given default. The default probability is computed on the basis of the historical average one-year default frequency on Standard and Poor's–rated corporate bonds; the loss given default is assumed equal to 50 percent. Basel unexpected loss refers to the value of unexpected losses computed according to the algorithm proposed by the Basel Committee on Banking Supervision (2004b) and using the default probability value corresponding to the value of expected losses over loss given default.

Three conclusions can be drawn from the results. The first is that the Basel formula, applied to Argentina and Mexico, generates levels of protection inferior to the advertised 99.9 percent.[32] In the case of Brazil, our results indicate the opposite, but they are affected by the different universe of loans used. As the IRB approach is currently calibrated, the degree of protection would be in the range of 95–99 percent of the credit loss distribution for Argentina and Mexico. Another way to state this result is that achieving the advocated 99.9 percent level of protection would require substantially higher capital requirements than those advocated in Basel II.[33] Moreover, the fact that different levels of capital are required to achieve the level of protection theoretically granted by the Basel IRB curve calls into question the curve calibration. In other words, given the types of default

32. This conclusion is conditional on events in the year chosen for the analysis.

33. The Basel II IRB formula in fact calculates assets at risk, and capital requirements are defined as 8 percent of those assets at risk. Assets at risk are then 12.5 times required capital. Our results may be interpreted as saying that assets at risk must be larger (maintaining the 8 percent capital requirement) or that the 8 percent should be increased to achieve 99.9 percent protection. This discussion also assumes that provisions cover expected losses.

probabilities in emerging countries, it would not necessarily be appropriate to apply the IRB curve, as written, to individual instruments to ensure a good approximation to portfolio risk.

The second conclusion is that emerging countries face a difficult choice if they wish to apply the IRB approach. They may either implement the IRB curve as it is written and hence very likely opt for a lower degree of protection than that envisaged by the Basel Committee on Banking Supervision, or they must attempt to recalibrate the curve to obtain a degree of protection closer to the 99.9 percent as suggested by the Basel Committee. This should not come as a surprise, since the same issue is present with Basel I. Many countries adopted the Basel I methodology, but they applied a higher minimum than the recommended 8 percent.[34]

A third conclusion of our results is that for emerging countries, the foundation IRB level of capital requirement is (notwithstanding its benevolent risk calibration) likely to give higher capital requirements than the existing 8 percent minimum of the Accord. In the case of Argentina, the foundation IRB approach gives a requirement of about 15 percent, but in fact it is close to actual capital requirements in Argentina.[35] In Mexico and Brazil, the foundation IRB approach would, according to our simulations, yield requirements of around 10 percent and 14 percent—higher than Basel's 8 percent and higher than current levels in both Mexico (8 percent) and Brazil (11 percent).[36]

In the discussion above we compared the foundation IRB approach with the actual default experience to measure the default probabilities. We obtain much lower figures, however, when we use the Standard and Poor's historical mappings of ratings to default probabilities and the relevant sovereign rating. Rating agencies typically interpret such a rating as the floor to nongovernmental ratings, and therefore the associated default probabil-

34. A country could simply state that capital requirements are, for example, 10 percent of Basel II IRB-calculated assets at risk, but there seems little point in adopting a relatively sophisticated formula and then applying an ad hoc adjustment without considering what the effect of that adjustment would be on the level of protection within, say, a value-at-risk framework.

35. Argentina had a baseline 11.5 percent capital requirement, but various add-ons implied that the overall requirement was close to 15 percent of assets at risk as calculated under Basel I.

36. Moreover, this does not take into account the additional operational risk capital requirement (set equal to 15 percent of gross income for the basic indicator approach; see figure 1). On the other hand, we have not computed whether the enhanced rules on credit risk mitigation techniques or securitization risk would significantly change this conclusion.

ity, expected loss, and unexpected loss can be considered as a floor for the corporate sector's default probability, expected loss, and unexpected loss.[37] Table 4 shows that, notwithstanding the lower level of capital requirements derived from Standard and Poor's ratings and default probabilities, increased capital charges are likely to emerge for most Latin American and Caribbean countries—where the sum of expected and unexpected losses already exceeds the value of the all-encompassing 8 percent capital requirement of the current Accord.

