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CAD3 and Developing Countries: the Potential Impact of Diversification Effects on International Lending Patterns and Pro-cyclicality

Introduction

This paper will present the cumulative results of empirical work that we have undertaken on the issue of international diversification. We have suggested in previous papers that one reason why capital requirements under the new Accord could be *inappropriately* high for developing and emerging economies, is that the benefits of international diversification are not taken into account. The impact of diversification effects has of course been acknowledged since the pioneering work of Harry Markowitz in the 1950s. Consequently, with respect to regulatory capital in the banking sector, if it could be demonstrated that the correlation between developed/developed country lending was higher than that between developed/developing, then a case could be made that an internationally diversified loan portfolio, with a range of developed and developing country borrowers, would have a lower level of risk – in terms of the overall portfolio – than one which focused primarily on developed country lending. If this were, in fact, the case, then it would be possible – and certainly desirable – for the Basel Committee to incorporate the benefits of international diversification into the new Accord.

The argument that asset correlation is variable is self-evident. Furthermore, the suggestion that this variability impacts upon the level of risk in an overall portfolio, and should therefore be reflected in capital requirements would also seem to have force. Consequently, we have followed this approach in our own empirical work, which, as we shall detail below, provides strong support for a similar modification of the IRB formula with respect to internationally diversified lending.

One undisputed consequence of the adoption of internal ratings based (IRB) approaches by internationally active banks is that capital requirements for higher rated borrowers will fall, whilst those for lower rated borrowers will rise. To the extent that regulatory capital requirements feed through into the pricing of loans, it is clear that these changes will cause the pricing of loans to lower rated borrowers – disproportionately concentrated in developing countries – to rise significantly from their current levels. It has been argued that, even if this were to occur, the change is acceptable, since it merely reflects a more accurate assessment of the risks associated with such lending: this, of course, is the primary aim of the Basel II reforms. However, as set out below, we and others have clearly demonstrated that, in one area at least, this is not the case: by failing to take account of the benefits of international diversification at the portfolio level, capital requirements for loans to developing countries will be significantly higher than is justified on the basis of the actual risks attached to this lending. These findings formed the basis of our submission to HM Treasury's consultation paper on CAD3 in March 2004, and, it was hoped that the robustness of our results might be such as to enable the UK's negotiating team in the Commission to argue for adequate incorporation of international diversification effects in the forthcoming EU legislative amendments. These hopes were encouraged by the generally positive response to our research, and more importantly to the generalized acceptance of the benefits of geographical diversification, by large banks, other academics and developing country regulators. Nobody seriously argues that diversification effects do not occur, nor that they do not have a material effect on the overall riskiness of a bank's loan portfolio. For example, the recently appointed Chair of the Basel Committee – Jaime Caruana – has acknowledged this in a number of public arenas, and others have commented on the Accord's failure to take account of diversification effects as its major flaw.

For example, in two major recent conferences on Basle 2 (one organised by the Association of Supervisors of Banks of the Americas [ASBA], the Latin American Bank Federation [FELABAN] and the Centre of Monetary Studies in Latin America [CEMLA]; the other organised by the Central Bank of Spain), the need to incorporate the benefits of diversification was repeatedly raised as the major outstanding challenge for Basle 2.

Jaime Caruana, for example, said that these benefits were a clear fact and conceptually evident. The only possible obstacles to incorporating them into the Accord were, he argued, practical. However, representatives of major international banks such as BBVA and Santander argued that the practical objections – in terms of appropriate modelling – were surmountable. The Chief Risk Officer for BBVA – Manual Mendes – argued that incorporating the benefits of international diversification was no more complex than the flattening of the IRB curve for SMEs, which had already occurred. A speaker from the Institute of International Finance argued similarly, suggesting that the failure to incorporate diversification was the great defect of the Accord, which ignored basic principles of finance theory. Many other speakers – such as the Governor of the Central Bank of Mexico and the President of the Latin American Federation of Banks - argued in the same vein.

