THE NEW BASEL CAPITAL ACCORD

STRUCTURE, POSSIBLE CHANGES AND MICRO- AND MACROECONOMIC EFFECTS

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EXECUTIVE SUMMARY

During the last twelve years, the drawbacks of the simple rules stated in the 1988 Basel Capital Accord on minimum capital requirements have become increasingly apparent. To address such shortcomings, the Basel Committee on Banking Supervision has been engaged for several years in a revision process that will finally lead to a New Basel Capital Accord (henceforth NBCA).

This report aims to provide a complete, up-to-date, critical picture of the NBCA, by summarising its structure and possible changes. We first briefly review the structure of the proposal issued in January 2001 (the so-called 'consultative package 2', or CP2). A thorough introduction to the mathematical model underlying the NBCA risk weights is also presented, to enable the reader to understand the technical steps leading to the new capital requirements.

Several features are then discussed in detail. The main issues can be summarised as follows:

Asset correlations. The asset correlation levels used in the CP2 would lead to a sharp increase in the overall capital requirements for banks and financial institutions all over the world. Such a rise in bank capital levels, although enhancing savers' protection and financial stability, might also turn out to be socially undesirable as it leads to an increase in the cost of credit. Moreover, rationing problems might arise, forcing banks to cut their loan portfolios and thus reducing credit supply to non-financial firms.

We show that the use of lower asset correlation coefficients for riskier borrowers represents a reasonable way of making capital requirements less demanding, reducing the threat of a generalised increase in the cost of credit. The Basel Committee itself proposed such a solution through an informal note in November 2001. This seems to be a step in the right direction, and would reduce the risk of adopting an overly conservative supervisory scheme.

Expected and unexpected losses. The new regulation should fully acknowledge the difference between expected and unexpected losses (ELs vs. ULs), and supervisors should ask banks to make use of this distinction in their pricing and provisioning practices. ELs represent the mean of the distribution of future losses and should be dealt with as a cost, not as a risk. ULs, on the other hand, might not materialise for many years. In order to face them, banks have to ask their shareholders to provide them with an adequate amount of capital, so to avoid bankruptcy if actual losses exceed expected ones.

It has been suggested that ELs be excluded from regulatory capital, since they are shielded by the banks' future margins. Such a perspective was cautiously endorsed by the Basel Committee in its November 2001 note, at least for retail portfolios (other than mortgages), and would bring in a sharp decrease in capital requirements against credit cards, revolving credits and similar forms of consumer financing (where default rates tend to be high but stable, and ELs represent a considerable share of future losses). Such an approach, however, might prove ineffective when an economic downturn increases the default rates on consumer loans, while reducing the amount of new loans demanded by individuals and families (and the margins earned by the lender).

Rather, one should encourage banks to make provisions against expected losses, charging their costs against current revenues, not against future ones.

The PD/LGD correlation. The credit risk measurement schemes followed by the Basel Committee might prove somewhat inaccurate if default and recovery risk respond – to some extent – to the same background factors. Namely, capital requirements risk becoming downward biased if PD (probability of default) and LGD (loss given default) are driven by some common causes, and show a significant, positive correlation.

Altman et al. (2001) show that, at least as far the US bond market is concerned, such a correlation emerges rather clearly from the data of the last 15 years. Recovery rates tend to decrease as defaults become more frequent, suggesting a strong link between these two sources of risk.

Procyclicality. The Basel rules are based on a minimum ratio between bank capital and weighted assets. In the NBCA, as in the 1988 protocol, losses reduce capital (the numerator in the quotient) when the economic cycle deteriorates and defaults become apparent. Furthermore, in the New Accord, weighted assets (the denominator) increase as borrowers are downgraded, due to an economic downturn. To comply with the regulatory 8% limit in the capital ratio, banks are then forced to reduce credit supply and to increase the cost of loans; which in turn, makes recessions even worse.

Such ‘procyclicality’ effects are investigated in this report, by means of a numerical simulation based on 1980–2000 data. We find that, by imposing compulsory provisions against expected losses, the risk of credit rationing in ‘bad’ years could be significantly reduced (although procyclical shifts due to rating transitions would still exist).

Moreover, we show that if banks adopting the ‘advanced’ approach to internal ratings should update their LGD estimates based on the credit risk cycle, the procyclicality effects of the new Basel protocol might be much stronger than expected.

Credit availability for less developed countries (LDCs). The NBCA might exert some strong adverse consequences for developing countries. It would bring about tougher capital requirements for high-risk borrowers, which form the customer base of most LDC banks, excluding them from bank lending and/or increasing the cost of bank finance up to unbearable levels. Moreover, the complexity of the Accord would bring about high compliance and implementation costs, not only for banks but also for their regulators. Finally, sophisticated banks from industrialised countries operating in the LDCs might enjoy a strong competitive advantage compared to small, local banks.

Furthermore, it is doubtful whether the costs incurred by an LDC-based bank developing an internal ratings-based (IRB) system would actually lead to a true improvement in its risk-measurement techniques. The lack of robust, long-term historical default data for all classes of borrowers could make the risk-assessments very subjective, thereby weakening the effectiveness of the NBCA and exacerbating its procyclicality.

Implementation costs. This is the first, and most certain channel through which the NBCA is going to affect the profitability of individual banks. Complexity is one of the most striking features of the new Accord, and setting up some ‘Basel-compliant’ risk-control systems is going to be a major challenge both for bankers and their supervisors. Complexity costs are expected to be particularly high in the European Union, where the implementation process is going to be especially cumbersome. A rough estimate of the implementation costs of Basel II suggests that these might well exceed $1,000 billion, which amounts to a considerable share of all Tier 1 capital held by banks in the world (which the Institute for International Finance estimates at about $2,000 billion). This means that, at least in the short-term, the first effect of a regulatory reform intended to improve the banks' capital adequacy might be to erode a considerable portion of it.

Market equilibria. A stronger uniformity will be the result of the adoption, by many banks, of the same risk-management tools and procedures. This might prove beneficial, if financial institutions are forced to move towards the 'efficient frontier' by adopting more sophisticated and rigorous practices. Unintended consequences might follow, however, that reduce the degree of efficiency and stability of the system. As far as stability is concerned, the adoption of a uniform risk-assessment model by all market participants is likely to magnify the swings in the economic and financial cycle; as for the banking system's efficiency, a more pervasive regulation (think of the second pillar, enabling supervisors to influence and shape the banks' risk evaluation practices) runs the risk of reducing the role of markets, cancelling out the differences between 'good' and 'bad' bankers.

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1. Introduction

During the last twelve years, the 1988 Basel Capital Accord dealing with minimum capital requirements for internationally active financial institutions has grown more and more pervasive, being integrated into national regulations in most advanced countries. Meanwhile, the limitations and drawbacks of the simple rules on which it is based have become increasingly apparent. In other words, the existence of a considerable gap between supervisory requirements and risk-based measures of economic capital has led to forms of regulatory arbitrage (whereby loopholes in the regulation have been exploited to increase the real leverage of a bank without reducing its capital ratios). Paradoxically, the inability of the 1988 protocol to discriminate between investment grade and junk borrowers might also have made some financial institutions more risk-seeking, instead of helping them control their risks.

To address such challenges, the Basel Committee on Banking Supervision has been engaged for several years in a revision process that will finally lead to a New Basel Capital Accord (NBCA). Remarkably, the new Accord is not being engineered inside a secluded laboratory by a handful of regulators and financial rocket-scientists, but its contents have been thoroughly discussed by national supervisors, banks and academics. Thus, the NBCA drafting has become a meeting point for many different perspectives: legal experts, accountants, bank managers, central bankers, finance scholars (to name only a few) have been working together, merging their professional backgrounds to make the NBCA more robust in its structure and parameters.

This report tries to provide a complete, up-to-date, critical picture of the new Basel approach to bank capital, by summarising its structure and possible changes, and by focusing on some limitations and pitfalls that might deserve further investigation.

Section 2 quickly reviews the basic framework of the reform proposal released in January 2001 (the so-called Consultative Package 2, or CP2[1]) and the mathematical model underlying the capital requirements on internally rated loans. Some simple mathematical and statistical tools are also reviewed, since they are important in order to appreciate the modification proposals discussed by supervisors, practitioners and academics over the last months.

A selection of these modification proposals is discussed in Section 3, where the main adequacy and calibration issues are outlined. We consider what steps must be taken to avoid a generalised increase in capital levels, and what possible omissions must be carefully addressed to improve the NBCA effectiveness. These include the need to distinguish carefully between the capital requirements dictated by expected losses, and

[1] Basel Committee on Banking Supervision (2001a).

those due to unexpected losses. Moreover, we stress the need to investigate the empirical link between defaults and recoveries, since a positive correlation between these two sources of risk might lead to a systematic underestimation of future credit losses.

Section 4 focuses on the main effects that the NBCA is likely to exert both on financial markets (macro effects) and on individual banks (micro features). The former include the risk of reducing credit supply to less developed economies and, above all, the danger of making credit supply strongly procyclical, exacerbating cycles that bank regulation should, in principle, level out. Some computer-based simulations are carried out to see whether the risk-weight calibrations proposed in recent months would really ease the problem. We evaluate the effect on procyclicality of a compulsory provisions regime, and also the risk that the empirical link between default probabilities and recovery rates may make procyclicality even worse than expected. As concerns the microeconomic effects of the new Basel Accord, we briefly analyse its implementation costs and try to figure out how it will change the way banks compete in originating and maintaining their loan books.

This report is part of a long-term commitment by CEPS to monitor and discuss – through research papers, workshops and roundtables – the NBCA revision process. I would like to thank Karel Lannoo and Rym Ayadi for providing me with valuable suggestions and hints on the structure and aims of this work.

2. Towards Basel III: A review of the 2001 proposals

This section is dedicated to the basic structure of the reform proposal released in January 2001 (the so-called Consultative Package 2, or CP2) and discussed by supervisors, practitioners and academics in the subsequent months.

It consists of two parts. The first briefly recalls the basic structure and aims of the CP2, which should by now be well known to most readers and the second one is dedicated to a quick review of the mathematical model underlying the capital requirements on internally rated loans. Note that this model not only builds the core of the January 2001 proposal, but also plays a pivotal role in most changes suggested in recent months. Therefore, a quick analysis of its structure will enable us to better understand the possible drawbacks in the CP2 that were highlighted after its release, and the modifications likely to be implemented in the new version of the Accord, due to be released by the end of this year.

2.1 The January 2001 draft: Basic features

According to the CP2, bank supervision will be based on three components (the so-called ‘pillars’ of the NBCA), i.e. minimum capital requirements, supervisory review process and market discipline. Although all of them are equally meaningful in the supervisors’ eyes, most comments and criticisms have focused on the first pillar, since it contains some precise, quantitative rules for computing the new minimum capital requirements, and any change in such rules is likely to have a deep impact on bank leverage, profitability and the price of bank credit for the real economy.