In short, our results suggest that while the foundation IRB approach implies a rather generalized increase in capital requirements, it may not afford the 99.9 percent protection advocated by the Basel Committee on Banking Supervision given the default probabilities encountered in emerging countries. This result also calls into question the calibration of the published curve for use in these environments. If we assume that provisions cover expected losses, then achieving 99 percent protection would require capital levels significantly higher than the Basel I recommendation of 8 percent and around a 15 percent overall requirement. Achieving 99.9 percent protection would require even higher levels of capital. While these levels were close to Argentina's overall capital requirement in 2001, they represent a steep increase in capital requirements for many countries.

Policy Implications for Latin America and Emerging Countries

The previous section focused on the appropriate calibration of the Basel II IRB approach. The results are highly relevant for the wider discussion of appropriate Basel II application to Latin America and emerging countries.[38] That is the focus of this section. The IRB approach reflects recent developments in the internal risk management of larger G10 banks. Many large banks have developed their own rating methodologies and have tested how their own ratings map into default probabilities and value at risk—both on an individual claim and on a portfolio basis—using their own

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37. Having said that, each of the three major rating agencies now allows private institutions to break through the sovereign floor, although each is subject to slightly different rules.

38. Kupiec (2001) also discusses Basel II calibration for developing countries. However, he considers the original Basel II curve and examines specific assumptions on particular types of loans in a model-based approach.

credit risk portfolio models.[39] Supervisors across G10 countries have largely been playing catch-up in their understanding of these models.[40] The starting point is very different, however, in a typical country in Latin America.

Is Latin America Ready for the IRB Approach?

Banks in emerging countries are generally less advanced in terms of developing and using internal rating methodologies, mappings those ratings into default probabilities, and establishing portfolio models of credit risk. In many emerging countries, the supervisory agency's main motivation for moving towards the Basel II IRB approach may be to improve banks' own internal risk management, rather than to catch up with what banks are already doing.[41] Moreover, supervisors tend to have significantly less resources in emerging countries, and they lack supervisory human capital, information systems, and both legal and real power.[42]

The statistics on compliance with the Basel Core Principles for Effective Banking Supervision convey a picture of inadequate banking supervision across many emerging countries worldwide and across Latin America in particular. The average emerging country is compliant with just seven of the thirty Basel Core Principles.[43] Figure 6 illustrates emerging economies' compliance with a set of critical Basel Core Principles. Emerging countries fare poorly, to say the least, and Latin America performs worse than the average of this group. This suggests that it may be many years before supervisors in these countries would be advised to adopt the IRB approach, given the heavy burden on scarce supervisory resources implied.

39. In fact, the concern of many larger G10 banks is that Basel II does not give them sufficient freedom to use their own portfolio models of credit risk and that they must use the IRB formula to approximate the risk of a loan portfolio. See the comments by several large banks on the proposals at www.bis.org.

40. The Basel Committee on Banking Supervision has decided to maintain the formula rather than allow banks to use internal models for multiple reasons, including the issues of parameter and model risk and perhaps the fundamental moral hazard reasons discussed in the introduction.

41. The more sophisticated emerging markets will present exceptions to this, and local banks that are branches or subsidiaries of large G10 banks are likely to have benefited from the risk management methodologies implemented across the globe.

42. See Pagano (2001) for a set of papers on issues related to the legal system and credit risk in Latin America.

43. There are actually twenty Core Principles; here we count the subprinciples of principle 1 as principles in their own right to obtain thirty.