Dr. Ortiz – Governor of the Mexican Central Bank – suggested that: "any postponement of incorporating the benefits of diversification runs the risk of discouraging large international banks from maintaining and expanding their loans to emerging markets. This concern has been expressed not just by the financial authorities of many countries but also by several senior private bankers." More broadly, Dr. Ortiz expressed his "serious concern about potential negative effects that the new Accord could have on the level of volatility of capital flows to emerging economies." These views, by the Central Bank Governor of one of the major emerging markets deserve careful attention.

Despite this weight of opinion, it has been argued that banks' internal Full Credit Risk Models (CRMs), which do take account of these effects, are currently not sufficiently developed to accurately determine regulatory capital, although, as we have seen, this is not universally accepted. Furthermore, the option of incorporating an adjusting factor into Pillar 1 to alter regulatory capital at the portfolio level has also unfortunately not been introduced. Instead the issue was to be dealt with under Pillar 2, where the supervisory review process would be able to adjust capital requirements in the light of the degree of diversification in a bank's loan portfolio.

Whilst not ideal, this compromise could, in theory, work reasonably well, as long as supervisors had a clear framework to follow. The publication of the final Accord, however, made it clear that even this potentially second-best solution had been watered down to the extent that any impact is likely to be minimal at best. The word diversification is used just twice in the 251-page document.

First in the context of stress testing, where the degree of international diversification should be 'conservatively' taken into account:

...the objective is not to require banks to consider worst-case scenarios. The bank's stress test in this context should, however, consider at least the effect of mild recession scenarios. In this case, one example might be to use two consecutive quarters of zero growth to assess the effect on the bank's PDs, LGDs and EADs, taking account – on a conservative basis – of the bank's international diversification. (paragraph 435, p. 89: IRB section)

Second in the context of Advanced Measurement Approach (AMA) to operational risk, where the degree of international diversification of a banking group can be taken into account, but only in a very narrow sense. Neither of these references resembles the manner in which diversification effects are currently taken into account by the most sophisticated international

banks, and seem unlikely to have any significant impact. Our disappointment at this discrepancy between the stated views of those responsible for finalising the Basle Accord and the reality of the final document was, to some extent, tempered by the CAD3 process, which raised the prospect of the EU taking a more technically accurate and enlightened stance on the issue.

The recent publication by the Commission of the draft Directive was not encouraging in this regard, however. As with Basel 2, the word diversification gets two mentions and in similar contexts in both cases. If anything the wording is even less strong than with the Accord itself, and the issue is only seriously addressed in paragraph 89 of the Commission's response to previous submission on its consultation paper on the reforms:

> *The Commission Services continue to note the strong position of supervisory authorities, in relation to the development of more sophisticated rules, that at this stage credit risk modelling and therefore institution's own correlation assumptions are not sufficiently developed to be recognised as a basis of minimum capital requirements calculations. Accordingly, diversification effects have been implicitly recognised in the IRB risk weight formulas and the QIS3 has shown that on average for international active institutions these assumptions are correct and lead to capital requirements which provide appropriate incentives to move to the more sophisticated approaches.*

The standard argument on the inadequacies of CRMs is here augmented by the suggestion that the IRB risk weight formula already takes account of diversification effects. This seems somewhat strange. Internationally, perhaps only one or two banks could be described as fully internationally diversified. By the logic expressed above, therefore, all other banks should have their capital requirements increased as a result of not being adequately diversified, and there is no evidence of this occurring.

While we welcome the fact that the benefits of internationally diversification are universally acknowledged, and that the Basle Committee has committed to future work in this area, we would stress the need for urgency. As pointed out by Dr. Ortiz above, failure to incorporate these effects may act as a disincentive for international banks to engage lending to emerging and developing economies. One consequence of this could be that banks may start to shut-down, or at least scale back, their emerging market desks. Unfortunately, however, it is easier to remove these elements from a bank's infrastructure than it is to reinstate them, with the result that, once removed, future moves towards the incorporation of diversification benefits may not be a sufficient incentive for banks to resume their emerging market operations.

For many observers a key failing of the proposals is their potentially pro-cyclical impact. The arguments are well known and need not be reiterated here, but the important link between this issue and that of international diversification has not been made. Clearly a well-diversified bank is also likely to be a more stable bank than one that is more geographically focused. It is also likely that more extensive diversification will have a dampening effect on pro-cyclicality. If this were the case, then the incorporation of the benefits of diversification would also have the positive effect of mitigating pro-cyclicality in lending patterns.