As concerns credit risk capital, the CP2 marks a break with the past, since loans issued to similar counterparts (e.g. private firms or sovereigns) will require different capital coverage depending on their intrinsic risk, as evaluated by some external rating institution ('standard approach') or by the bank itself ('internal ratings-based', or IRB approach).

In the standard approach, the amount of capital required on a €1 loan to a private firm (now fixed at 8 eurocents) could decrease to 1.6 eurocents or increase to 12 eurocents, based on the ratings issued by external credit assessment institutions.[2] However, the capital ratio for unrated borrowers (which build the vast majority of a bank's loan portfolio, and tend to be riskier than rated ones) would stay unchanged at 8%, in order to avoid any dramatic change in the total capital requirement.[3]

If a bank chooses to create its own rating system (instead of depending on external agencies), it will face two options: a simplified, or 'foundation' IRB approach and a more 'advanced' one. In the foundation approach, the bank is responsible only for measuring (in a transparent and reliable way) the probability of default (PD) of its borrowers. However, this is just one of the basic components originating credit risk; the other ones (loss given default or LGD, exposure at default or EAD, maturity) are set at some fixed levels by the supervisors.[4] In the advanced approach, on the other hand, the bank will be responsible for estimating all the parameters required for credit risk measurement, although it will have to prove to supervisors that such estimates are based on a wide empirical dataset and are consistent with its own loss experience in the previous years.[5]

The risk parameters of each loan (PD, LGD, EAD and maturity) are turned into a capital requirement by means of an algebraic formula based on a simple credit risk model (see section 2.2 below). Capital ratios increase linearly with LGD and EAD, less than linearly (although quite steeply) with default probability.

The bank's final capital target is then computed simply as the sum of all individual requirements. Subadditive portfolio models,[6] e.g. credit VaRs, are not admitted, but an adjustment is performed to account for portfolio 'granularity'. This acknowledges the

[2] As noted by Altman and Saunders (2001), the capital requirements associated with different 'risk buckets' envisaged in the standard approach do not reflect the different quality levels associated with agency ratings. For example, the 'best' loans (rated AAA to AA-) command a 1.6% capital charge even if their historical default rates look almost immaterial. At the opposite end of the scale, the dominant 'junk bond' rating (single B) and the lowest (and far less common) CCC rating are combined into the same bucket, even though the empirical evidence on rated bonds suggests that the default probability is much greater for the latter than for a single B issue.

[3] Note that, even so, the total capital charge for banks adopting the standardised approach shows a significant increase when operational risk is added (see below).

[4] Note that such standard levels are not constant for all loans, but vary with the degree of riskiness of the underlying loans. For example, while LGD is fixed at 50% for senior, unsecured facilities, it can be lower for loans backed by financial collateral (or by some kinds of 'physical' collateral, such as residential estate).

[5] Following a so-called 'evolutionary' approach, banks will first be prompted to adopt the foundation approach. Only as they grow more confident about their internal estimates (and can show the regulators the databases on which those estimates are based) will they be allowed to move to the advanced approach.

[6] A risk measure is said to be *subadditve* if the total risk (therefore also the total capital requirement) of a pooled loan portfolio is less than the sum of the risks (and capital requirements) of the individual loans. Note that, since different loans tend to be imperfectly correlated, thereby allowing for some risk diversification, sensible risk measures always tend to be subadditive.

fact that portfolios formed by a high number of small facilities tend to be less risky than those based on a set of large loans. Nevertheless, the different degree of correlation between various groups of obligors (i.e. firms belonging to different industries or geographical areas) is not accounted for, and all borrowers are supposed to be affected by the same macroeconomic drivers.

Finally, the new capital requirements will not be limited to credit risk (as in the 1988 Accord[7]), and a considerable amount of capital will have to be held against operational risk (i.e. the risk that flaws in a bank's own systems or human resources, as well as external events, may cause unexpected losses, e.g. due to mass litigation, fraud or natural catastrophes). Namely, according to the January 2001 draft, as much as 20% of total bank capital should be set aside for operational risks. Since for many small banks credit risk capital is likely to remain roughly unchanged, this would lead to a 25% increase in the total requirement.

2.2 An overview of the model used to generate capital requirements against credit risk

The risk weights used in the CP2 and in the subsequent materials issued by the Basel Committee are based on a simple credit risk model. This section quickly reviews its structure, to enable the reader to fully understand the comments made later in the report. Note that another quick introduction can be found in Finger (2001), while a more detailed and rigorous presentation of the model is available in Gordy (2001).

Consider a credit portfolio made up of a huge number of small loans (that is, an 'infinitely granular' portfolio). Each borrower defaults if and only if the value of his or her assets falls below some default threshold at a given time horizon (e.g. if one year later the asset value falls below the value of the debts that have to be repaid at that date). The per cent change in the asset value of borrower *i* can be expressed as:

$$Z_i = w \cdot Z + \sqrt{1-w^2} \cdot \varepsilon_i \qquad [1]$$

that is, as a linear combination[8] of two components: factor Z, which responds to the macroeconomic cycle (and therefore affects all borrowers in the same way) and factor ε_i which depends only on the borrower's individual (i.e. idiosyncratic) risk. Depending on the factor loadings, a borrower can be more or less exposed to the cycle. As *w* increases, all obligors tend to be more and more correlated among themselves, whereas a decrease in *w* means that idiosyncratic features prevail and that all borrowers are more and more independent.

Note that this is probably a simplistic way of representing the effect of macroeconomic forces on a firm's asset value. A multifactor model, with two or more random variables accounting for the different factors that drive the state of the economy (such as inflation,

[7] Note that, however, the original Accord was amended in 1996 to accommodate some sources of market risk, mainly on foreign currencies and trading portfolios.

[8] Note that since *Z* and ε_i have variance one, and the variance of the sum of two independent random terms, $var(\alpha x_1+\beta x_2)$, always equates $\alpha^2 var(x_1)+\beta^2 var(x_2)$, one has to impose that $\alpha^2+\beta^2=1$ in order to make sure that Z_i follows a standard normal distribution. In our case, this is done by setting the second weight equal to the square root of $1-w^2$, where *w* is the first weight.

foreign exchange, unemployment, interest rates and so on) would probably be more realistic, and would account for the fact that different firms respond to different macro drivers. However, such a model, although well known to credit risk scholars,[9] would be somewhat impractical for regulatory purposes.[10] This is why the Basel Committee decided to stick to a single-factor model such as the one we are presenting here.

Both Z and ε_i are thought to follow a standard normal distribution; from equation 1, it follows that Z_i is standard normal-distributed too. Note that, for any pair of obligors, the correlation between per cent changes in their asset values (henceforth 'asset correlation') is:

$$\rho(Z_i, Z_j) = w^2 \qquad [2]$$

Now, let p_i be the unconditional (i.e. independent of the macro factor) default probability for obligor i. Then the per cent decrease in the asset value that makes obligor i hit his or her default threshold is α, such that $\Phi(\alpha)=p_i$ (see Figure 1), where $\Phi(.)$ denotes the standard normal cumulated density function. This means that firm i defaults if and only if $Z_i < \alpha$.

Now, suppose we know that the macro factor is going to take value Z*. Then:

$$Z_i = w \cdot Z^* + \sqrt{1-w^2} \cdot \varepsilon_i \qquad [3]$$

and firm i defaults if and only if:

$$Z_i = w \cdot Z^* + \sqrt{1-w^2} \cdot \varepsilon_i < \alpha \qquad [4]$$

that is, if

$$\varepsilon_i < \frac{\alpha - w \cdot Z^*}{\sqrt{1-w^2}} = \frac{\Phi^{-1}(p_i) - w \cdot Z^*}{\sqrt{1-w^2}} \qquad [5]$$

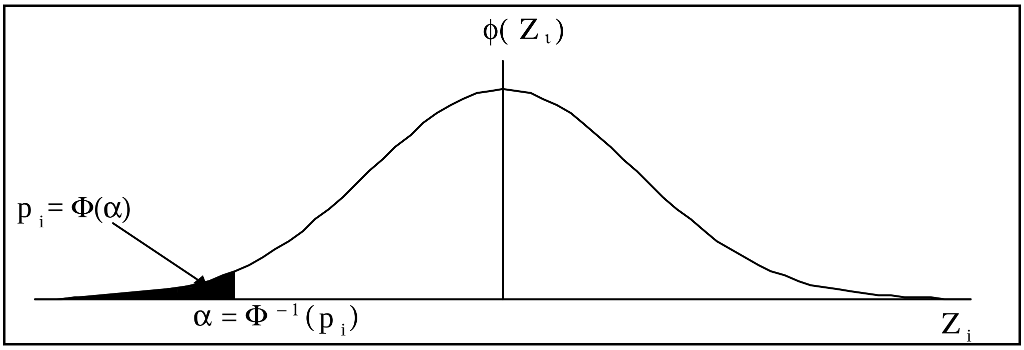
Since ε_i follows a standard normal distribution, the default probability for obligor i, *conditional on* $Z=Z^*$, is as simple as:

$$p_i\big|_{Z=Z^*} = \Phi\left[\frac{\Phi^{-1}(p_i) - w \cdot Z^*}{\sqrt{1-w^2}}\right] = f(Z; p_i, w) \qquad [6]$$

[9] See e.g. Credit Suisse Financial Products (1997) or Gupton et al. (1997), on the CreditRisk+ and Creditmetrics models, respectively. Note, however, that a single-factor version of the latter was proposed by one of its authors (Finger, 1999) to make computations faster.

[10] A multi-factor model would make computations more complex and, above all, it would make capital requirements on a new loan dependent on the composition of each bank's portfolio.

Figure 1. The default threshold expressed as a per cent decrease in asset value



Note that, since our portfolio is infinitely granular, the empirical default rate experienced when $Z=Z^*$ equals this conditional default probability. In other words, similar to what happens in Montecarlo experiments, as the number of draws becomes larger, random (idiosyncratic) error fades away and observed distributions tend to coincide with theoretical ones. The conditional probability shown in equation [6] therefore can also be thought of as *the loss our credit portfolio will actually stand,* given a €1 exposure and a 100% LGD, *if the macroeconomic factor takes value Z*.*

However, we do not know what value factor Z will take. Infinite values for Z* may generate infinite values for our future losses. Yet, since we know that *Z* follows a standard normal distribution, where the *X*-th percentile can be denoted as:

$$Z_x \big| \Phi(Z_i) = X \qquad [7]$$

we can use equation [6] to pick up a loss value *L*, such that it will be exceeded only X% of the times. Clearly, this is:

$$L = f(Z_X; p_i, w) = p_i\big|_{Z=Z^*} = \Phi\left[\frac{\Phi^{-1}(p_i) - w\cdot\Phi^{-1}(X)}{\sqrt{1-w^2}}\right] = g(X, p_i, w) \qquad [8]$$

This equation gives us the amount of capital that will cover (1-*X*%) of all possible losses. Choosing X=0.5% and $\rho=w^2$=20% one gets a capital requirement that depends only on the obligor’s unconditional PD:

$$L = g(X, p_i, w) = \Phi\left[\frac{\Phi^{-1}(p_i) - \sqrt{20\%}\cdot\Phi^{-1}(0.5\%)}{\sqrt{1-20\%}}\right] =$$
$$\cong \Phi\left[\frac{\Phi^{-1}(p_i) - 0.447\cdot(-2.576)}{0.894}\right] \cong \Phi\left[1.18\cdot\Phi^{-1}(p_i) + 1.288\right] \qquad [9]$$

which builds the core of the weighing function described in the January 2001 draft.