Figure 6. Emerging Countries' Compliance with Specific Basel Core Principles for Effective Banking Supervision
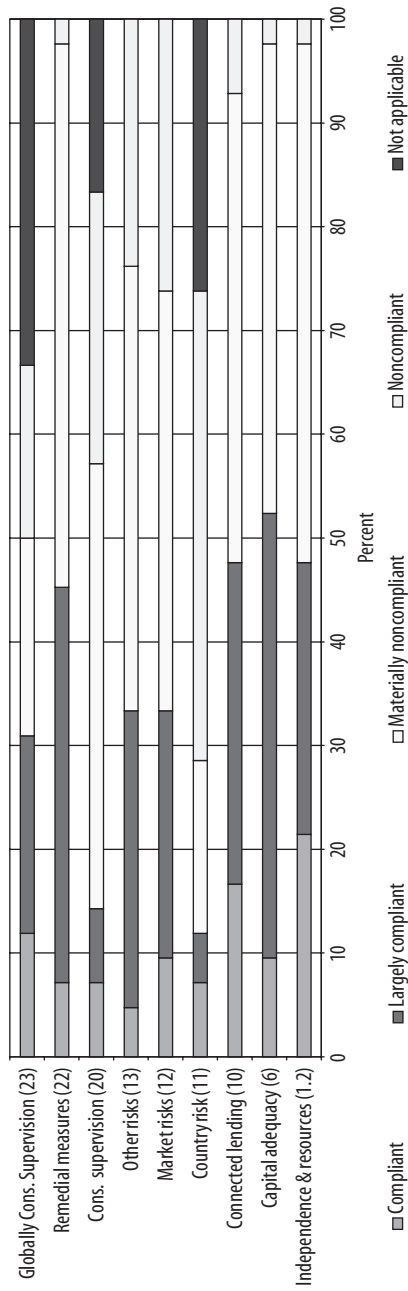
As discussed earlier, however, the standardized approach may yield little in relating regulatory capital to risk because of the low penetration of rating agencies in emerging countries. Therefore an intermediate approach is warranted to serve as a transition measure to the IRB model. We refer to this as the centralized ratings-based approach.

The Centralized Ratings-Based Approach

Our proposed centralized ratings-based (CRB) approach is similar in spirit to the IRB framework in that banks would place their clients into a set of rating buckets based on their estimated default probabilities, and then each rating bucket would translate into an average default probability that is then mapped to a capital requirement using a formula along the lines of the Basel II IRB model. We simplify the methodology significantly, however, because the rating methodology and the mapping to capital requirements are determined by the regulator. The Basel II IRB approach stipulates that there would be a minimum of seven rating buckets. Under the CRB approach, the regulator would define the default probabilities (mean, minimum, and maximum) that would correspond to each of a minimum of seven buckets. This scale might conform to one used by a leading rating agency, but bank supervisors may wish to define the scale to reflect the risk characteristics of their own country and any objectives they wish to achieve.[44] Banks would then simply slot their clients into the buckets suggested by the regulator based on their estimation of each borrower's probability of default.

This approach suffers from one disadvantage—namely, that each bank would be forced to use the same rating scale (though not necessarily the same rating for each client, since banks' opinions might differ). This means that a bank specializing in one type of business or region of a country would have to use the same rating scale as a bank in another line of business or region. Put another way, because the buckets would essentially be defined by the minimum and maximum default probabilities, the default probability range of each bucket may not be ideal for every bank. Some banks may have a large number of clients in one or two buckets of a CRB approach, whereas if they used an internal scale, they could break those buckets down

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44. For a supervisory-based application using cluster analysis, see Foglia, Iannotti, and Marullo Reedtz (2001). Rating agency scales are typically through the cycle, whereas internal bank rating scales tend to specify a twelve-month or other horizon. Supervisors may wish to adopt a through-the-cycle scale to reduce concerns of procyclicality.

into finer ones with a smaller range of default probabilities, thereby achieving a more precise measure of required bank capital. The supervisor would most likely define the buckets to be appropriate for the largest, systemic institutions in the banking sector.[45] Consequently, these problems would be limited to relatively small institutions. One solution would be to adopt the U.S. model, which calls for such institutions to remain on Basel I or adopt the standardized approach of Basel II.

Countries may be concerned that the CRB approach would not be seen as compatible with Basel II. Some emerging countries, especially in Latin America, already use a type of CRB approach for calculating provisions, and the level of provisions tends to be high in the region.[46] In our simulations we defined default as more than ninety days past due and a loss given default of 50 percent, whereas many countries in Latin America ask for 100 percent provisions for noncollateralized loans in this category.

