Basel II & CAD3: Response to the UK Treasury's Consultation Paper

Stephany Griffith-Jones, Miguel Segoviano
and Stephen Spratt

s.griffith-jones@ids.ac.uk

March 2004

Introduction

The aim of this paper is to respond to the UK Treasury's consultation paper on CAD 3. We will focus on details of the potential impacts on developing and emerging economies of the new Basel Accord (Basel 2) in general, and on its translation into EU legislation via the CAD3 process in particular. To this end, we shall concentrate on those aspects of the proposals, which we believe a) are likely to have the most significant impact, and b) have the greatest chance of being addressed prior to implementation. Specifically, the concerns that we have expressed elsewhere[1] - that the Accord may lead to an overestimation of the risks of lending to developing and emerging economies – will be elaborated in the context of perhaps the Accord's major shortcoming: its failure to deal adequately with the issue of international diversification.

This shortcoming should be viewed in the context of the net impact of the Accord on developing countries, which is our overriding concern. In particular, we think it highly probable that the undisputed increase in regulatory capital that will occur for lower rated borrowers – disproportionately represented in developing countries – will feed through into an increase in cost and/or and reduction in quantity of international bank lending to these countries. Although the relationship between regulatory capital and economic capital is somewhat opaque, qualitative – interview based – evidence suggests that in practice banks operate with a cushion between regulatory capital and economic capital. If this is indeed the case, then an increase in regulatory capital for lower rated borrowers in developing countries will produce an increase in economic capital to maintain the cushion. In this event, of course, the cost of such lending will be expected to rise; possibly substantially so given the anticipated scale of the increase in regulatory capital. To return to the issue of international diversification, our view is that addressing this point adequately and correctly in the Accord will not only produce a more accurate measurement of risk but will serve to mitigate the likely increase in costs that we have described. Importantly, this mitigation will serve to further the fulfilment of the stated aim of the whole process: to align regulatory capital more closely with actual risk.

Whilst welcoming many of the points raised in the Consultation Document, there is an important general issue which we would like to raise at the outset: the fact that no comprehensive analysis has been undertaken (either in the UK or elsewhere) on the aggregate impact of the proposed Accord (both Basle 2 and even more CAD3) on borrowers and end users, and indeed on the whole economy, especially for developing countries (section 3.22). This is important for Basle 2 (and even more for CAD 3, which as the Treasury document rightly point out, will include all European credit institutions and investment firms). Furthermore, the issue of coherence of policies has been established as a major priority of G-8 governments; and yet, the analysis of the impacts of changes to the Basle Accord have been focused mainly on their effect on the banks and financial system (clearly crucial), but without examining carefully the equally important effect on the whole economy.

From our perspective it is particularly worrying that there has been no examination of the macro-economic impact on developing economies, as bank lending –both

[1] http://www.ids.ac.uk/ids/global/Finance/intfin.html

domestic and international- plays such a large role in them. This is particularly relevant as - in the case of developing economies - G-10 governments have committed themselves to the achievement of the Millennium Development Goals, which crucially include reducing poverty by half by 2015. The UK government, and its Chancellor, Gordon Brown, have a particularly strong and admirable commitment to these goals, and have championed mechanisms like the IFF to help provide resources for this aim. If Basle 2 (and CAD 3) were to inappropriately penalise international lending to developing countries, then it would work against the achievement of growth and poverty reduction objectives, to which G-10 governments are so strongly committed.

As pointed out, we believe the Treasury Consultation Document to have a number of very positive features. At a broad level, these include particularly the call for flexibility, so as to allow current practices to be updated through a Lamfalussy type directive, or through comitology (paragraph 4.27). This would allow changes to CAD 3 when appropriate, which is extremely important. For reasons we detail below, we feel that incorporating the benefits of diversification should be one of the issues where such flexibility is essential, as the Basle Accord is very likely to evolve in this aspect.

The other points we welcome are as follows:

- It is encouraging that the Consultation Document clearly recognises that "as a result of Basle 2, banks may restructure their portfolios away from those areas that attract higher regulatory capital requirements, or if the markets allow, pass on a significant proportion of the increased cost of capital to borrowers and end users." (para 3.17).

- It is very valuable that the Treasury document reflects some of the concerns expressed by developing countries about adverse, including unintended, consequences, such as that Basle 2 may increase the cost of finance to borrowers with a low credit rating, and that this increase in cost is exaggerated by the fact that the proposed new Accord does not fully take account of diversification benefits (para 4.13). The risk that Basle 2 may reduce international bank lending even further from its current low levels, especially to low-income countries, is however not explicitly addressed in the Consultation Document.