In order to test this hypothesis our most recent empirical work has explicitly looked at this aspect of changes to regulatory capital. The results, which are set out in Section II below, clearly demonstrate that capital requirements that take account of international diversification are indeed far less pro-cyclical than those that do not. Before presenting the results of this work, and in order to make the cumulative case in full, Section I will briefly recap our earlier relevant work.

I. Earlier findings

It has long been argued that one of the major benefits of investing in developing and emerging economies is their relatively low correlation with mature markets. We tested this hypothesis empirically using a wide variety of financial, market and macro variables. These included directly relevant variables such as the spreads on bank loans and the profitability of banks, financial market date drawn from equity and bond markets, and supportive macroeconomic variables such as GDP growth rates. The purpose of the tests was to assess the degree of correlation between developed and developing markets, compared with the correlation between developed markets themselves. Importantly, every statistical test that we have performed, regardless of variable, time-period or frequency, pointed in the same direction: the correlation of developed and developed markets was higher, in every case, than that between developed and developing markets. Furthermore, all these results are clearly statistically significant on a variety of tests. The evidence clearly supports the hypothesis that a bank's loan portfolio that is diversified internationally between developed *and* developing country borrowers would benefit in terms of lower overall portfolio risk relative to one that focused exclusively on lending to developed countries. Therefore, such a bank should have lower capital requirements than one which is not.

Building on these results we proposed a more specific hypothesis: an international bank with a portfolio diversified across both developed and developed markets should have a lower overall portfolio level risk as measured by unexpected losses - than one focused exclusively on developed markets. The fact that the quality of the credit portfolio of any bank can change at any time in the future means that there is a need to make frequent calculations of the expected losses that a bank could suffer, under a variety of situations. Given the constant changes in portfolio quality, it is unlikely that the computed preventive reserves will be the same for different periods. The difference between preventive reserves computed at different periods, (due to changing credit quality), is the cause of the potential losses to the bank - those that could erode their capital in extreme situations. These losses are called "Unexpected Losses".

In order to test this hypothesis we simulated levels of unexpected loss for two portfolios: one with a loan portfolio that is evenly distributed across developed and developing regions; the second with a portfolio that is distributed across only the developed regions. The approach employed represents a modification of the well-known CreditMetrics approach, which has been widely used to simulate unexpected losses in portfolios. Following a similar approach, two simulated portfolios were constructed: one with an even distribution of loans across the major developed and developing regions[1]; the other with the loan portfolio evenly distributed across the developed regions. We then programmed an algorithm that simulated 10,000 different 'quality scenarios' that might impact on these portfolios, and so produce migration of loans between credit quality bands. Each quality scenario shows a change in the market value of the assets of the creditors in the portfolio, and therefore the difference between the initial and final credit quality can be assessed. Once the credit portfolio quality scenarios have been simulated, it is possible to compute the losses/gains that come from the difference between initial and final credit qualities.

The losses/gains obtained from the simulation process are used to build a histogram, which summarises the loss distribution of the credit portfolio. From this distribution a 'value at risk' (VaR) is defined from which we obtain the amount of unexpected losses from the portfolio. The unexpected losses divided by the total amount of the portfolio represent the percentage that with, a given probability, (defined by the chosen percentile) could be lost in an extreme event.

[1] Developing: Africa and the Middle East; Asia and Pacific; developing Europe; Latin America. Developed: EU (non-EMU); EMU; Other Industrial; offshore centres.

Table 1. Comparison of non-industrially diversified portfolios

1. Diversified developed/developing			2. Diversified developed			
Total Exposure = 117,625,333.00			Total Exposure = 117,625,333.00			
Percentile	Loss value	Unexpected loss (%)	Percentile	Loss value	Unexpected loss (%)	Percentage Difference
99.8	22,595,312	19.21	99.8	27,869,349	23.69	+23.34
99.9	26,390,246	22.44	99.9	32,187,075	27.36	+21.96

The results of these simulations are detailed in table 1 above, and provide convincing support for the hypothesis that the level of unexpected loss that a portfolio focused on purely developed country borrowers would face in an extreme event, would be about twenty-three percent higher than a portfolio diversified across developed and developing countries.