To be able to view our default rate as a per-euro loss we imposed a 100% LGD. This assumption can be easily relaxed by scaling down the capital requirement according to the real LGD (in practice, assuming that a €2 loan with a 50% LGD can be treated like a €1 loan with a 100% LGD[11]):

[11] Note that LGDs are treated as deterministic. In other words, once a bank has estimated the LGD on a loan, this forecast *is always correct*, and no additional risk can arise from the fact that actual LGDs can be

$$L = LGD \cdot g(X, p_i, w) \cong LGD \cdot \Phi\left[1.18 \cdot \Phi^{-1}(p_i) + 1.288\right] \qquad [10]$$

This formula is based on a default model and therefore covers only default risk. Long-term loans, however, might experience a decrease in their fair value just because the obligor has been downgraded, and the future cash flows on the loan have to be discounted using higher credit spreads. We therefore should adjust the formula to account for different maturities, increasing the capital required against loans lasting more than one year. This can be done by multiplying L by a 'maturity factor' such as the following one:

$$b_{p_i} = 1 + \frac{0.0235 \cdot (1 - p_i)}{p_i^{0.44}}(M - 1) \qquad [11]$$

This factor amounts to one (implying no change in L) when the loan maturity M is one year. Longer maturities bring about an increase in capital and this increase tends to be more significant for high-quality borrowers, since they are more exposed to downgrade risk.

Suppose that the average maturity of bank loans is three years. Then the formula becomes:

$$b_{p_i} = 1 + \frac{0.047 \cdot (1 - p_i)}{p_i^{0.44}} \qquad [12]$$

And the overall capital requirement $L^*=L \cdot b$ amounts to:

$$L^* = L \cdot b = LGD \cdot \Phi\left[1.118 \cdot \Phi^{-1}(p_i) + 1.288\right] \cdot \left(1 + \frac{0.047 \cdot (1 - p_i)}{p_i^{0.44}}\right) \qquad [13]$$

To get the weighing function used in the CP2, we still have to add in a prudential scaling factor of 1.56, which is supposed to account for possible measurement errors in the banks' rating systems, and for the fact that Tier 2 instruments (such as subordinated loans) show a weaker loss-bearing capacity than core capital. Adding this scaling factor, we finally get the capital requirement on corporate loans indicated in the January 2001 document:

$$L^* = 1.56 \cdot LGD \cdot \Phi\left[1.118 \cdot \Phi^{-1}(p_i) + 1.288\right] \cdot \left(1 + \frac{0.047 \cdot (1 - p_i)}{p_i^{0.44}}\right) \qquad [14]$$

(see Basel Committee, 2001a). More generally, the capital requirement based on this model can be expressed as:

$$L^* = \boldsymbol{s} \cdot LGD \cdot \Phi\left[\frac{\Phi^{-1}(p_i) - w \cdot \Phi^{-1}(X)}{\sqrt{1 - w^2}}\right] \cdot \left[1 + \frac{0.0235 \cdot (1 - p_i)}{p_i^{0.44}}(M - 1)\right] = \qquad [15]$$
$$= l(p_i, LGD; \boldsymbol{s}, M, X, w)$$

higher than expected. However, recovery risk exists and should be factored into a bank's credit risk computations. See e.g. the discussion in Frye (2000) and Altman et al. (2001).

where, by setting σ=1.56, M=3, X=0.5%, w^2=ρ=20%, one gets back to the CP2 capital requirement on corporate loans[12] shown in equation [14]. Reducing asset correlation ρ to 8.1–8.2%, one gets the CP2 capital requirement on retail exposures.[13]

3. Towards Basel III: Some changes that might (or should) be implemented

The overall framework of the CP2 met the appreciation of the banking and financial community, and was welcome as a significant step towards a closer integration between regulatory and economic capital. As noted by the Basel Committee itself, however, many of the procedures and rules indicated in the draft might require some further calibration. Namely:

1. Since the Accord is not meant to raise capital requirements for the whole financial system, but only to make capital closer to risks on an individual basis, some steps must be taken to avoid a generalised increase in capital levels.
2. All possible flaws, omissions and inconsistencies must be carefully addressed, also to minimise the risk of generating some new kind of 'regulatory arbitrage' like those prompted by the 1988 agreement.

3.1 Appropriateness of overall capital requirements

We first consider the risk of a generalised increase in capital levels. The Basel Committee has been promoting some simulations, or 'impact studies', in which a large, international sample of banks has tried to estimate the effect that the new Basel rules would exert on their capital requirements. The results of such simulations have highlighted that, although some banks might experience a decrease in their regulatory capital, most of them would face a sharp rise, especially when adopting the so-called IRB foundation approach.

Table 1 and Figure 2 summarise the main findings of the impact study carried out by the Basel Committee in the second half of 2001.[14] As can be seen from the table, both the standardised and IRB foundation methods would bring about a considerable increase in total capital requirements for all groups of banks. However, although in the standardised framework the upsurge in capital ratios can be ascribed mainly to non-credit risks,[15] both operational and credit risk capital would considerably rise for banks implementing a 'simplified' internal ratings system.

[12] In the CP2, all capital requirements are capped at 100%, in other words, a bank may never be asked to set aside an amount of capital higher than the loan it refers to.

[13] This reduction accounts for the well-known fact that retail loans are influenced more by individual (idiosyncratic) risks and therefore allow a higher degree of diversification, even though they are usually riskier than corporate exposure on a stand-alone basis.

[14] This is usually referred to as the 'QIS 2' (Quantitative Impact Study 2) exercise. Details can be found in Basel Committee on Banking Supervision (2001b).

[15] Note that the capital charges against operational risk used in the QIS 2 exercise were significantly lower than those stated in the CP2. While the latter suggested that operational risks absorb some 20% of total capital, QIS 2 data were adjusted, reducing the relative weight of operational risks to 10-12%.

Table 1. Changes in capital requirements under the CP2 proposals*

	Standardised		IRB foundation		IRB advanced	
	Credit	Overall	Credit	Overall	Credit	Overall
Large, internationally active G-10 banks	+6%	+18%	+14%	+24%	-5%	5%
Smaller/specialised G-10 banks	+1%	+13%				
Large, internationally active EU banks	+6%	+18%	+10%	+20%	-1%	9%
Smaller/specialised EU banks	-1%	+11%				
Non-G-10, non-EU banks	+5%	+17%				

*After cutting operational risk charges – see footnote 15 below.

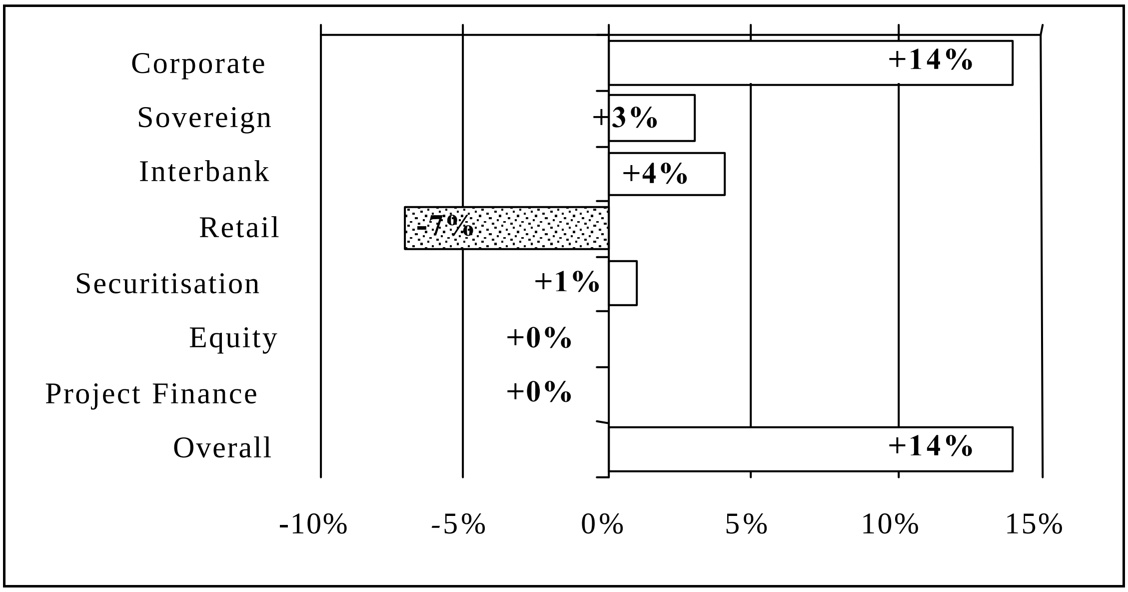
Source: Basel Committee estimates based on a sample of 138 banks.

- As concerns *operational risks*, the introduction of a heavy capital requirement has been extensively criticised in the last months. First, the definition of operational risk given in the CP2 is still too wide-ranging and vague. Furthermore, the techniques and databases used to measure this category of risk are yet in their early days, and it might be unwise to link them to an explicit (and costly) capital requirement before they are adequately tested in the years to come. Finally, given the 'idiosyncratic' nature of most operational risks (which, unlike financial risks, appear to be mostly uncorrelated to each other), it has been argued that they should not attract any compulsory capital charge, since bank regulation is aimed at protecting consumers and markets from systemic risks, not at preventing individual banks from failing.[16]
- Turning to *credit risk*, the capital increase shown by most banks can be decomposed into its main drivers. For example, Figure 2 (still based on the Basel Committee's QIS 2), shows how the 14% rise experienced by large, international banks under the foundation approach can be broken up into its main components: while capital requirements due to retail loans experience a reduction, the corporate, sovereign and interbank portfolios are the main causes of the overall increase.[17] This is consistent with some estimates referred to single banking systems or carried out by international associations. For example, Maino (2001) reckons that Italian banks adopting the foundation approach would experience an increase of about 17% in capital requirements due to corporate loans, while the capital charges against retail facilities would be cut roughly by 10%. Other members of the Institute of International Finance in their own individual impact studies achieved similar results.