- It is also positive that the Consultation Document raises the risk of Basle 2 increasing pro-cyclicality of bank lending (para 3.25). Indeed, the risk of increased pro-cyclicality of international bank lending to developing countries may well seriously undermine the positive effect that the Treasury Consultation Document points to – that Basle 2 may encourage more sustainable bank lending to developing countries because of close alignment of regulatory capital charges to risk (para 4.12).

The remainder of the paper is structured into two main parts: Section I will give an overview of the current composition of bank lending to emerging markets from European countries; Section II will examine the issue of international diversification in some details, and conclude with concrete proposals of how the acknowledged difficulties in this area could be overcome.

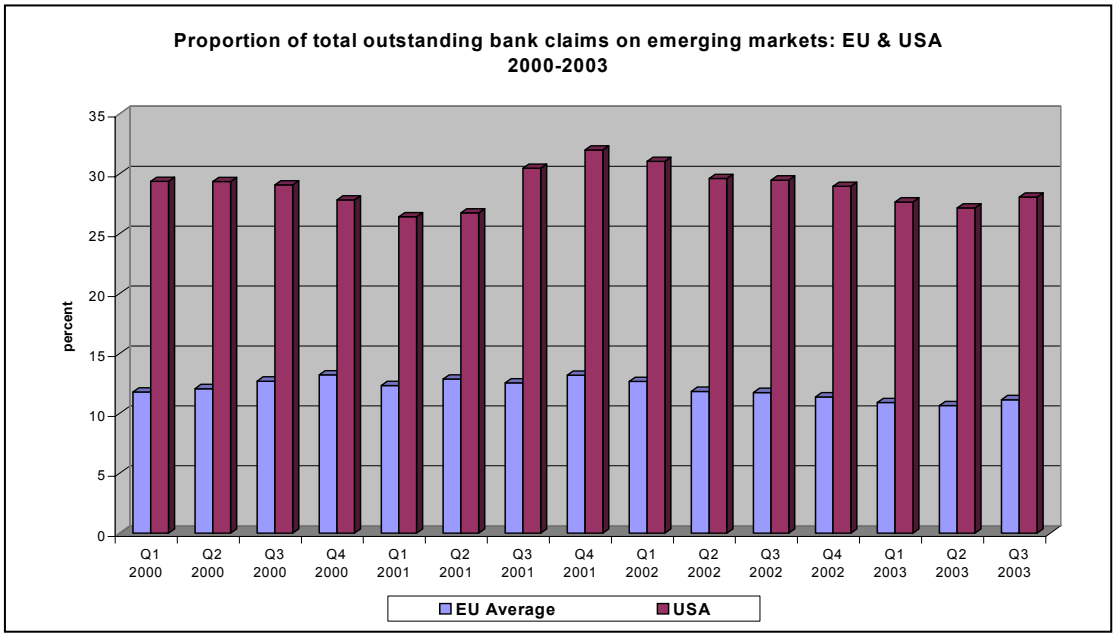
I. European bank lending to emerging and developing economies

European banks have a long history of engagement with developing and emerging economies. This has not always been an unalloyed benefit to both parties; in some cases periods of overlending during booms have been followed by credit crunches, which has been damaging to both borrowers and lenders alike. A desirable aim, for both international banks and developing countries economies, is that the developing economies are able to attract sufficient, but not excessive, bank lending to support growth and development in a sustained way.

While it may be true that banks have underestimated the risks of lending to emerging markets in some periods in the past, the more common environment is one of famine; not feast. The current situation exemplifies this phenomenon, with net bank lending to developing and emerging economies having remained at such low levels since 1998, that they have been mostly net negative. It is in this context particularly crucial that Basle 2 does not inappropriately further discourage international bank lending to developing economies, nor that it makes it more pro-cyclical.

For the EU, from 2000 to the end of 2003, the average proportion of total outstanding claims on emerging markets from EU banks has been fairly constant at 10-13%. The latest figure is just over 11%. How does this compare internationally?

Figure 1.