It is, of course, always possible to question the assumptions which underpin any simulation despite the fact that we attempted to ensure that our assumptions were as reasonable as possible. It was therefore encouraging that our results were supported by results from an internationally active bank using their own internal data.

Using their own proprietary data BBVA undertook a similar analysis, where they compared the capital requirements using a one-factor model (as in the IRB approach), with those that would pertain under a two-factor model that took account of diversification effects.[2] Significantly the difference between the capital requirements, which can be taken as a proxy for the effects of diversification, was in the range of 16% to 21%. This is very close to our own results, suggesting that the potential impact of international diversification is in the region of 20%.

As simulations can be criticised, so can results from one set of real data. Perhaps the BBVA findings are not representative of the industry as a whole. To test this possibility, we therefore undertook a further piece of empirical research, based on a different data set to that used by BBVA. Furthermore, we also decided to explicitly examine the potential impact on pro-cyclicality of diversification effects.

II. Our Most Recent Findings

The first dataset is from Moody's, and was available for the U.S.A. from 1982 to 2003. This was supplemented with data for Mexico from 1995 to 2000, which enables us to compare two very different types of market. In this exercise, we compared the implied capital requirements for our `typical' bank under three regulatory regimes; first the standardised approach in Basel II; second, the Foundations IRB approach, (i.e. assuming a constant Loss Given Default, since we do not have good time series for average LGD); and third, a Full Credit Risk Method (ICRM). This third regime uses a Merton approach to model credit quality changes and an indirect approach to model correlations amongst the individual credits in the overall portfolio. The ICRM approach entails deriving the distribution of the possible values that the portfolio of financial assets held by the bank can take. The potential different values that a portfolio could take - and their respective probabilities - are then recorded in the profit and loss distribution of the portfolio (P&L).

For risk management purposes, the VaR from which economic capital for a bank is defined is then obtained from this distribution. We can then attempt to quantify how the diversification of a bank's assets will affect the value of its portfolio: when computing the bank's P&L, the geographical location and industrial activity of the assets held in a portfolio are taken into

[2] See BBVA (2002) *The Two-Factor Model for Credit Risk: a Comparison with the BIS II one-factor model*

account.[3] As with our earlier simulation, we then programmed an algorithm that simulated 10,000 different 'quality scenarios' that might affect these portfolios, which results in a migration of loans between credit quality bands. Again, the losses and gains obtained were used to build a histogram, and from this distribution the VaR is defined, representing the percentage that could be lost in an extreme event with a given level of confidence.

We have therefore simulated the time paths of Capitalisation Requirements (CARs) under each of our three approaches, standardised, IRB Foundation (IRB F) and FCRM (which incorporates the benefits of diversification), for both countries. The results are detailed in tables 1 and 2 below

Table 1. CARs for the USA

PERIOD	Standardised	IRB F	ICRM
1982	9.597967	8.591044	8.070189
1983	8.933900	7.185306	6.802057
1984	8.933900	7.624870	7.032411
1985	9.133900	8.024912	7.262765
1986	9.463390	9.989917	8.736384
1987	9.463930	9.824500	8.545390
1988	9.463930	8.659141	6.990717
1989	9.563390	10.804149	6.488127
1990	9.563390	11.677029	7.601025
1991	9.986339	11.434979	7.541649
1992	9.687739	8.064210	6.470195
1993	9.287739	6.468979	4.665018
1994	8.901877	5.395182	3.783256
1995	8.507394	5.561594	4.087216
1996	8.246774	5.646111	4.316443
1997	8.294313	5.940010	4.837646
1998	8.312774	6.508256	5.831926
1999	8.403155	7.810893	6.704727
2000	8.410316	8.126805	7.163834
2001	8.531238	8.245881	7.242604
2002	8.312375	8.180511	6.779526
2003	8.107739	6.603000	6.258685
Average	**8.959430**	**8.016694**	**6.509627**
Variance	**0.339964**	**3.392352**	**1.945790**

Clearly the average credit quality of borrowers in the US will be significantly higher than in developing economies. The impact this has on average capital requirements under the three different regimes is noteworthy. The highest average requirements occur under the standardised approach, which resembles the current Accord. The requirements using the IRB Foundation Approach are considerably lower; this reflects the impact of the lower capital requirements for higher rated borrowers in the US economy, which is one of the principle aims of the new Accord of course.