This discussion underlines the need for a highly coordinated system for loan loss reserves and capital requirements. It is the sum of provisions and capital that should be compared against the value at risk (the sum of expected and unexpected losses)—and not necessarily provisions against expected loss and capital against the unexpected component.[47] If for some reason (legal or otherwise) there are impediments to increasing capital to cover unexpected losses relative to the desired level of protection, then provisions might be increased over and above the level of expected loss.

The methodology should gauge the overall value at risk of loans rather than their expected or unexpected loss components. This calls into question the common system combining a general loan loss reserve, a specific loan loss classification and provision depending on past performance (say, according to the traditional five-category classification), and a specified level of capital.

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45. In a more complex proposal, the regulator could allow the use of more than one centralized scale to reflect different banking specializations. The Hong Kong Monetary Authority planned the introduction of a loan classification regulation similar to that described in this paper (with loan grades characterized by an upper and lower default probability for each grade; see Hong Kong Monetary Authority (2002)).

46. Colombia, for example, is developing a system labeled SARC (*Sistema de Administración de Riesgos de Crédito*) to quantify loan loss reserves based on individual banks' assessments of expected losses (internal models). Argentina and Brazil also have databases that include a rating scale determined by the regulator, which is used to monitor provisioning.

47. We abstract here from a discussion of the potential dynamic aspects of banks' provisioning policies or counter cyclical regulations regarding loan loss reserves; see Cavallo and Majnoni (2002) and Laeven and Majnoni (2003) for discussions.

How would capital requirements be defined under a CRB approach? One possibility would be to rely on observed default probabilities, use the Basel II IRB curve to calculate unexpected losses, and set provisions and capital to cover expected and unexpected losses, respectively.[48] In this case, provisions could be derived as a residual from the following expression, based on the estimated value at risk (VaR^e):

$$\text{General Provisions} = VaR^e - \text{Capital}$$

If a regulator could not alter provisioning rules for some reason, a second approach could set capital equal to value at risk minus the allowable provisions along the lines suggested by the Basel Committee in the revisions to the third consultative paper.[49] This approach is intended to ensure a more rational integration of bank capital requirements and loan loss reserves. In this case, capital would be computed as a residual:

$$\text{Capital} = VaR^e - \text{General Provisions}$$

A third approach, which is appropriate for regulators who have the freedom to alter provisions but who prefer compatibility with Basel II and a simple rule for capital, would be to adopt the Basel II standardized approach but then establish forward-looking provisions determined by the value at risk minus capital requirement specified by the Basel II standardized approach. This method thus uses the CRB approach to enhance forward-looking provisioning rules in a fashion that is totally consistent with Basel II.[50] Moreover, banks' internal rating methodologies should develop over time, allowing such banks to move over to the full IRB approach when they are ready.

The CRB approach has many advantages as a transition tool. First, it lowers the monitoring costs for bank supervisors. Supervisors would have to verify the quality of banks' methodologies for slotting clients into the rele-

48. Whether a regulator is free to do this would depend on the particular constraints, legal or otherwise. However, if regulators do not have the freedom to determine provisioning or capital rules, then they would not comply fully with the first Basel Core Principle on independence and autonomy.

49. Basel Committee on Banking Supervision (2004a, 2004b).

50. In practice, regulators in Latin America tend to have more freedom to determine provisions than capital. It thus is not surprising that provisions are typically higher than a standard expected loss calculation.

vant buckets; to do so, they could very easily establish a homogeneous scale for comparing different banks' ratings of particular corporate clients, corporate clients of similar characteristics, corporate clients in particular economic sectors or regions, and so forth. The homogeneous scale would also allow the supervisor to easily verify loan classifications based on the default probabilities. Second, the CRB approach provides a consistent treatment of capital and loan loss reserves, which is a vital component of Pillar 2 and Basel Core Principle 8. Third, a risk-based capacity is developed within the banking system, independently of each country's decision to officially remain in Basel I or to adopt the different options of Basel II. Fourth, the homogeneity of bank classification schemes implies that bank data could easily be aggregated at a country level, thereby generating an important (and thus far largely missing) source of data for prudential monitoring at the macroeconomic level. These data would be useful for analyzing changes in the asset structure of the financial system, developing tools to consider aggregate financial sector risk, and predicting where problems might occur and their potential depth. Finally, if countries (in a region or more widely) could coordinate the number and definitions of their rating buckets, then this would enhance aggregation and comparability across countries. Under the standardized approach, local regulators will likely use incomparable local ratings, and comparability will undoubtedly be lost under the IRB approach, in which individual banks will use their own rating methodologies. From this perspective, the CRB appears particularly suited for ensuring the dissemination of a new risk-based regulatory standard.