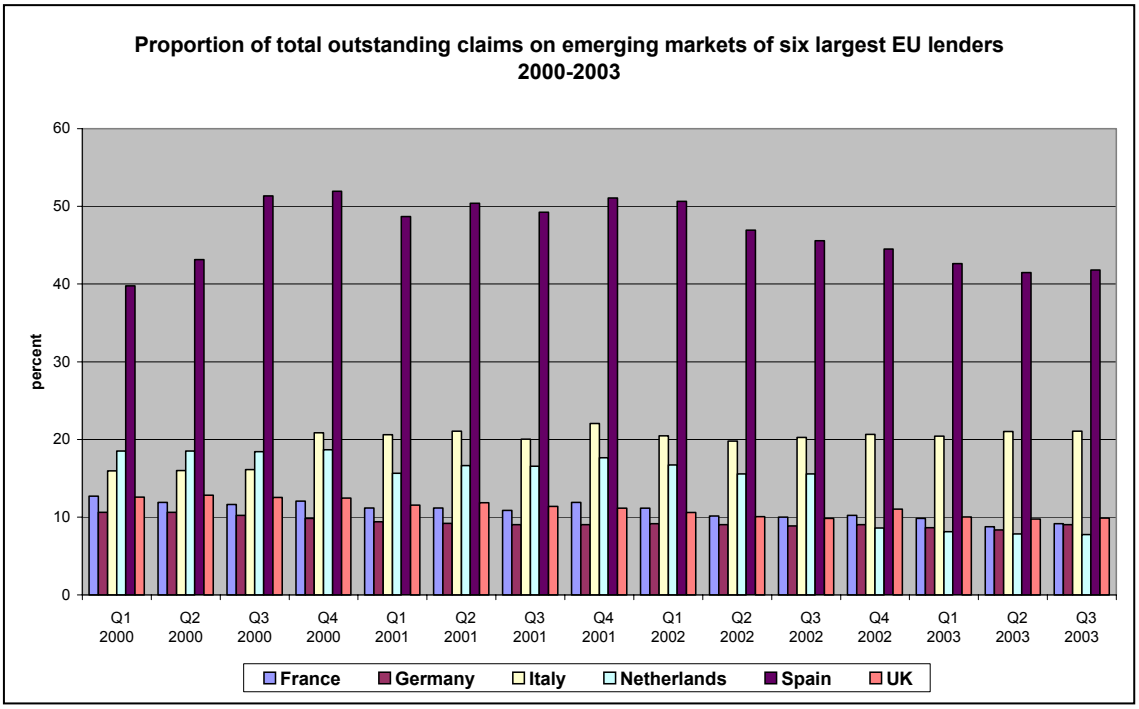
Source: BIS.

As we can see from figure 1 above, the average EU exposure to emerging markets has been almost three times lower than that for competitor banks in the U.S. The difference is – and remains – striking.

The averaged EU figures obviously disguise wide variations in the approach taken by the banking sectors in the different EU countries. Figure 2 gives disaggregated figures for the six largest international lenders from the EU.

As can be seen, the country with by far the highest proportion of banking activity in the emerging markets is Spain, which has over 40% of its total outstanding claims in the non-developed world. Next is Italy with around 20%, with the remaining four countries having between 9% and 10% of their total outstanding claims in emerging markets. Although, the most recent figure for the UK of 9.8% is not substantially below the EU average, this average is of course dragged down by the inclusion of the smaller EU economies, which have little exposure to these markets. Clearly, however, U.K. banks lend a significantly lower proportion of their total claims to emerging markets than do U.S. banks.

Figure 2.



Source: BIS

One of the primary purposes of the regulation of the capital which banks are required to hold is to minimise systemic risks to the banking system. An important aspect of the stability of any banking system is its vulnerability to economic shocks; this vulnerability in turn will be a function of a number of factors. First, the extent to which banks accurately assess, price and provision for risk will strongly influence the vulnerability of its loan portfolio to an economic shock. Second, the degree to which banks' loans are concentrated in a sectoral and geographical sense will also have a strong impact on their ability to withstand economic shocks – concentration in a small number of highly correlated sectors or markets sharply increases risks to the bank in the event of an economic shock specific to these markets and/or sectors. Although Basel 2 and its CAD3 translation into EU law are designed to improve the first of these factors, it is regrettable that the second issue has not been addressed to any meaningful extent. This is important, since by over concentrating their lending on highly correlated developed markets – far more than is the case with their US competitors – EU banks leave themselves highly vulnerable to an economic shock that affects these markets.

II. International diversification

We have seen above that major US banks are significantly more exposed to emerging markets than are their European counterparts; they are more internationally diversified. The logic of this stance lies in the practical application of modern portfolio theory as first espoused by Markowitz (1959). By diversifying their activities across a range of markets and sectors – particularly those with low correlations with one another – a bank (or indeed any kind of investor) is able to protect itself against risk in any one market whilst improving the risk/return profile of its portfolio; returns are higher for a given level of risk.