[16] As noted by Danielsson et al. (2001), 'failures that are due to market or credit risk can spread because they arise out of shocks that are common to many participants. Operational risk is fundamentally different, however – it is in most cases purely idiosyncratic: hence the argument from contagion is largely irrelevant here.' Similar concerns were raised by Goodhart (2001), who noticed that 'the introduction of this new capital requirement will add a further layer of complexity and bureaucracy to the regulatory process in the financial field. The positive case why it should be introduced at all has yet to be convincingly made.'

[17] Sovereign and interbank loans (as well as securitisation tranches) were found to be more heavily affected, in relative terms, than the corporate portfolio. However, due to its pivotal role among bank loans, the latter exerts a stronger absolute effect on total capital requirements.

Figure 2. Contribution of partial portfolios to the overall change in capital requirements for G-10 large, international banks adopting the IRB foundation approach



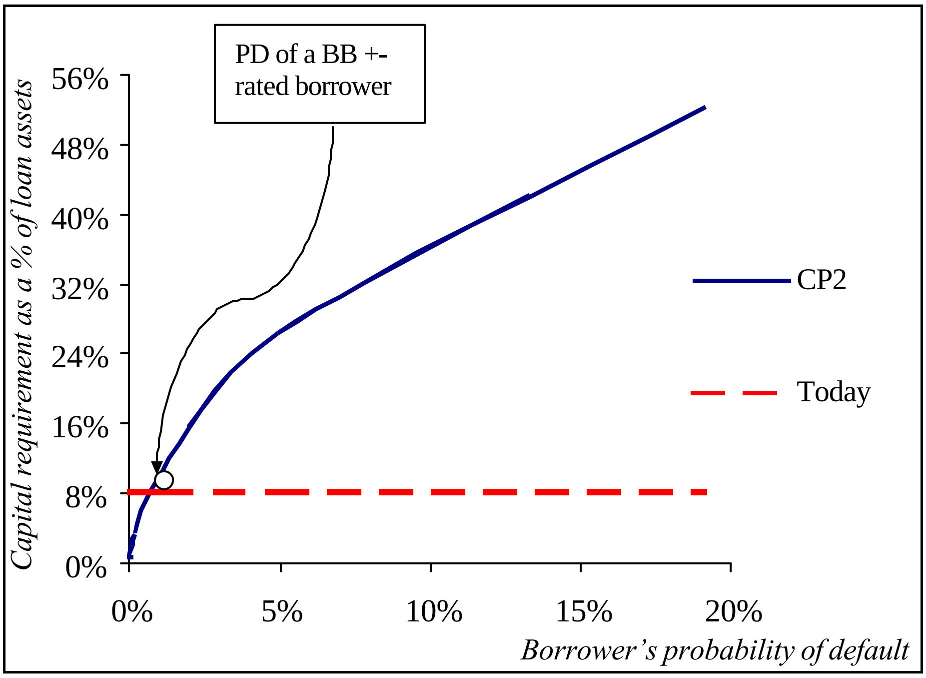
Note: Partial figures do not add up to the total, due to rounding.
Source: Basel Committee on Banking Supervision.

The rise in capital requirements against corporate loans is hardly surprising, given the structure of the weighing function adopted in the CP2. Under that function (see Figure 3), capital charges on corporate exposures remain unchanged at 8% for unsecured loans to obligors having a 0.7% probability of default (roughly equivalent to a BB+ rating on Standard & Poor's scale). However, most bank borrowers would never achieve such a rating because they are small, young or risky firms that capital markets are not willing to fund directly. Obviously, then, if the average default probability of bank borrowers is more than 0.7%, the CP2 function can only bring about an increase in capital requirements.[18]

Note that an overall rise in bank capital levels, although it enhances savers' protection and financial stability (at least in a static sense[19]), might also turn out to be socially undesirable as it leads to an increase in the cost of credit.[20] Moreover, if all banks were to turn to capital markets to raise more Tier 1 and Tier 2 capital, rationing problems might arise, forcing them to cut their loan portfolios and thus reducing credit supply to non-financial firms.

[18] According to some historical estimates performed by the Bank of Italy in its Public Database (*Base Informativa Pubblica*), the average yearly default rate for bank borrowers being granted facilities for more than €2.5 million appears to range between 1.6% and 8.5% in different regions of the country. This is much more than the 0.7% default probability needed to leave capital charges unchanged under the CP2 scheme. Moreover, estimates carried out by the Bank of Italy on a portfolio of loans issued by 51 Italian banks to medium-large obligors show that 62% of the loans go to (mostly unrated) companies with a credit quality equivalent to BB or below (see Marullo-Reedtz, 2000); should smaller firms be included, this percentage would obviously increase.

Figure 3. Capital charges for loans of different quality according to present rules and to CP2 proposals (a 50% LGD, 3-year maturity is assumed)



This does not imply, however, that average capital requirements cannot be raised from today's 8%. Simply, it means that all assumptions and parameters in the CP2 model must be carefully scrutinised before they come into effect, leading to a (potentially painful) increase in capital ratios.

Among those parameters, asset correlation (ρ) has caught the attention of many bankers and researchers. As seen in the previous section, its square-root (the factor-loading *w*) measures a borrower's sensitivity to the overall economic cycle (highlighting systematic risk, like the β coefficient in the Capital Asset Pricing Model). In principle, then, each obligor should be assigned a different *w* depending on the degree of 'cyclicality' of his or her business. However, to keep things manageable, the CP2 sets ρ at 20% for all corporate exposures.

Although such a value might be sensible for large firms, which respond heavily to changes in the macroeconomic environment, medium-to-small companies seem to be driven mainly by idiosyncratic elements, which reduce their average asset correlation. In other words, small, low-quality firms usually tend to be riskier because of their own weaknesses (such as bad management, poor financial planning, low-quality accounting). This means that the effect of systematic risk on their profits, liquidity and financial health is proportionately lower.

The 20% asset correlation used in the CP2 seems have been estimated mainly from three data sources: the historical volatility of default rates measured by large rating

[19] See below for a discussion of the procyclicality effect.

[20] Given a 6% risk-premium on bank equity, for example, a 10% increase in the minimum capital ratio (from 8% to 8.8%) would raise average bank rates by about 5 basis points.

agencies such as Moody's or Standard and Poor's;[21] asset values estimated – through a Merton-like model[22] – from the equity value of a wide sample of listed firms; and a survey on the internal practices of a sample of large banks.

All these sources, however, might be somewhat biased towards large obligors, since they are more likely to be agency-rated, listed or financed by large, internationally active banks like those surveyed by the Basel Committee.

Actually, empirical analyses carried out on average commercial banks suggest that asset correlations might be remarkably lower. For example Sironi and Zazzara (2001), based on Italian data,[23] suggest that asset correlations might be of about 4% for corporate obligors.[24] Even accounting for the fact that they are working on sample data, the authors show that, in 95% of all cases, the 'true' value of ρ should not exceed 7.5%.

The Basel Committee has been working extensively on the calibration of ρ. In November 2001 an informal note was issued ('Potential modifications to the Committee's Proposals'), suggesting that the asset correlation coefficient on corporate exposures might be set below 20% (but not lower than 10%), depending on the borrower's probability of default (p_i). In symbols, the ρ (i.e. w^2) in equation [15] should be computed as:

$$\rho_i = \eta(p_i) \cdot 10\% + [1 - \eta(p_i)] \cdot 20\%$$

i.e. a weighted average of two extreme values (10% and 20%). The weight η would depend on p_i according to the following rule:

$$\eta(p_i) = \frac{1 - e^{-k \cdot p_i}}{1 - e^{-k}}$$

where k is a parameter (set at 50 in the November 2001 note) governing the steepness of the function. A higher k implies that the η increases faster with p_i, and therefore the ρ_i assigned to a low-quality borrower converges quickly to 10%.

This new rule would recognise the fact that (as mentioned above) riskier firms are usually driven mostly by idiosyncratic factors, and therefore are less prone to systematic

[21] Given some assumptions, asset correlation coefficients can be estimated from the time-series of default rates: see Appendix F in Gupton et al. (1997) for details. Intuitively, if default rates tend to be more volatile over time, this suggests that firms respond more heavily to economic cycles, so their asset correlations must be higher.

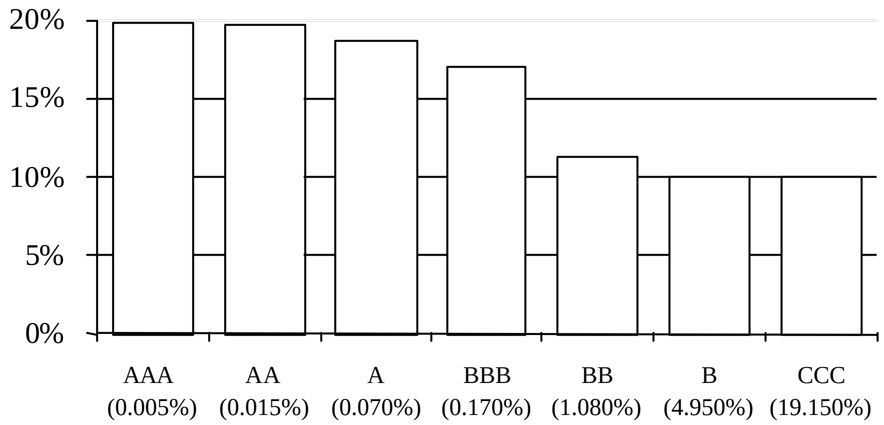
[22] Such estimates are regularly carried out by KMV, a San Francisco-based consultancy that specialises in models connecting default probabilities to equity prices. See e.g. Crosbie (1999) for an introduction to KMV's use of Merton-like models.

[23] Italy represents a favourable setting for empirical analyses, since the Central Credit Registry run by the Central Bank has been maintaining statistics on bank defaults for the last 16 years. Those statistics, aggregated by loan size, industry and geographical area, were made public in 2000 and are updated every year.

[24] Obligors being granted credit lines of €250 million or more by the whole Italian banking system.

risk.[25] It therefore would assign lower asset correlations to non-investment grade ratings (see Figure 4).

Figure 4. Asset correlations (r) for corporate obligors with different ratings (unconditional probability of default p_i is shown in parentheses)



However, this is not the only modification to corporate risk-weights suggested in November 2001. As shown in Table 2, the conservative scale factor σ would be eliminated (i.e. reduced to 1) and replaced by an increase in the confidence level of the model (which would be set at 99.9%, instead of 99.5%).

Table 2. An overview of possible parameter changes for corporate exposures

		January 2001	November 2001
Scale factor	σ	1.56	1
Maturity	M	3	3
Confidence level	1-X	99.5%	99.9%
Asset correlation	$\rho=w^2$	20%	10-20%
Expected losses		Included	Included

Note: Highlighted cells are changes from the CP2.