Developing a Basel II Decision Tree

Many emerging countries face a difficult decision of whether to stay with Basel I or move to Basel II.[51] If they choose the latter, they must consider which of the many alternatives to adopt, or whether to implement a mixed approach leaving some banks on a simpler approach and allowing or forcing a selection of banks to incorporate a more advanced alternative. Five country characteristics that may aid to guide these important choices: the degree of compliance with the Basel Core Principles and hence with Basel II Pillar 2; the penetration of rating agencies and the operation of the ratings market in general; the current level of bank capital and the feasibility of increases in bank capital ratios in the short term; the size of, or the

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51. This section draws on Powell (2002, 2004).

desire to develop, domestic capital markets; and the availability of information and the degree of sophistication of both banks and the supervisor in assessing and monitoring loan loss provisioning.

As discussed above, evidence from Financial Sector Assessment Programs completed by the International Monetary Fund and the World Bank illustrates that many countries are far from being fully compliant with the Basel Core Principles for Effective Banking Supervision and, on average, emerging countries lag behind their G10 counterparts.[52] Of particular concern is the lack of (i) effective consolidated supervision, (ii) supervisory independence, resources, and authority, and (iii) effective prompt corrective action. If supervisors lack resources and the basics of effective bank supervision, then correcting this deficiency should be the first priority, and the implementation of complex rules on capital requirements may well be counter productive. Basel II also introduces a significant change in the level of consolidation required for banking supervision—from the bank itself to its holding company. Since many countries do not comply with more modest versions of consolidated supervision, these countries remain far from the spirit of the Basel II proposals.

However, full compliance with the Basel Core Principles for Effective Banking Supervision is too strict a precondition for moving to Basel II. After all, many G10 countries are not compliant with all the Core Principles. A country should be compliant with the Core Principles to the degree required to implement the appropriate alternative chosen within the Basel II framework. For example, if a supervisor does not have the resources (including data, information, technical competence, staffing, and management) to consider whether the calibration of the Basel II IRB approach is appropriate to that country, or to monitor effectively how banks would apply the IRB methodology, then a simpler alternative should be adopted.

Many emerging countries will probably opt for the simpler Basel II approaches, including the simplified standardized approach and the standardized approach. An important difference between the two is that the latter allows for the use of credit ratings from private agencies, whereas the former only uses the ratings of official export credit guarantee agencies for sovereign risk assessment. The problem for many emerging countries, however, is that markets for credit ratings are shallow, so the standardized approach would not improve much on either the simplified standardized approach or Basel I in terms of aligning capital requirements with risk.

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52. See the joint IMF–World Bank project (IMF and World Bank, 2002)

Adopting the standardized approach may create incentives for such ratings' markets to develop, but this brings its own dangers in terms of companies buying a good rating and provoking a "race to the bottom" in ratings quality. The second key characteristic, then, is the state of the ratings market. The standardized approach makes little sense for a country with no ratings market to speak of. Such a country should stick with Basel I or adopt the simplified standardized approach. Alternatively, if the country's compliance with the Core Principles is reasonably high, the authorities could consider the CRB approach as a potential precursor to the Basel II IRB approach. For a country with an active ratings market, the standardized approach makes more sense.

If a country adopts either the simplified standardized approach or the standardized approach, Basel II will likely increase bank capital requirements.[53] The source of the extra capital charge is operational risk. An increase in capital requirements may not be a bad thing, but an emerging country deciding whether to adopt Basel II should carefully consider the current level of bank capital and the feasibility of increasing required bank capital. This is the third characteristic listed above.