Undoubtedly the most diversified of US banks – and one of the very few fully diversified banks in any country– is Citigroup. Citigroup is not only the largest banking group in the world but also highly profitable. Indeed, in 2003 the group posted profits of US$17.85 billion, which represented the largest annual profit ever posted by a private sector entity.[2]

Given its size in the international banking market, and its enviable record of success, one would expect Citigroup's views on Basel II to carry considerable weight with the Basel Committee. What has it had to say on the issue of international diversification; a subject that is likely to be of considerable interest to the group given the scope of its international operations, not least in emerging markets?

Stanley Fischer is Vice Chairman of Citigroup and President of Citigroup International. Commenting on the costs to large internationally active banks of implementing Basel II in an emerging market context, Prof. Fischer argues that:

Large international banks that are active in emerging market economies would probably consider Basel II well worth the price of admission if the new Accord took account of the benefits of global diversification in increasing these banks' risk capacity. But unfortunately, it does not – and this is a key point. Specifically, in its current form, Basel II requires capital requirements in each country to be calculated on a standalone basis. This could significantly increase the capital requirements for operating in these markets.[3]

What would be the effect of this omission?

In the case of Citigroup, the current version of the new Accord would result in almost a doubling of the risk weighting on retail credits in the emerging markets, relative to what we currently hold, even if the probability of default (PD) and loss given default (LGD) were calculated at the regional level.

Prof. Fischer's assessment of the more general impact:

In not taking into account the risk mitigation effects of international diversification, Basel 2 in its current form runs the risk of materially reducing the incentive for larger internationally active banks to maintain and expand their operations in emerging market economies. Given the economic and other benefits of such operations, not just for the host economies and for the international financial system more generally, this must be considered a significant shortcoming.

[2] HSBC has had the largest ever pre tax profits by a UK based bank, which may also in part be explained by their high degree of international diversification.

[3] Presented as the William Taylor Memorial Lecture at the International Conference of Banking Supervisors, Cape Town, September 19, 2002.

In a more general sense, a variety of financial institutions, including representative industry bodies such as the Institute of International Finance (which represents all major international banks) and The New York Clearing House Association[4] (that represents also some major European banks), have argued strongly for the incorporation of the benefits of international diversification into the Accord. The latter commented as follows in its submission to the Basel Committee in August of 2003:

Under CP3, the benefits of diversification of business lines, asset classes, geographical regions and risk types is not adequately recognized in assessing capital requirements. This is in contrast to modern economic theory, industry practice and empirical evidence. Diversification mitigates the possibility and extent of loss by allowing holding companies to rely on earnings from one area when another area slows or experiences losses and to benefit from diversification of risk. Diversification also allows strength in market or credit performance in some areas to offset weaknesses or problems in other without necessarily drawing on capital. The regulatory capital requirements should reflect the benefits of diversification.

a) The Case for diversification benefits

In Griffith-Jones et al (2002), we presented the results of empirical work showing that the degree of correlation between the real and financial sectors of developed economies is greater than that which exists between developed and developing economies. We tested this hypothesis of differential correlations, first with specific regard to international bank lending and profitability and, secondly, in a more general but supportive sense. All of our results offer significant support for the validity of this position.

Table 1.

Variable	Time-Period	Frequency	Developed/ Developed Mean Correlation Coefficient	Developed/ Developing Mean Correlation Coefficient	Test Statistic (H0:Mx=My) Critical Value of 0.05% one-tailed test in parentheses
Syndicated	1993-2002	Monthly	0.37	0.14	3.33 (3.29)
ROA	1988-2001	Annual	0.10	-0.08	4.40 (3.29)
ROC	1988-2001	Annual	0.14	-0.11	6.92 (3.29)
GDP	1985-2000	Six-monthly	0.44	0.02	9.08 (3.29)
GDP HP	1950-1998	Annual	0.35	0.02	9.41 (3.29)
STIR	1985-2000	Six-monthly	0.72	0.23	11.09 (3.29)
STIRR	1985-2000	Six-monthly	0.66	0.22	10.93 (3.29)
GBI-EMBI	1991-2002	Daily	0.78	0.53	5.45 (3.29)
GBI-EMBI	1991-1997	Daily	0.90	0.74	4.64 (3.29)
GBI-EMBI	1998-2002	Daily	0.42	0.09	5.87 (3.29)
IFCI-COMP	1990-2000	Daily	0.58	-0.15	7.83 (3.29)
IFCG-COMP	1990-2000	Daily	0.58	-0.17	8.06 (3.29)