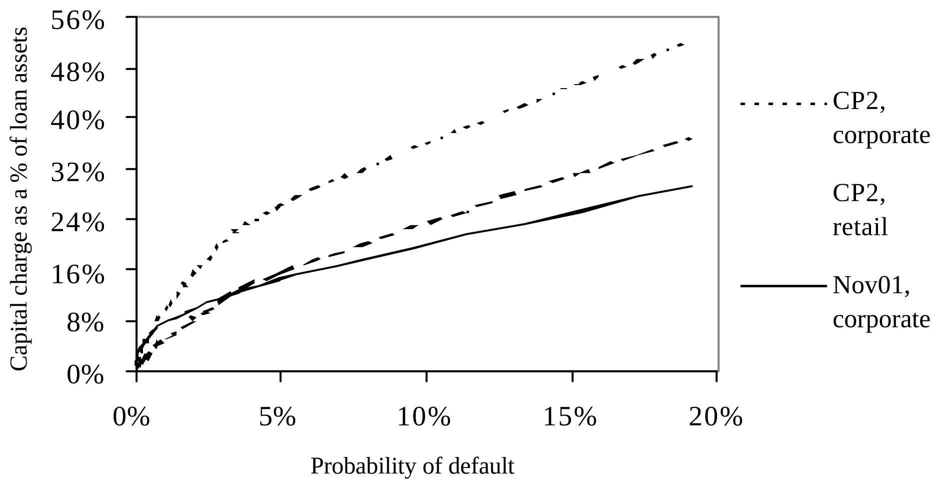
Those changes would significantly reduce capital weights for lower-quality corporate exposures (see Figure 5), and would make capital requirements for non-investment grade obligors even lower than those generated by the retail curve in the CP2.[26] Hence, more sensible values of asset correlations would bring about a more sustainable overall

[25] However, while this empirical rule is probably correct for small firms based in industrialised countries, it might be more questionable for low-quality loans issued in the emerging markets, where risk can be both high and systemic.

[26] Note that this would greatly de-emphasise the choice of the criteria under which loans to small-medium enterprises (SMEs) might qualify for the retail portfolio. Such criteria, which were only roughly sketched in the CP2, were demanded by national authorities, but have proven difficult to identify without risking jeopardising the 'level playing field' originally promoted by the Basel rules.

capital charge. Moreover, since the change in capital requirements due to an obligor's downgrading would be less marked, the so-called pro-cyclical effects of prudential regulation would also be reduced (although not so dramatically, see section 4.1).

Figure 5. Changes in the risk-weighting curve under different values of the model's parameters (a 50% LGD, 3-year maturity is assumed)



Although the changes drafted in the November 2001 note do not represent by any means a formal proposal, they seem to represent a step in the right direction. After all, the aim of banking supervision is to protect depositors and markets from otherwise unmanageable shocks, not to prevent single banks from failing. Actually, allowing banks to fail might exert a beneficial effect on the financial system, as the fittest institutions survive, and the less efficient ones disappear. In this sense, a banking system which is fully protected against bankruptcies does not look, in our eyes, as the best possible one. As one supervisor once put it,

> Requiring all of our regulated financial institutions to maintain insolvency probabilities that are equivalent to a triple-A rating standard would be demonstrably too stringent, because there are very few such entities among unregulated financial institutions not subject to the safety net. That is, the markets are telling us that the value of the financial firm is not, in general, maximised at default probabilities reflected in triple-A ratings. This suggests, in turn, that regulated financial intermediaries cannot maximise their value to the overall economy if they are forced to operate at unreasonably high soundness levels (Greenspan, 1998).

3.2 Other possible inconsistencies

Several concerns have been expressed about the appropriateness of the technical choices made in the CP2.[27] For example, the presence of a 'haircut factor' to discount the

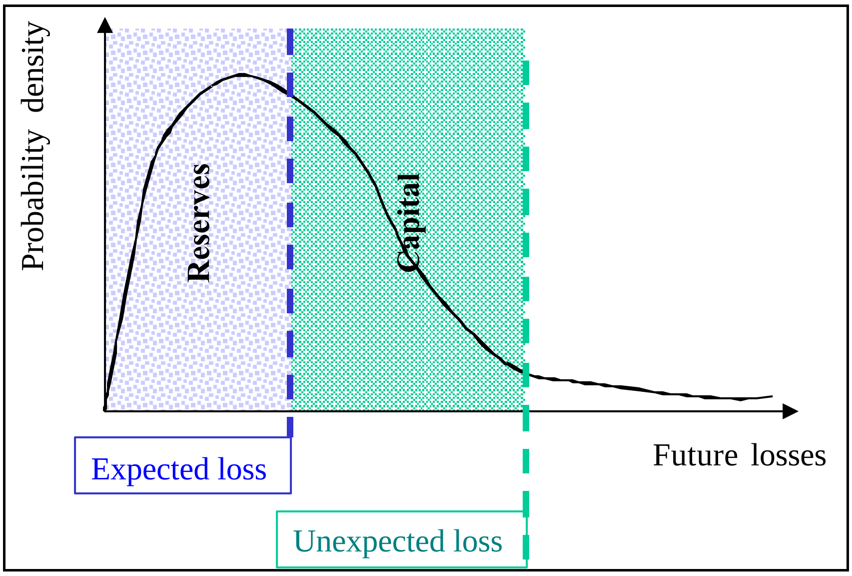
[27] See e.g. Institute of International Finance (2001), Danielsson et al. (2001) and Altman and Saunders (2001). See also CSFI (2001) for an anthology of views on the NBCA.

market value of financial and physical collateral has been openly criticised, as it might lead to an underestimation of the role of such guarantees. The 'granularity adjustment' has been accused of being a pure concentration measure that increases capital charges regardless of correlation-based diversification benefits. The risk of a sharp increase in the cost of credit issued to small and medium-sized enterprises has also been highlighted and the theoretical limits of value-at-risk measures (on which the CP2-weights are based) have been stressed as well.

A thorough review of such comments, however, goes beyond the scope of this report and would risk being both lengthy and incomplete. We prefer to focus on a couple of aspect that might deeply affect the effectiveness and robustness of the NBCA. The former concerns the role of bank capital and the relationship between expected and unexpected losses. It has been extensively addressed by the Basel Committee itself over the last months and might lead to some meaningful revisions in the draft due to be published in 2002. The latter deals with the link between default probability and loss given default, and might undermine the soundness of Basel capital requirements, if default risk and recovery risk prove to be correlated with each other.

The role of bank capital: Expected and unexpected losses. The CP2 chooses to cover with regulatory capital all possible losses up to a given confidence level (1-*X*, to recall the notation used above), for example, up to 99.5% of all possible cases. This means that bank capital is used to shield both expected losses (ELs) and unexpected losses (ULs) (see Figure 6).

Figure 6. Expected and unexpected losses



However, this choice is far from being conceptually correct. As ELs represent the mean of the distribution of future losses, they should be dealt with as a cost, not as a risk. They should be charged off in the current profit and loss account, and this amount should be held aside, as a reserve fund, until they are actually incurred. ULs, on the other hand, might not materialise for many years, so it would be unnecessarily conservative to treat them as a cost that must be fully covered by a bank's lending rates. In order to face them, banks just have to ask their shareholders to provide them with an adequate amount of capital, so to avoid bankruptcy if actual losses exceed expected losses.

The difference between ELs and ULs, then, is far from being merely theoretical, since it determines how losses must be shielded by the bank and 'priced' to its present borrowers. The decision not to distinguish between these two components in the CP2 therefore looks quite unsatisfactory, and should somewhat be reconsidered.

Note that this decision was partly justified by the desire to avoid the lengthy negotiation process needed to redefine bank capital on an international scale. Actually, a change in the international definition of bank capital, forcing banks to use reserves (instead of shareholders' capital or subordinated debt) to face expected losses, would be quite attractive, but it represents quite a challenging step and would cause an unacceptable delay in the Basel reform process. Thus, it can be left as a goal for future negotiations.

Meanwhile, the new supervisory rules should explicitly indicate how much capital is required against EL and UL and, through the so-called second pillar, national supervisors should ascertain that this distinction is actually incorporated into the banks' capital planning policies and into their loan pricing schemes. Moreover, adjustments in the capital charge linked to 'granularity' and 'maturity' effects should be applied to unexpected losses only, not to total capital.

Some of the possible changes discussed over the last months, and highlighted by the Basel Committee in its November 2001 note, show a greater willingness to take into account the distinction between expected and unexpected losses. Namely, the note suggests that efforts should be made to carefully and transparently distinguish the capital needed to cover ULs from that used against ELs. These efforts would lead to an array of 'practical' implications, since separate charges for ULs and ELs could allow the introduction of some important changes to overall capital requirements, namely:

- Defaulted exposures would be measured gross of specific provisions made against expected losses; those provisions could be recognised as capital, at least as far as they do not exceed the EL component; specific provisions based on the average LGD ratio of a particular portfolio should be allowed to cover EL-related capital charges also on other loans within the same portfolio.
- General loss provisions that exceed the limits dictated by the present definition of bank capital (1.25% of risk-weighted assets, or 50% of overall Tier 2 capital) could be allowed to cover EL-related capital charges.
- Expected losses on retail portfolios (excluding mortgages) could be excluded from regulatory capital, since they are assumed to be shielded by the bank's future margins on the same kind of loans.

The last suggestion looks quite remarkable, as it would bring in a sharp decrease in capital requirements against credit cards, revolving credits and similar forms of consumer financing, where default rates tend to be high but stable, and ELs represent a considerable share of future losses.

Figure 7 shows capital requirements on consumer loans, computed according to three different rules: a) the CP2 capital ratio; b) the new formula proposed for consumer loans in the November 2001 note, which excludes ELs (see Table 3, first and last column, for a comparison with the CP2 approach); and c) the same formula, recomputed including

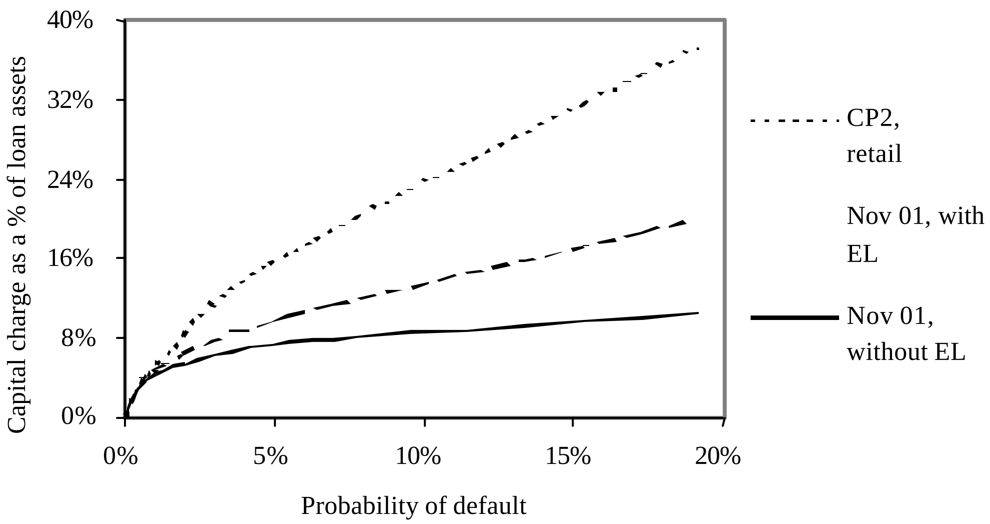
ELs. As can be seen, excluding expected losses would make the compulsory capital requirements significantly lower, and dramatically lower than those indicated in the CP2. The capital ratio, even for risky exposures having a PD around 20%, would only slightly exceed the present 8% level.