Logically, one would expect the reverse to be true in a developing country, where the average credit quality of borrowers is significantly lower. That is, one would expect average capital requirements to be higher under the IRB approach than under the standardised approach.

Table 2, below details the results using data from Mexico, and confirms that this is indeed the case, with average capital requirements under the IRB approach being almost twice as large as those under the standardised approach.

Thus banks that focus on lending to higher-rated borrowers in developed countries will see their average capital requirements fall under the new Accord, whilst banks that focus on developing country borrowers, and wish to implement the IRB approach, will see their capital requirements increase substantially. It is not unreasonable to assume that a bank would rather minimise than maximise the regulatory capital that it is required to hold. The impact of these changes on the incentives banks face in allocating their international lending is therefore clear: to avoid a large increase in capital requirements a bank must reduce its lending to developing countries; to reduce its capital requirements it must focus this lending on higher rated borrowers, which are disproportionately concentrated in developed markets.

[3] When implementing this approach, we assumed that the *benchmark portfolios* had loans that were evenly distributed across geographical regions and industrial activities within their respective countries.

Table 2. CARS for Mexico

PERIOD	Standardised	IRB F	ICRM
Mar-95	8.765096	13.864230	10.462123
Jun-95	9.221855	16.650790	12.285877
Sep-95	9.299730	17.103009	12.714591
Dec-95	9.493498	18.151470	12.820000
Mar-96	9.251044	17.067542	12.589874
Jun-96	9.494958	18.448561	13.248221
Sep-96	9.557249	19.415843	14.891864
Dec-96	10.303734	24.230942	17.645355
Mar-97	9.430354	19.088714	15.153354
Jun-97	9.273425	17.500911	13.895955
Sep-97	9.396601	18.254201	14.344051
ec-97	8.928781	15.194116	14.796451
Mar-98	8.813186	14.397932	13.673818
Jun-98	8.851211	14.428160	12.256023
Sep-98	9.058278	15.545394	11.622476
Dec-98	9.040916	15.456234	11.797630
Mar-99	9.052107	15.519282	12.003802
Jun-99	8.981783	15.296608	12.251375
Sep-99	9.135013	15.979265	12.725803
Dec-99	8.968905	15.345409	12.100842
Average	**9.215886**	**16.846931**	**13.163974**
Variance	**0.122662**	**5.644965**	**2.588205**

The third regime to be examined was the Full Credit Risk Model (ICRM). Although average requirements for Mexico are well above those for the standardised approach, they are also considerably below those for the IRB Approach.

In fact capital requirements under the ICRM approach are 21.86% lower in the case of Mexico and 18.85% lower in the case of the USA than the IRB approach. This is highly significant: a major differences between the two types of approach is that full credit risk models take full account of the effects of international diversification, whilst the IRB approaches do not. In our earlier simulation described in Section I the unexpected losses in a fully diversified portfolio were found to be between 21.96% and 23.34% lower than for a bank that focused purely on developed markets. The BBVA study also found the discrepancy between a diversified and an undiversified portfolio to be of a similar magnitude. Professor Lamothe's – of the *Universidad Autonoma de Madrid* - empirical work finds the benefits of international diversification reach around 16%.

This strongly suggests that the potential benefits of diversification in a bank's loan portfolio – in terms of lower risk at the portfolio level – are indeed of the order of 16-23%, that is around 20%. The fact that Basel II does not take account of an effect of this magnitude would appear to undermine claims that regulatory capital requirements will accurately reflect risk in the new Accord.

Another aspect of the Accord that has come in for significant criticism is its potentially procyclical effects. Our findings would appear to confirm these fears. When the variance of annual capital requirements is considered, it is not surprising to note that the variance of the IRB Approach represents an enormous increase compared to the standardised approach: the aim of the IRB approach is for capital requirements to reflect changes in risk in a way that the more rigid standardised approach cannot. This is the case for both the USA and Mexican data.