As can be seen from Table 1, all the results were tested to ensure statistical significance. In each cases, the results were significant at the 99.5% confidence level and the null hypothesis that the average mean correlations of the two series were equal (H0: Mx=My) was clearly rejected. As is also clear from Table 1, a wide variety of financial, market and macro variables were employed in these tests. Whilst it might

[4] The members of The Clearing House include: Bank of America, Bank of New York, Bank One, Citibank, Deutsche Bank America, Fleet National Bank, HSBC USA, JP Morgan Chase.

be suggested that each of the variables we have used could be criticized as imperfect in some way, we would argue strongly that the possibility of distortions in the data are likely to be cancelled out, as they are unlikely to be the result of common causes. Consequently, the fact that every statistical test that we have performed, regardless of variable, time-period or frequency, has pointed in the same direction - and all are clearly statistically significant on a variety of tests - offers robust and unequivocal support for the benefits of diversification.

b) How would these diversification effects be manifested in a bank's portfolio?

On the basis on this evidence, we suggested that 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. In order to test this hypothesis in the specific context of a bank's loan portfolio, a simulation exercise in Griffith-Jones et al (2002), was undertaken to assess the potential unexpected loss resulting from a portfolio diversified within developed countries, and one diversified across developed and developing regions.

Table 2. 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**

As can be seen from Table 2, the unexpected losses simulated for the portfolio focused on developed country borrowers are, on average, almost twenty-three percent higher than for the portfolio diversified across developed and developing countries. The simulated loan portfolios constructed offers more direct evidence that the benefits of international diversification produce a more efficient risk/return trade-off for banks at the portfolio level. Given that capital requirements are intended to deal with unexpected loss, the fact that the level of unexpected loss in our simulation is lower for a diversified than for an undiversified portfolio, suggests that – in order to accurately reflect the actual risks that banks may face – Basel 2 should take account of this effect.

This simulation can be criticised – as can all simulations – on the basis of the assumptions made. However, further evidence using real data has been provided by the Spanish bank, BBVA, in its document: *A practical proposal for improving diversification treatment in Basel 2*. In this paper, the authors define a "correction factor" which measures the error made when using a single factor model - such as that envisaged in Basle 2 - when in fact there are two (or three) factors affecting diversification of the portfolio. These factors could be geographical areas (emerging vs. non emerging economies), industrial activities or a combination of the two. The correction factor is defined as the ratio between the capital calculated with the two (or three factor model) and the capital obtained with the single factor model. In their study, the authors calculated the following values for the correction factor[5].

[5] The authors define the correction factors for a correlation between factors of 60%.

Table 3. Correction factor for the two and three factor model

Diversification Index	Two factor model Correction factor	Three factor model Correction factor
35 %	-	79 %
40 %	-	81 %
45 %	-	82 %
50 %	84 %	84 %
55 %	85 %	86 %
60 %	87 %	87 %
65 %	89 %	89 %
70 %	90 %	91 %
75 %	92 %	92 %
80 %	94 %	94 %
85 %	95 %	96 %
90 %	97 %	97 %
95 %	99 %	99 %
100 %	100 %	100 %

The diversification index measures how diversified the factors considered in the portfolio are. A diversification index of 35% indicates maximum diversification and 100% indicates maximum concentration. The authors show that there is a clear relationship between the correction factor and the diversification index. That is, in a situation of no diversification, the discrepancy between the one-factor model (to be used in the Basel 2 IRB framework, which does not take account of the benefits of diversification) and the two and three factor models is zero: they produce the same result as there is no diversification to take into account. However, as the level of diversification increases so does the discrepancy between the Basel 2 one-factor model and the more sophisticated two and three factor models: as diversification increases the Basel 2 one-factor model becomes increasingly inaccurate in its overestimation of the capital required. Given this, it is not surprising that the most diversified banks – Citigroup and BBVA, for example – take the issue of international diversification so seriously: they will feel the full force of this error in the form of increased capital requirements, well above that which is needed under an accurate assessment of risk. From a UK perspective, the same will of course be true for the most diversified bank: HSBC.

In practical terms – as shown in Table 3 - the maximum capital saving in the BBVA empirical work (for both the two and three factor models) ranges from 16% to 21%. It is noteworthy that these figures coincide with our own simulated calculations, suggesting that something beyond a particular case is being captured here**.** In short, if a one risk factor model were used as proposed under the Accord, it would require capital requirements to be higher than the two and three factor models by between 16% and 21%, which can be seen as a proxy for the failure to take account of international diversification.

c) Why is this not accepted?