Table 3. An overview of possible parameter changes for retail exposures

		Jan 2001	Nov 2001	
			Mortgage	Other
Scale factor	σ	1.56	1	1
Maturity	M	3	1	1
Confidence level	1-X	99.5%	99.9%	99.9%
Asset correlation	ρ=w2	8.13%	15%	4%-15%
Expected losses		Included	Included	Excluded

Note: Highlighted cells are changes from the CP2.

Figure 7. Possible changes in capital requirements against consumer loans (a 50% LGD, 3-year maturity is assumed)



We are not sure, however, that such a practice would be fully sound and correct. Advocates of expected-loss netting observe that, in businesses like credit cards, the high margins available on the assets act as a buffer against losses, before recourse to general provisions. In other words, today's assets can pay the bill for yesterday's losses, just as today's workers can pay pensions to their fathers in a 'pay-as-you-go' (PAYG) scheme, provided that no dramatic demographic changes take place.

It is doubtful, however, that such a system would work, should the consumer loan portfolio decrease in size or should the margins earned by the bank shrink. If an economic downturn increases the default rates on consumer loans, while reducing the amount of new loans demanded by individuals and families, the coverage of expected losses granted by the PAYG scheme might turn out to be severely inadequate.

Note that such issues are well known to financial regulators. For example insurance companies operating in the retail market (say, in car insurance), are usually requested to set aside an adequate amount of EL-related reserves, and are not permitted to use future earnings (i.e. insurance premia) to cover future losses implied in their current portfolio. The coverage of expected losses through future margin income, therefore, should be evaluated carefully, and admitted only to the extent that such income can be considered stable, certain and unaffected by demand and spread cycles.

Actually, it seems to us that a clear distinction between EL- and UL-linked capital should be used to make capital requirements more, not less demanding. As a rule, expected losses should be covered by charge-offs *in the current P&L account*. If one wants to offset them through expected *future* income, then the problem of unexpected deviations from today's income levels should be carefully addressed.

The LGD/PD link. According to the CP2 and to a widely accepted practice,[28] expected losses can be computed directly by multiplying PD by the expected LGD. Since expected LGD is the conditional mean of loss, given that a default has occurred, this is just an application of the standard formula for unconditional means:

$$E(L) = E(L|D) \cdot PD + E(L|\neg D) \cdot (1 - PD) = E(LGD) \cdot PD + 0 \cdot (1 - PD) = E(LGD) \cdot PD$$

However, such a result holds when the PD is known, and the uncertainty on future losses arises only from the fact that default might actually take place or not. In real life, though, PD itself is uncertain in the short-term (although its long-term value might be known, since it depends on the creditworthiness of the borrower). In this case, the simple relationship above does not hold any more. The following example[29] shows why.

Suppose that the long-term PD of a borrower is 6%, but this value grows to 10% in a recession ($PD|R$=10%) and shrinks to 2% when the economy is in expansion ($PD|E$=2%). To keep things simple, both scenarios (expansion and recession) are equally likely on an *ex ante* basis. Finally, suppose that the expected LGD is 50%, yet this value moves up to 70% ($E(LGD|R)$) in recession years and decreases to 30% ($E(LGD|E)$) during expansion years.

The expected loss – computed as an unconditional mean over all possible scenarios – will be:

$$E(L) = \frac{1}{2} E(LGD|E) \cdot PD|E + \frac{1}{2} E(LGD|R) \cdot PD|R = \frac{1}{2} 70\% \cdot 10\% + \frac{1}{2} 30\% \cdot 2\% = 3.8\%$$

while the simple product between expected LGD and unconditional PD would of course equal 3% and would underestimate the true value by 80 basis points (i.e. by 21% in relative terms).

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[28] See e.g. Jorion (2000).

[29] This example was originally presented in Altman et al. (2001).

This suggests that the standard way of computing expected losses, although clearly appropriate when the PD of a loan is fixed and certain, might be far from accurate when default and recovery risk respond – to some extent – to the same background factors.

Note that the same problem would arise for unexpected losses (i.e. for risk measures based on standard errors and percentiles), as noticed by Altman et al. (2001). There is a risk that a whole system of capital requirements would then be downward biased if PD and LGD were driven by some common causes and showed a significant, positive correlation.

Table 4. The link between recoveries and default rates (Pearson's correlation coefficients – yearly data)

	Default rate	Default rate (log)	Default rate (change in)
Period: 1982-2000			
Recovery rate	-67%	-76%	-71%
Recovery rate (log)	-70%	-77%	-72%
Period: 1987-2000			
Recovery rate	-66%	-74%	-71%
Recovery rate (log)	-68%	-75%	-73%

Source: Altman et al. (2001).

Altman et al. (2001) show that, at least as far the US bond market is concerned, such a correlation emerges rather clearly from the data of the last 15 years. Table 4, taken from the above-mentioned study, suggests that recovery rates tend to decrease as defaults become more frequent; taking logs, or absolute changes in default frequencies, as well as focusing on the latest years in the sample do not weaken the strong link between these two sources of risk.[30]

4. Some possible macro- and microeconomic effects of the NBCA

4.1 Credit availability and procyclicality issues

The NBCA risk-weights are guided by the willingness to achieve a closer correspondence between compulsory capital charges and the intrinsic quality of loan portfolios. This means that capital requirements *must* differentiate *across banks* and *over time*, i.e.:

- at time *t*, financial institutions and systems lending to riskier obligors are asked to raise more capital than the 'safer' ones; and

[30] Note that, however, as recovery rates are measured through the market prices of defaulted bonds, supply and demand might play a role in explaining the correlations shown in the table. Namely, as the number of defaults increases, supply of defaulted bonds might exceed demand, and the price of defaulted bonds might decrease, all other things being equal. Altman et al. (2001) deal with this problem through multivariate regressions: these seem to confirm that a negative link between default frequencies and recovery rates exists even when other market forces are factored in.

- moving from time *t* to *t+1*, capital charges must evolve as the obligors' riskiness varies.

In other words, the NBCA is intrinsically aimed at discriminating among different banks, countries and phases of the macroeconomic cycle. This discrimination might have undesirable effects if it leads to a severe reduction in bank credit for emerging countries. Similarly it risks exacerbating stability problems, instead of easing them, if it widens cyclical fluctuations by making loan origination more difficult (and more expensive) as the economy experiences a downturn.

In this section, we briefly review the first issue (credit rationing for the LDCs), then we concentrate on the second one (procyclicality), presenting some simulations aimed at quantifying the problem and at exploring some possible corrections.

Credit availability for less developed countries (LDCs). As pointed out, for example, by Meier-Ewert (2001), the NBCA might exert some strong adverse consequences for developing countries:

1. The risk-weights stated in the CP2 would bring about tougher capital requirements for high-risk borrowers, which form the customer base of most LDC banks, excluding them from bank lending and/or increasing the cost of bank finance up to unbearable levels (note that an increase in funding costs for obligors in the LDCs would exert a perverse chain effect, since it would jeopardise their financial stability, increasing their default probability and further reducing their ratings).

2. The rise in the price of loans in LDCs is likely to be even more substantial, given that the new rules for sovereign exposures might cause an upsurge in the cost of credit for governments and banks based in the LDCs, i.e. in the 'risk-free' base rates to which credit spreads on private loans are added.

3. Moreover, the complexity of the Accord would bring about high compliance and implementation costs, not only for banking institutions in the LDCs (many of which cannot afford the heavy investments required by a sound IRB system), but also for their regulators, who might not have enough resources to analyse and validate the procedures set up by local banks, and by local subsidiaries of international financial conglomerates.

4. Finally, if the weighting function for corporate and retail exposures should be calibrated along the lines shown in the previous section of this report, (that is, reducing the CP2 requirements and creating some clear advantages for banks adopting IRBs), sophisticated banks from industrialised countries operating in the LDCs might enjoy a strong competitive advantage compared to small, local banks, which would be forced to adopt the standardised approach.

Furthermore, it is doubtful whether the costs incurred by an LDC-based bank developing an IRB system would actually lead to a true improvement in its risk-measurement techniques. Actually, as noted by Griffith-Jones and Spratt (2001), local and foreign banks operating in many LDCs have no access to robust, long-term historical default data for all classes of borrowers. This could make their risk-assessments very subjective, thereby weakening the effectiveness of the NBCA and exacerbating its procyclicality effects.[31]

Similar risks emerge also in the standardised approach (where borrowers are evaluated through external agencies). As noted by Cornford (2001), since big rating firms enjoy a limited national coverage in most LDCs, some new, less skilled agencies would probably emerge, the reliability of which could only be tested (at some cost) in the years to come. Moreover, even well established agencies have proved regrettably slow at revising their assessments of LDC debtors when financial crises take place. The costs of implementing the NBCA in the less developed countries, therefore, could be only partially matched by true risk-measurement benefits.

Procyclicality. Procyclicality is somewhat inherent in financial markets, and cannot be blamed on regulation. As noted by Borio et al. (2001), procyclicality is caused mainly by the fact that lenders, due to information asymmetries, judge the quality of the investment projects pursued by borrowers in a noisy way. To overcome noise and opaqueness, they tend to use the behaviour of other lenders (and the market value of collateral) as a signal of the true worth of the projects. Therefore, when markets are depressed, information asymmetries can mean that even borrowers with profitable plans find it difficult to obtain funding: the opposite is true when the cycle is booming.

Procyclicality becomes stronger when all market participants tend to behave according to the same risk-management rules, thereby mutually reinforcing their beliefs and expectations. As mentioned by Danielsson et al. (2001), forecasting risk is not like forecasting weather, in that future volatility (unlike rain) *is* affected by volatility forecasts. This endogeneity may be innocuous in 'calm' times, when the actions of many heterogeneous market participants tend to offset each other, yet it becomes crucial in times of crisis when all investors and lenders, using similar models, pursue the same strategies and the same self-fulfilling prophecies. For example, if someone forecasts that a given asset class will depreciate, and sells it accordingly, then those assets shall really decrease in value, prompting more sales and reducing the price even further. For this reason, all models and regulations injecting homogeneity into the behaviour of market participants are likely to magnify price movements and economic cycles.[32]

This is certainly the case of the capital adequacy rules proposed in the NBCA, which force banks to adopt a somewhat homogenous evaluation of risks.