However, another similarity between the two countries is that the variance of the IRB approach is also significantly higher than that for the full credit risk model approach. These differences can be seen pictorially in charts 1 and 2 below.

As can be seen, capital requirements in both countries are considerably more variable using the IRB approach than the ICRM approach. Again, this is reflective of the latter taking into account the benefits of international diversification. Clearly, the operation of the normal business cycle will cause actual risks to change over time. However, it is also clear that these moves are not perfectly correlated in different market sectors or in different parts of individual countries: a US bank whose loan portfolio was entirely comprised of hi-tech companies before the collapse of the dotcom bubble would have been in a far riskier position

than one with a diversified loan base across industrial sectors.

Chart 1.

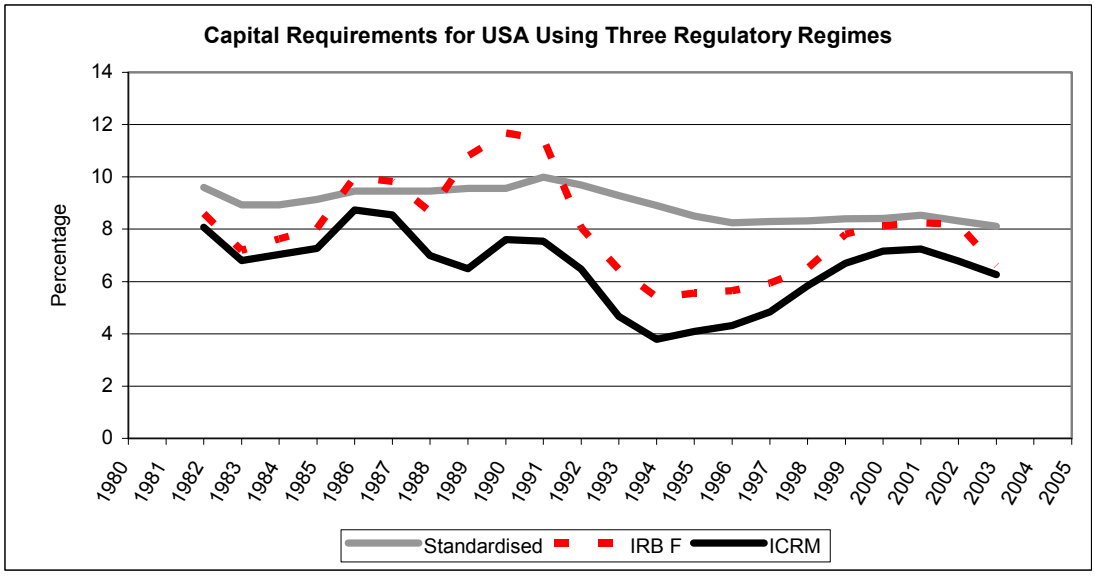
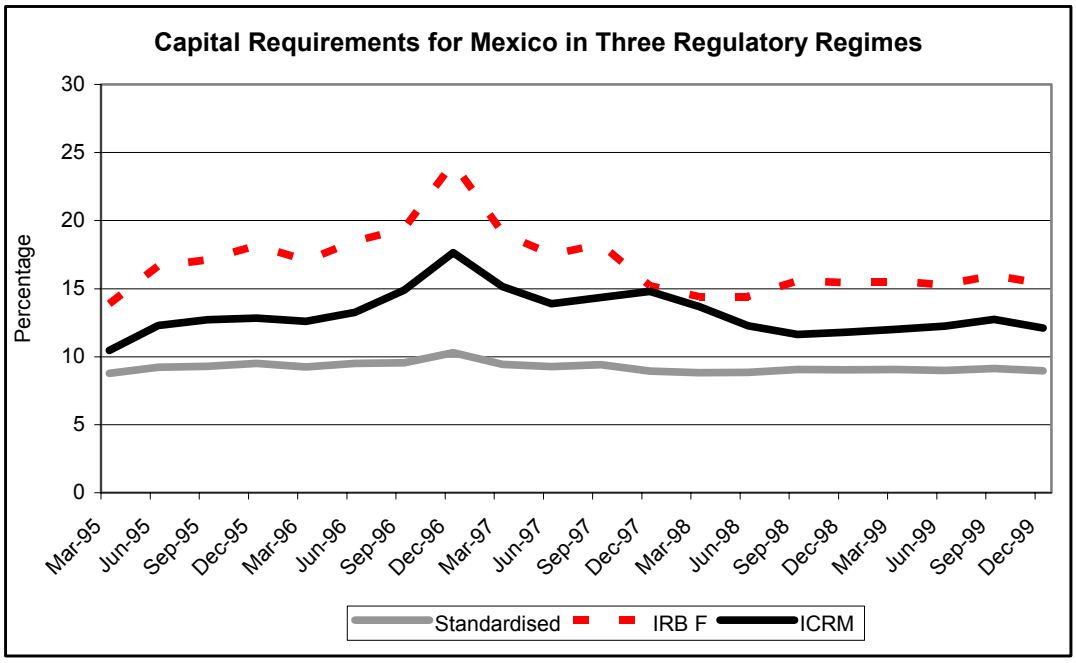