Given this evidence - as well as the widespread acceptance of the risk reducing benefits of international diversification, which have been well-known for more than 40 years - it is strange that these benefits have not been incorporated into the Basel II proposals. This is particularly so given that the Basel Committee itself does not deny

that these benefits exist. The new Chairman of the Basel Committee, Jaime Caruana, makes this explicit below:

Portfolio theory suggests that an obvious step to further enhance the risk-sensitivity of the capital framework would be to incorporate calculations of diversification benefits into the framework. In the coming years, and we can start very soon, we look forward to working with banks, with banking associations such as the BBA, and with academics and researchers to find ways to move Basel in the direction of full credit risk models.[6]

The intention of moving Basel to full credit risk models is highly welcome. However, we think it is important that in a transition phase –whilst they are developed-, benefits of diversification are already incorporated in simpler ways (along lines we detail below). If this is not done, international banks may be inappropriately discouraged in the short term, from lending to developing countries, trend which may then take some time to reverse due to factors, such as the need of re-hiring expertise for such tasks. Such a reduction of international bank lending could have negative impacts on output and poverty reduction.

The full credit risk models that Mr Caruana refers to are, of course, the same as the two and three factor models described above. At the outset of the Basel process the possibility of using such models was investigated, but it was concluded that too many problems in their use existed for them to be used at this stage. This may seem somewhat strange, given that all major international banks – the very banks that the Basel cite as embodying best practice and that the banking industry should seek to emulate – employ such models in their calculations of economic capital. Although we would not deny that these models currently have problems, we would argue that, even in their current condition, they would be far preferable to the proposed use of one-factor models under Basel 2.

What are the problems with the current full credit risk models?

d) Modern risk management and full credit risk models

Modern risk management has developed models to assess the amount of risk that a bank faces. This 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 recorded in the so-called profit and loss distribution of the portfolio (P&L). For risk management purposes, the Value at Risk measure (VaR), from which economical capital for a bank is defined, is obtained from this distribution. If a bank holds a portfolio of assets, it should attempt to quantify a) how a given shock will affect the individual value of each of the assets held in the portfolio, and b) how the value of such assets changes jointly once a shock is recorded.

In order to derive the P&L in statistical terms, it is necessary to model the multivariate distribution of the portfolio. The modelling of the multivariate distribution requires the modelling of two sets of variables: (1) the marginal distributions of the value of each of the assets making up the portfolio; and (2) the measures of dependence among

[6] Speech to the British Bankers Association (BBA) on 9 October 2003 by Jaime Caruana, Chairman of the Basel Committee on Banking Supervision.

these assets - the most common known measure of dependence is the correlation coefficient. In order to take proper account of diversification effects in a portfolio it is thus necessary to model the measures of dependence among the assets making up the portfolio.

Modern risk management models – or full credit risk models - attempt to model the P&L, and have taken an important step forward by the correct consideration of the two sets of variables described: marginal distributions and measures of dependence among the assets making up a portfolio**.** However, even though the right set of variables has been included, there is still some way to improve the way in which these variables ought to be modelled, as discussed below.[7] The main obstacles to the accurate modelling of financial risks are as follows[8]: (1) the modelling of extreme events, (2) the dependence of the assets making up the portfolio, (3) data constraints

Since developments in the financial system depend critically on the state of confidence, it is necessary to quantify the effects of extreme shocks on the state of confidence of the markets – point 1 above. However, by definition, such shocks occur relatively infrequently and therefore the quantification of the effects of such shocks proves to be a significant challenge. As it is indicated in equation (A1.1) of Appendix 1, the underlying value of the assets making up a portfolio of loans is usually assumed to follow a normal distribution. Under this assumption, the probability of extreme negative values of these assets and therefore their probabilities of default (e.g. equation A1.3) are predicted to be much lower than has empirically been observed.

There have been models that have replaced the normality assumption by distributions with fatter tales - the probability of extreme values are thus higher under these distributions than under the normal) - however, even if this is the case, it may prove difficult to calibrate these distributions. This is because of the severe constraints in the quantity and quality of the data that is usually available for credit risk modelling. In most cases, only partial and incomplete information can be obtained on the assets of interest, and the time series of the observable variables are usually very short. Under these circumstances, the distributions may not be consistent with the analysed assets' data-generating processes, and erroneous statistical inference and economic interpretations might be reached. This makes correct calibration and implementation of the models very difficult. In other words, since any choice of model form is a postulation, limitations in data quality and quantity introduce uncertainty about the model and parameter estimates, making model and parameter risks significant (see Koyluoglu (2003)).