The Basel rules are based on a minimum level in the ratio of bank capital to weighted assets. In the NBCA, as in the 1988 protocol, losses reduce capital (the numerator in the quotient) when the economic cycle deteriorates and defaults become apparent. Furthermore, which is typical of the new Accord, weighted assets (the denominator) increase as borrowers are downgraded, due to an economic downturn. To comply with

[31] As noted by Griffith-Jones and Spratt (2001), when risk becomes a quantification of subjective expectations, this produces high levels of uncertainty and creates strong incentives to herd, with developing countries periodically going 'in and out of fashion'.

[32] As noted by Davies (2001), risk should be contrasted by encouraging diversity: 'Populations are at risk of extinction when they concentrate – be it a physical concentration (putting them at risk of some natural disaster such as flood or earthquake) or when they have genetic concentration (putting them at risk of disease or environmental change). To encourage concentration in risk analysis and management is to create risk of extreme events.'

the regulatory 8% limit in the capital ratio, banks are then forced to reduce credit supply and to increase the cost of loans. This in turn makes recessions even worse.

This is a side effect of the closer integration between regulatory and economic capital that is pursued in the NBCA. It is generally accepted[33] that the optimal amount of bank capital tends to increase when the economic cycle slows (and credit risks turn into actual losses): the ‘Basel capital’ just mimics this behaviour. In other words, by making supervisory requirements closer to the banks’ endogenous models, the new Accord is bound to increase procyclicality, at least to some extent.[34]

This was clearly shown by Ervin and Wilde (2001) through a simulation summarised in Table 5. A loan portfolio originally consisting only of BBB-rated obligors is first considered at the end of 1989, then one year later. Based on the transition matrices released by Standard & Poor’s for 1990, only 6 out of 1000 obligors default over the 12 months.[35] However, due to unfavourable macroeconomic conditions, downgrades clearly outweigh upgrades, so that at end-1990, the average quality of the portfolio worsens significantly. What are the consequences of those changes for capital charges? According to the 1988 Accord, only defaults would affect capital, since they require a charge-off that roughly matches the estimated LGD on non-performing loans (e.g. 50%). However, in the NBCA framework, rating changes affect capital requirements as well.

As shown in the table, capital requirements tend to be less demanding under the CP2 weights than they were according to the old protocol (as in the case of a BBB-rated portfolio of three-year corporate exposures with 50% LGD). Nonetheless, the adjustment required in bank capital is quite more dramatic – moving from 4% to 4.8% implies a 20% increase, while a change from 8% to 8.2% is no more than a 3% change in relative terms.

To get some further insight into the procyclicality effects of the NBCA, we present a new simulation exercise, carried out along the guidelines set by Ervin and Wilde, but aimed at enhancing their results in several directions. Namely:

- We will not limit our analysis to a single year, but will try to *cover a longer time period, ranging from 1981 to 2000*, to fully appreciate the behaviour of the new Basel rules throughout a whole economic cycle.

[33] Since capital is raised by banks to offset risks and minimise the expected costs of failure, its optimal level, at least in a static framework, tends to be positively correlated with financial risks. However, these conclusions have recently been challenged by Estrella (2001) who, based on a multi-period, infinite-horizon model with capital-adjustment costs, finds that the optimal level of bank capital is *negatively* correlated with present risks, measured by a value-at-risk measure. As mentioned by the author, these results differ from conventional wisdom. They might depend, however to some extent, on the way economic cycles are modelled. Those are assumed to follow a fully predictable pattern, and to be perfectly known to bankers, who choose their optimal capital level after calculating all expected future losses.

[34] Alternatively, the NBCA might force banks to hold a large capital cushion in excess of minimum requirements, to avoid the costs (and risks) of raising new capital during economic downturns. This ‘indirect’ cost of procyclicality was highlighted, e.g., by Jokivuolle and Peura (2001).

[35] Asset quality deteriorated sharply in 1990 in the US, which is why Ervin and Wilde chose this particular year to show the procyclicality effects of the NBCA.

- We will *simulate both the evolution of assets and that of the bank's overall interest-based profits*; in other words, loans will not just originate losses, but also a margin income (based on some risk-related pricing rules[36]); by combining income and losses, we will be able to simulate endogenous capital fluctuations over time.

Table 5. Procyclicality effects in the NBCA: A numerical example

	Portfolio composition		*1988 Capital Accord*			*NBCA – CP2*		
	End-1989	*End-1990*	*Weights*	*End-1989 Requirements*	*End-1990 Requirements*	*Weights*	*End-1989 Requirements*	*End-1990 Requirements*
AAA		0.0%	8.0%		0.0%	1.1%		0.0%
AA		0.0%	8.0%		0.0%	1.1%		0.0%
A		4.2%	8.0%		0.3%	1.8%		0.1%
BBB	100%	89.1%	8.0%	8.0%	7.1%	4.0%	4.0%	3.5%
BB		5.2%	8.0%		0.4%	11.6%		0.6%
B		0.9%	8.0%		0.1%	26.0%		0.2%
CCC		0.0%	8.0%		0.0%	50.0%		0.0%
Default		0.6%	50.0%		0.3%	50.0%		0.3%
TOTAL	*100%*	*100%*		*8.0%*	*8.2%*		*4.0%*	*4.8%*

Source: Ervin and Wilde (2001).

Our simulation exercise mimics the evolution over time of a bank's assets. The initial portfolio composition of the bank (at the end of 1980) was chosen arbitrarily, as shown in Table 6. However, this choice is based upon the estimates gathered by Treacey and Carey in 1997 from a sample of 26 US banks. Using European data (namely, data estimated by the Bank of Italy and reported in Marullo-Reedtz, 2000) would not alter the final results significantly.[38]

All loans are supposed to have a three-year maturity and a 50% LGD. In the table, we suppose that the initial loan stock of the bank is €1 million, so we can use absolute amounts as well as percentages.

From 1981 till 2000, the bank's portfolio mix changes accordingly to S&P transition matrices[39] (based on static pools). Rates on new loans are revised to compensate for their changes in riskiness, yet margins earned on 'old loans' remain unchanged (since the loans have a three-year maturity, this means that only 1/3 of the loans can be re-priced). Losses emerge according to the empirical default rates recorded by S&P and the loans' LGD (given a 50% LGD, a €100 default means a €50 loss).

[36] The spread set by the bank covers expected losses and capital costs (see the Appendix for details). The risk-free rate is set at 5%, while the bank's unit cost of capital is 10%.

[37] The spread set by the bank covers expected losses and capital costs (see the Appendix for details). The risk-free rate is set at 5%, while the bank's unit cost of capital is 10%.

[38] The use of data on rated bonds would probably have introduced a severe bias, as the average credit quality of bonds tend to be better than that of bank loans (after all, banks are there to screen and monitor investment projects that are too risky for the capital markets).

[39] Standard & Poor's (2001). We are aware that bond data and through-the-cycle ratings are not fully apt to represent the behaviour of bank loans, yet we believe that such limitations are outweighed by the benefits of using public, certified, long-term data as those supplied by S&P.

Table 6. Portfolio mix used in our simulations (%)

	1980	1990	2000
AAA	3.0%	2.7%	2.4%
AA	5.0%	7.4%	8.6%
A	13.0%	20.2%	24.8%
BBB	28.0%	24.5%	29.7%
BB	39.0%	20.9%	18.5%
B	10.0%	20.3%	13.8%
CCC	2.0%	3.9%	2.1%

Note: The 1980 mix was chosen arbitrarily, based on bank data reported in Treacey and Carey (2000); subsequent evolutions were generated through S&P historical transition matrices.

Figure 8 shows the main results of our simulation:

1. The first panel reports three indicators of the credit quality cycle: the default rate measured by Standard and Poor's on US bonds, the default rate experienced by the bank (given its portfolio mix) and the 'net downgrade rate' (downgrades minus upgrades, over total outstanding issues). Note that scales are inverted, since an increase in these variables means that the cycle is getting worse. As can be seen, default and downgrade risks fluctuate up and down in the 1980s, hit a low in the early 1990s, then keep improving in the following years, although they worsen again towards the end of the decade.

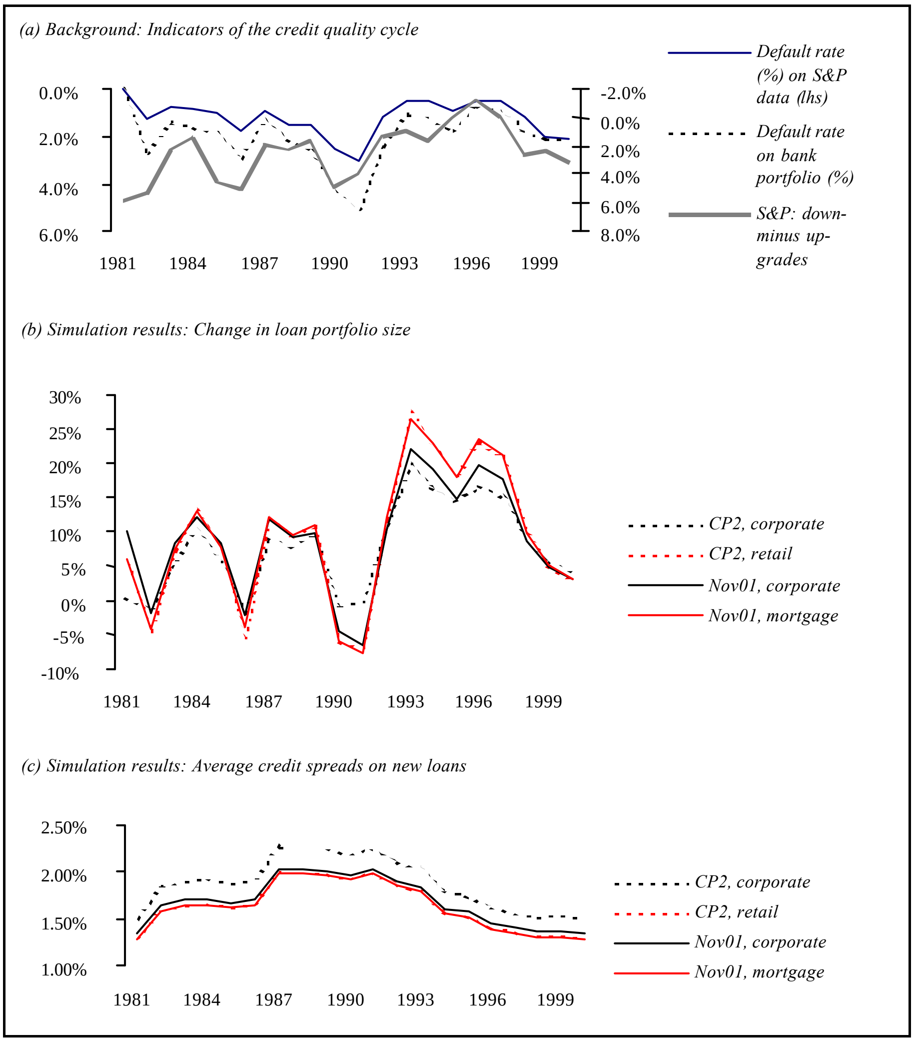
2. The second panel reports a measure of credit availability: the percent change in the loan portfolio made possible (or necessary) by the evolution of the capital ratios. When the margin income exceeds credit losses, and/or capital requirements decrease because of a favourable evolution in the quality mix of the loans, the bank's capital grows beyond the minimum requirements. We then compute by how much the loan portfolio could be enlarged. Similarly, when capital charges increase more than net profits would allow, we estimate the reduction in loans needed to comply with the Basel ratio.[41]

   Two results are worth mentioning. First, the procyclicality effect is driven by up- and downgrades, rather than by default rates. In other words, adjustments in credit supply needed to comply with capital requirements seem to respond mainly to changes in the structure of weighted assets, and only to a minor extent to actual credit losses. However this is not true in 1990-91, when the default rate is exceptionally high.