Basel II also includes enhancements for the credit risk implications of securitization risk and for credit risk mitigation techniques. A country with a fairly inactive ratings market may still benefit from the use of ratings in these areas. For example, if a country has an active market for securitized claims (a market that is currently growing in importance in some countries), then those claims will most likely be rated and the Basel II standardized approach regarding securitization risk might be gainfully adopted. This may not seem to be a critical feature, but if a country wishes to develop capital markets, then it needs to ensure that banks have the right incentives to securitize claims. Basel II does a better job here than Basel I. A similar argument can be made for credit risk mitigation techniques. Basel II makes useful improvements in this area, so it may be appropriate if markets using securities as collateral are important or if a country wishes to develop them. The fourth characteristic listed is thus the importance of local capital markets and the desire to develop them.

The final characteristic suggested above is the sophistication of the supervisor and banks in terms of provisioning rules, monitoring, and control. Basel

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53. This may also depend on the long list of items under national discretion. Two such issues are the risk weights for mortgages and for retail exposures. Capital requirements are more likely to rise if the more generous treatments are not applied. We do not go further into the specific items left to national discretion.

II replaces a set of ad hoc rules regarding capital requirements with a more robust estimate of credit risk reflecting value at risk. Value at risk may be decomposed into expected and unexpected losses subject to a statistical tolerance value. As discussed, current theory holds that provisions should reflect expected loss, whereas capital should reflect unexpected loss. For an economist, the appropriate level of provisioning and capital for credit risk then both come from the same probability distribution; they simply reflect different statistics of that same distribution.
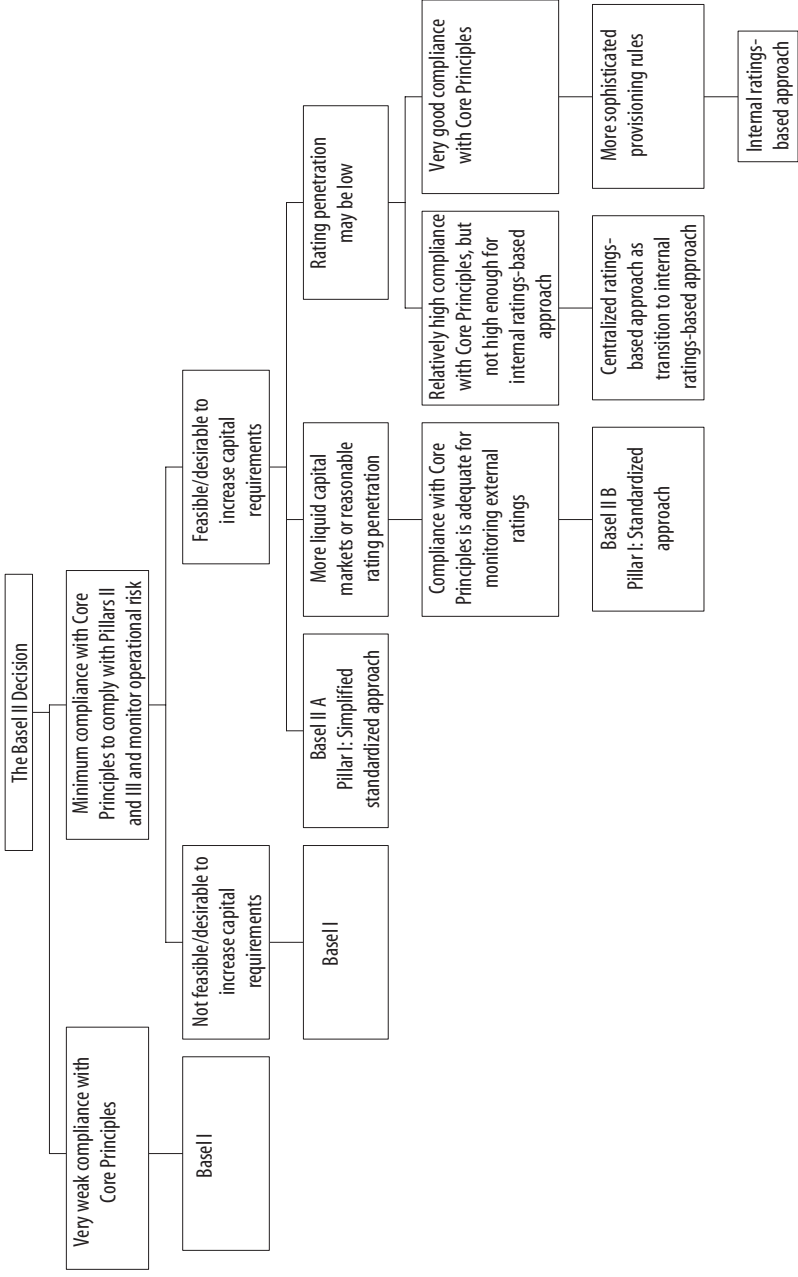
Under this more general approach, a supervisor that has advanced in terms of more forward-looking provisioning rules has also advanced in terms of considering finer risk-based capital rules. In several countries in the region, supervisors have set up centralized databases to monitor the large debtors of the financial system and ensure that each lender knows the total debt outstanding of large borrowers. In some cases these databases have been expanded to cover most loans of the financial system and are used to monitor and control provisioning requirements. Miller presents a review of the design and uses of these databases.[54] While in most countries such requirements are not forward looking but reflect arrears, the move to a forward-looking system for provisioning and capital is certainly made more feasible if such a database is in place. For example, some countries have now incorporated a bank rating into these databases that includes not only backward-looking variables, but also cash-flow-type analyses.