The new Basel Accord's proposal to use a one-factor model in the IRB approaches, which views each lending decision in isolation and fails to take account of recognised diversification effects, has been justified by the necessity to get around the difficulties related to the other two factors listed above – points 2 & 3: modelling of the measures of dependence of the assets making up a portfolio; and the lack of reliable databases. We do recognise the difficulty in accurately capturing the measures of dependence of the assets making up a portfolio. We also agree that the models developed so far in

[7] This has been evidenced in recent financial crises, since even the use of more sophisticated risk management models have underestimated the severe effects of big shocks, when everybody is trying to get out of their positions at the same time.

[8] A more technical account of the limitations of full credit risk models is set out in Appendix 1.

the market are far from being optimal. However, we reiterate that these models have made an important step forward by correctly considering two sets of variables – marginal distribution and measures of dependence among the assets making up the portfolio. Though the right set of variables is included, the challenge is to improve further the way these variables ought to be modelled. .

It is important to note that the one-factor model's failure to capture diversification effects clearly goes against the grain of trying to get the best, and most accurate, valuations in order to guide efficient market pricing, investor information and capital allocation – these are some of the key objectives of Basel 2. In this regard, the failure to incorporate diversification benefits into the Accord is likely to produce a series of wrong incentives with respect to the type of assets held in a loan portfolio, both at a point in time, and even more dynamically. This distortion could have extremely negative consequences; consequences that would be severest in emerging markets, given that an inaccurate measurement of portfolio risk will imply higher capital requirements for banks operating in these markets. We have argued that these higher capital requirements are likely to negatively affect flows and/or pricing of credit in such markets.

By not recognising portfolio diversification effects in the Basel proposal, the Basel committee is effectively taking a step backward in the development of risk management methodologies, which is likely to discourage or even reverse improvements in models and data collection: banks will have a lower incentive to make progress in these areas than would otherwise be the case. We believe that instead of excluding the portfolio diversification effects from the proposal -as is done with the one factor model approach- they should be considered explicitly with the aim to provide the right incentives to accelerate the development of improved portfolio risk management methodologies, models and databases.

The proposed use of a one-factor model in the new Basel Accord is certainly a sub-optimal outcome, since, as we have seen, the benefits of portfolio diversification are indisputable. Whilst it may be that the optimal outcome is not possible at the current time – due to the limitations of full credit risk models described above – it is surely better to select the second best option and embed incentives into the Accord that make the achievement of the optimal outcome more, not less, likely. In this respect, we could think of the current full credit risk models as a second best, whilst the one factor risk model embedded in Basel 2 is a poor third best.

Conclusion and a simple proposal

As has been demonstrated in our study and the BBVA paper, the failure of the proposals to date to take account of the benefits of international diversification suggests that, in this instance at least, risk has not been accurately measured. The fact that the proposals under Basel II will not allow these diversification benefits to be taken into account, suggests that the regulatory capital associated with lending to developing countries will be *higher* than that which the banks would – and currently are – choosing to put aside on the basis of their own models.

The specific manner that the Basel Committee –and later the European Commission for CAD3- might want to incorporate these findings is, of course, best left to them. However, BBVA has proposed a simple practical adjustment mechanism that enables the introduction of the benefits of international diversification into the current proposal. The mechanism proposed consists of using the previously mentioned correction coefficient (see Table 3) so that regulatory capital is defined from the one factor model currently proposed multiplied by this coefficient,

Capital adjusted for diversification = Capital defined by the one factor model x Correction coefficient

That is, a diversified bank would multiply its total regulatory capital by a coefficient to correct for diversification, with the coefficient being proportional to the degree of diversification. For a fully diversified bank this would be 0.79 for the three factor model and 0.84 for the two factor, in the BBVA study. As we have pointed out above, these results are compatible with our own simulation, which would suggest a correction coefficient in the range of 0.77 to 0.80. Adoption of such a correcting factor - at least as a transitional measure until full credit risk models are sufficiently robust to be used directly - would a) produce a more accurate measure of risk than under the current proposals, and b) prevent the overestimation of risk for international borrowers – particularly those in emerging and developing economies

Above all we would call for flexibility. Basel 2 should be seen as a temporary phase in an evolving process wherein individual banks develop their own effective proprietary models, preferably with continuing differences and innovation. Seen in this light it is imperative to ensure that it contains the right incentives for the development of such models and databases. This could be achieved by incorporating the benefits of international diversification. A methodology like that suggested by BBVA seems a practical and flexible way forward to achieve this immediately. CAD3 could then also allow for such transitional arrangements on international diversification. In comparison, the rigid imposition of a third best solution –as currently proposed- where no account is taken of diversification effects would seem the worst of the available options.