Chart 2.



Just as this is the case within a country, it is even more so between countries, where the drivers of the economy are not the same and business cycles are thus not synchronised. For example, if the U.S. economy slows downs, the Chinese may not do so or may slow down much less.

This is clearly shown in the lower volatility of the ICRM approach when compared with the IRB approach. In effect, the incorporation of the effects of international diversification smooths the fluctuations seen with the IRB approach. While this does not eliminate the problem of procyclicality, it does mitigate it significantly. This is particularly so in times of high risk, when capital requirements are high. As can be seen in the two charts above, in these circumstances the incorporation of diversification effects prevents capital requirements increasing to the same degree as under the IRB approach. In the case of Mexico, the high

point of the series comes in December 1996: under the IRB approach capital requirements would then be 24%, whereas the ICRM derived requirements would be just 17%. Differences of this magnitude, whilst not preventing difficulties, may well be significant enough to prevent a 'credit crunch'.

Therefore introducing benefits of international diversification will not only lead to a more accurate measurement of risk. It will also reduce the pro-cyclicality of capital requirements through time, which will both allow smoothing of bank lending –and therefore some smoothing of economic cycles in both developed and developing countries. It will also strengthen the stability of the banks, especially the large international ones, which is clearly a key economic objective, and an absolutely central one for G-10 bank regulators.

Concluding remarks

The cumulative evidence set out above offers overwhelming support for a) the existence of international diversification effects, and b) the impact that these effects have on the overall riskiness of a bank's loan portfolio. As the aim of Basel II is to accurately align capital requirements with risk, it is clear that in this instance far greater accuracy would be achieved by the incorporation of the benefits of diversification into the Accord. This is not a trivial effect: cumulative evidence clearly indicates that the reduction in the riskiness of a portfolio that significant diversification can produce is in the order of 20%. Crucially, credit risk models that incorporate these effects produce capital requirements that are on average 20% lower than those produced by the IRB approach, where diversification effects are not taken into account. The combined effect of this evidence strongly suggests that these effects are real and are of this order of magnitude. If a correcting factor of around 20% was introduced, there could be an error or around 4% - maximum; if it is not introduced, the error could be as high as 24%.

As well as more accurately aligning regulatory capital with risk, the incorporation of diversification effects would also serve to mitigate the pro-cyclical nature of the Accord. Their absence, in contrast, leaves the pro-cyclical aspects of the Accord that have caused such concern essentially unchanged.

Therefore, introducing soon the benefits of diversification would: (1) clearly lead to a more precise measurement of risk, the main aim of Basle 2; (2) appropriately reduce the excessive increase in cost of lending to developing countries, caused by the current lack of precision in measuring risk; (3) diminish pro-cyclicality in capital requirement, which will imply both incentives for greater stability in bank lending, that would discourage accentuation of cycles and greater stability of banks themselves, as well as of the whole banking system. It is a clear win-win situation for all involved, technically and economically. There is therefore every reason to incorporate them now, as this would clearly be beneficial to all involved.