In sum, the key characteristic is the sophistication of the supervisor and banks in terms of information on provisioning and loan losses. A supervisor that has regularly tracked loan losses across banks and has developed monitoring tools such as transition probability matrixes and simple credit scoring techniques to monitor provisioning rules is in a much better position to implement the Basel II IRB approach or our simpler centralized ratings-based approach than a supervisor that has no experience in these areas. Still, the IRB or CRB approach will probably only be appropriate for large, relatively sophisticated banks. A country with a highly concentrated banking sector in which a few large, sophisticated banks control a large percentage of the sector will encounter added benefits in moving to the CRB or IRB formula, at least for those banks.

The decision tree in figure 7 illustrates how the above five characteristics may affect the Basel decision and provides a simple navigational aid for countries regarding the Basel standards. Countries that do not comply

54. Miller (2003).

F I G U R E   7 .   A Basel II Decision Tree

The Basel II Decision

Minimum compliance with Core Principles to comply with Pillars II and III and monitor operational risk

Very weak compliance with Core Principles

Basel I

Not feasible/desirable to increase capital requirements

Basel I

Feasible/desirable to increase capital requirements

Basel II A
Pillar I: Simplified standardized approach

More liquid capital markets or reasonable rating penetration

Rating penetration may be low

Compliance with Core Principles is adequate for monitoring external ratings

Relatively high compliance with Core Principles, but not high enough for internal ratings-based approach

Very good compliance with Core Principles

Basel II B
Pillar I: Standardized approach

Centralized ratings-based approach as transition to internal ratings-based approach

More sophisticated provisioning rules

Internal ratings-based approach

with many of the basic Basel Core Principles are probably advised to stay with Basel I. However, a country that wishes to increase bank capital requirements should consider the Basel II simplified standardized approach if the extra burden of supervising operational risk is feasible. Countries that have only a shallow market for ratings will get limited benefits from the standardized approach and should be advised that this will also lead to an increase in capital requirements. They should stick with the simplified standardized approach if supervisory resources are limited. Countries that have deeper capital markets or a strong desire to develop them should reconsider the standardized approach for its enhancements to securitization risk and credit risk mitigation techniques. Finally, countries that have made advances in terms of forward-looking provisioning rules and that have the information and systems to control banks' provisioning practices are better placed to consider the CRB or even the IRB approach.[55]