It is thus crucial that CAD3 is flexible enough on the subject of international diversification, to allow the possible introduction of such transitional arrangements and to be able to easily incorporate changes as Basle 2 evolves and improves. Of course introducing the benefits of diversification (for example including also amongst sectors) more broadly is one area where CAD3 should remain flexible and easy to modify.

References

BBVA, Risk Methodology, (January 2004), "A Practical proposal for improving diversification treatment in Basel 2", mimeo, Madrid.

BBVA, Risk Methodology, (January 2004), "The two-factor model for credit risk: A comparison with the BIS II one-factor model", mimeo, Madrid.

Griffith-Jones, S., Spratt S. and Segoviano, M. (2002) Basel II and Developing Countries, *The Financial Regulator,* vol. 7, No. 2, September

Koyluoglu, U., Wilson, T., Yague, M. (2003), ``The Eternal Challenge", Working paper in progress, Mercer Oliver Wyman.

Markowitz, H., (1959), *Portfolio Selection: Efficient Diversification of Investments*, John Wiley and Sons.

1. Appendix 1

1.1 Full Credit Risk Models: Current Practice

The basic premise of this type of models is that the underlying asset value of a firm (S) evolves over time (e.g. through a diffusion process: $dS = \mu dt + \sigma dW$), and that default is triggered by a drop in firms' asset value below a threshold value (X_d) that is modelled as a function of the firms financial structure. Under the original Merton (1974) framework, the creditor is effectively writing a put option on the assets of the borrowing firm. If the value of the firm (S) falls below the threshold (X_d), the shareholders will put the firm to debt-holders. Thus under this framework, we can characterize the region of default for each obligor as the area of the obligors' asset value distribution on which the default state is triggered. In summary, the liability structure together with the value fluctuations of the firms' assets determine the probability of default of individual obligors. Models commonly used by the industry such as Creditmetrics (Gupton, Finger and Bhatia (1997)) and KMV PortfolioManager are adaptations of this approach.

At the portfolio level, once the marginal distributions followed by the individual assets have been modelled, a correlation structure between the assets making up the portfolio is modelled. This correlation structure is usually modelled via the factors that affect the diffusion processes that drive the value of each type of assets (e.g. geographical areas, industrial activities). With these two elements, the multivariate distribution of the portfolio is generated. Lastly, Monte Carlo simulation algorithms are used to sample from the derived multivariate distributions and the P&L distribution is obtained.

Consider the following simplest example a simplification of the Merton (1974) model with two obligors. The value of the assets of the *ith* obligor at time *t* is denoted by $S_i(t)$. For example, for two types of obligors S_X and S_Y ; we have:

$$\begin{aligned} dS_X &= \mu_x\, dt + \sigma_x\, dW_x \\ dS_Y &= \mu_y\, dt + \sigma_y\, dW_y \end{aligned} \qquad \text{(A1.1)}$$

Where it is assumed that S_i is normally distributed. If we also assume the initial asset values to be zero $S_i\ (0) = 0$ and standardize the stochastic process such that $S_i(T) \sim \Phi\ (0,1)$. Obligor *i* defaults if its firm's value falls below a pre-specified barrier $S_i(T) \le X_d^i$.

At the portfolio level, the asset value of different obligors are assumed correlated with each other. The variance-covariance matrix (given the assumptions taken, in this case it corresponds to the correlation matrix) of S_X, S_Y is denoted by ρ. The default correlation is modelled as the correlation between the Brownian motions driving the firms' value processes. This can be written as: $dW_X\, dW_Y = \rho dt$. Equivalently this can be rewritten as:

$$\begin{aligned} dS_X &= \sigma_X dW_1 \\ dS_Y &= \sigma_Y \left[\rho dW_1 + \sqrt{1-\rho^2}\, dW_2 \right] \end{aligned} \qquad \text{(A1.2)}$$

Where W_1 and W_2 are independent Brownian motions. Under these assumptions, the individual default probabilities are:

$$\begin{aligned} \rho s_X &= \Phi\left(X_d^x\right) \\ \rho s_Y &= \Phi\left(X_d^y\right) \end{aligned} \tag{A1.3}$$

Where $\Phi(\bullet)$ is the standard normal distribution function. The joint default probability is:

$$\rho s_X s_Y = \Phi_\rho\left(X_d^x X_d^y\right) \tag{A1.4}$$

Where $\Phi_\rho(\bullet)$ stands for the bivariate standard normal distribution function with correlation ρ.