Conclusions

In this paper we have discussed the implementation of the Basel II Accord in emerging countries, with an emphasis on Latin America. The discussion suggests three broad concerns with the new accord. First, given the low penetration of rating agencies, the Basel II standardized approach (which uses external ratings to gauge credit risk) will do little to link regulatory capital to risk in Latin America. For countries adopting the standardized approach, moving to Basel II will imply only a marginal correction of other problems in Basel I, and it will not address the fundamental problems of Basel I that motivated the new accord.[56] Second, the more advanced Basel II internal ratings-based approach may require recalibration given our estimates of credit risk. It also appears complex and will stretch scarce supervisory resources in many countries. Finally, the essence of a standard may be lost if many countries adopt the standardized approach (using incomparable local ratings) or the IRB approach (using many different private banks' ratings and default-probability estimation methodologies).

We propose an intermediate approach between the standardized and IRB approaches, which we call the centralized ratings-based approach.

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55. We perceive a loss of comparability across countries as a cost of the IRB approach.
56. Implementing the standardized approach has advantages stemming from improvements in the treatment of securitization risk and credit risk mitigation techniques.

Our approach might be used as a transition measure to the IRB methodology; it might be employed to more fully integrate capital and provisioning regulations; and it might allow increased coordination on a standardized risk-based reserving policy across countries in the region or beyond. A main difference with the IRB approach is that although banks would rate their clients (and estimate default probabilities), the regulator would define the rating scale and the way in which the rating buckets would map to default probabilities. This approach could be used to set forward-looking provisioning requirements only. A country could then adopt the Basel II standardized approach, set provisions using the CRB methodology to cover the value at risk minus the standardized approach's capital, and thereby ensure that banks' total reserves (provisions plus capital) covered the entire value at risk up to the desired level of protection.

We employed a homogeneous bootstrapping methodology to analyze credit risk in three emerging markets in Latin America. The bootstrapping methodology implies that our estimates are free from the usual problems of parameter estimation error and model error that plague standard attempts to measure portfolio credit risk. At the same time, our results should be taken as indicative only, and we hope that future research will attain further precision by extending the empirical methodology over time. The results indicate that to achieve a 99 percent level of protection (in other words, such that capital covers the unexpected loss to 99 percent of the distribution), capital requirements would need to be significantly higher than the 8 percent level recommended in Basel I and closer to 15 percent. Even higher levels would be required to achieve 99.9 percent protection, as intended in Basel II. We also find that the Basel II foundation IRB approach, while resulting in increases in capital requirements above Basel I, would result in levels closer to the 90–95 percent protection rather than the 99.9 percent level stated as used in its calibration. We believe that further research is required in this area to consider if and how the Basel II IRB methodology might be recalibrated for countries that have default probabilities significantly higher than G10 countries.

We also discuss Basel II implementation in Latin America more generally and develop a simple Basel II decision tree. Countries should consider five characteristics when deciding whether to stay on Basel I or implement Basel II—and if the latter, how. An important characteristic is how countries comply with the Basel Core Principles for Effective Banking Supervision and, hence, with the second pillar of Basel II. If compliance with the Core Principles is weak, then countries should consider staying on Basel I.

If operational risk can be monitored and capital requirements increased, then the simplified standardized approach may be in order. If the ratings market is reasonably deep, if the country has a strong desire to deepen capital markets, and if supervising external ratings is feasible, then the standardized approach may be appropriate. As the degree of supervisory sophistication improves, especially in regard to the regulation and supervision of forward-looking provisions, then the CRB and, eventually, the IRB approaches may be considered.

Basel II may imply the end of a standard rather than the establishment of a new one, given the multiple Basel II alternatives, the reliance on incomparable local ratings, and the use of individual bank-generated ratings and default probability estimations. Put simply, two countries with 14 percent assets at risk under Basel II may actually be quite different. The CRB approach is an attempt to develop a more homogeneous system that is compatible with Basel II, suitable to the context of emerging country supervisors, and consistent with the notion of maintaining a standard.[57]

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57. We have not discussed a number of issues pertinent to Latin America that receive less attention in the new Accord: namely, bank lending to its own government, lending in foreign currency (domestic dollarization), and related lending. The Basel Accord addresses all three cases, but the treatment should be tightened in each case.