[40] Standard & Poor's (2001). We are aware that bond data and through-the-cycle ratings are not fully apt to represent the behaviour of bank loans, yet we believe that such limitations are outweighed by the benefits of using public, certified, long-term data as those supplied by S&P.

[41] The charts report simulations based on the CP2 curves and on the November 2001 versions; note that retail curves are reported for illustrative purposes only, as the loan portfolio and the transition matrices used in our exercise refer to corporate exposures. A separate exercise, based on a different loan mix and transition structure, would be needed to carry out a reliable analysis of the retail curves.

Figure 8. Main results of the base simulation



Second, the new weight curve for corporate loans proposed in the November 2001 note, although it would considerably reduce capital requirements in a static sense, *would not ease the procyclicality effect*, at least for loan portfolios with a rating mix like the one shown in Table 6. The reason is that, although the increase in weights when moving from an AAA- to a CCC-rated loan is lower, based on the November 2001 curve, rating changes for top-quality loans[44] *can bring about a sharper rise in capital requirements* than they did under the CP2 function. This would slightly enhance procyclicality in ‘normal times’ (when most rating changes affect the middle part of the scale). However, the new curve would smooth cyclical effects

[42] See Table A.1 in the Appendix.

[43] Note that such widespread downgradings might be more usual for bank loans (where ratings are assigned ‘point in time’, and respond quickly to the cycle) than for rated bonds.

[44] See Table A.1 in the Appendix.

under extreme scenarios, when a large part of bank borrowers moves to the bottom grades of the rating scale.[45]

3. As mentioned before, in our model the bank earns different spreads on the loans, according to their rating; therefore, as the quality mix of the portfolio evolves over time, the cost of credit for bank customers fluctuates too. The third panel in the figure shows the average spread paid by borrowers, which is another important indicator of the credit cycle.

As can be seen, bank rates tend to anticipate the default cycle (as they are driven mainly by net downgrades), then remain high as the default rate hits its peak. In this sense they tend to be procyclical, as they stay high as credit supply shrinks, so that 'price' and 'quantity' effects can be mutually reinforcing. The shift from the CP2 to the November 2001 curves, while reducing the average level of the spreads, does not alter their profile over time. The reason is that banks have to factor in future losses when pricing new loans, regardless of compulsory capital ratios. Since bank credit spreads depend heavily on expected losses, capital requirements cannot (and probably should not try to) interfere with their movements. Note that, however, base rates can be governed by policy-makers, and the overall cost of bank credit can be reduced, even when banks increase their margins to offset an upsurge in risks.

Figure 9 shows what happens to our simulation when LGDs tend to change with empirical default rates. Instead of using a fixed 50% LGD, here, we let it fluctuate between 60% (in high-default years) and 40% (in low-default years).[46] Note that a similar setting may become realistic when banks move to the advanced IRB approach and start using their own LGD estimates. These are likely to be revised upwards in recession years, when collateral values decrease and the market for distressed firms slows down due to an excess of supply. Revised LGDs are used both to set loan spreads and to compute capital requirements.

As can be seen, procyclical swings tend to be much wider than in the base case (the results of the base simulation for the CP2 corporate curve have been reported in Figure 9, to make comparisons easier). Bank spreads, too, become even more volatile than in the previous simulation, since now short-term LGD estimates are factored into loan prices. Thus, if a positive correlation between default and recovery risk (like that highlighted by Altman et al. for US bonds), were to be confirmed by bank data, *the procyclicality effects of the NBCA might be much more severe than expected*.

Of course, one might object that the bank in our model behaves in a somewhat myopic way, and that regulation should encourage 'advanced' IRB systems to use long-term average recovery rates (instead of revising them yearly, according to short-term signals like the current default rate). However, while the use of long-term LGDs would make procyclicality effects less marked, it would also force banks to maintain a less updated picture of their risks, thereby trading stability for precision.

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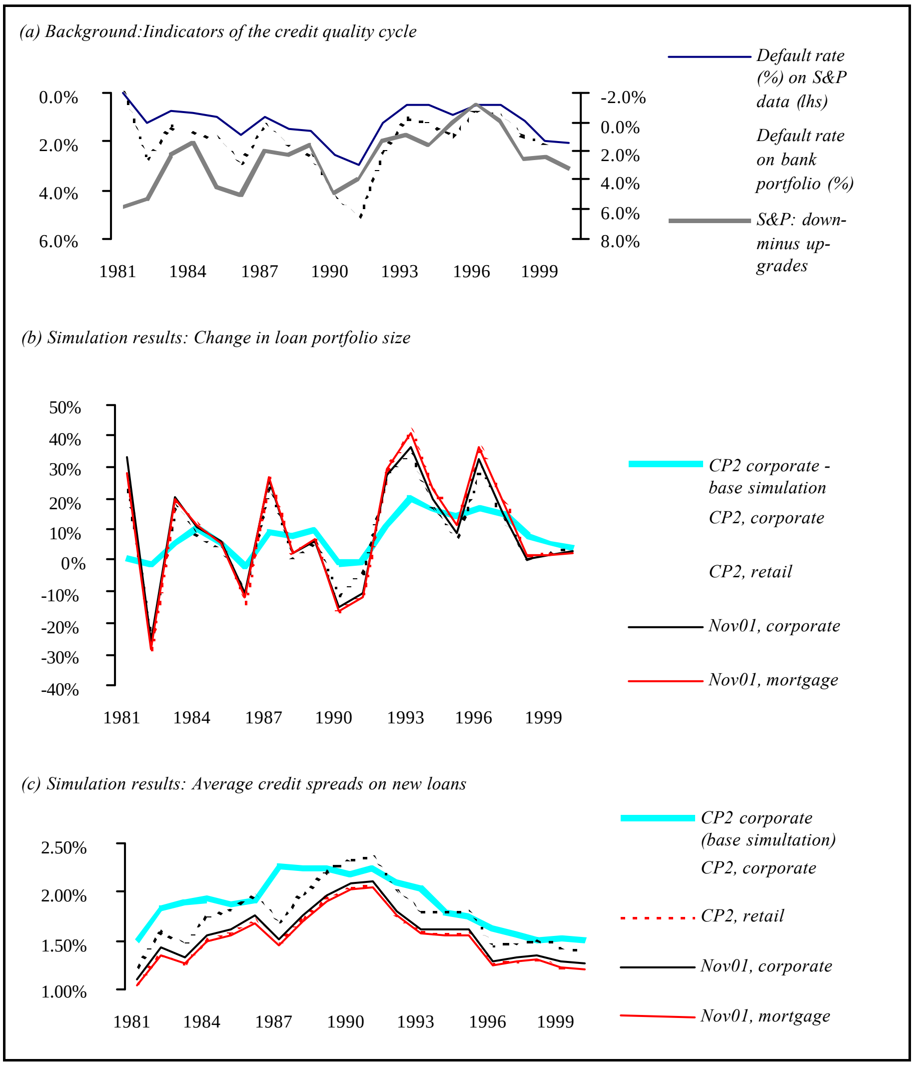
[45] Note that such widespread downgradings might be more usual for bank loans (where ratings are assigned 'point in time', and respond quickly to the cycle) than for rated bonds.

[46] We used a second-degree polynomial to model the link between LGDs and empirical default rates, so that LGD is 50% when default rates are at their 20-year average (2%), LGD is 60% when default rates hit their 20-year maximum (5%) and LGD is 40% when default rates hit their 20-year low (0%).

Figure 9. Effects of the correlation between default risk and recovery risk



The link between procyclicality and sound provisioning practices. As suggested, for example, by Cavallo and Majnoni (2001), cyclical shortages of banks capital may not only be due to the risk-based regulation of bank capital but also (and most prominently) to the lack of a risk-based regulation of the banks' loan loss provisioning practices. The blame for pro-cyclical effects associated with capital shortages could therefore shift from the contents of the currently proposed capital regulation to its limited scope, since no compulsory provisioning scheme has been included in the NBCA.

As mentioned in section 3.2, expected losses should be deducted from the profit and loss account and covered through reserves in 'quiet' (i.e. favourable) years; however, there is no international regulation forcing banks to follow such a principle. Actually, some national laws even prevent banks from making adequate provisions because that is seen as a form of profit-smoothing, aimed only at reducing the tax bill.

[47] We used a second-degree polynomial to model the link between LGDs and empirical default rates, so that LGD is 50% when default rates are at their 20-year average (2%), LGD is 60% when default rates hit their 20-year maximum (5%) and LGD is 40% when default rates hit their 20-year low (0%).

In this context, it comes as no surprise that loan-loss provisioning by banks tends to be negatively correlated with the macroeconomic cycle. Most banks accept to pay for losses only when these are about to materialise instead of setting aside an adequate volume of EL-related reserves when high operating profits would make provisioning easier.

This was clearly shown by Borio et al. (2001), who analysed the link between bank provisions (i.e. provisions for loan losses over total assets) and a macroeconomic indicator (output gap, as calculated by the OECD). Going back to the 1980s, they found negative correlations for most industrialised countries, suggesting that banks are not willing (and/or not permitted) to exploit expansion years to increase their loan-loss reserves.

On the other hand, Cavallo and Majnoni (2001), using a more sophisticated, multivariate model, found some evidence of a *positive* association between loan-loss provisioning and banks' EBTD. As in most G10 countries, however, this suggests that provisions tend to increase in 'good' times, but do not prove to be fully adequate to cover subsequent losses. Moreover, this result does not hold for banks operating in emerging countries, where low provisioning in the upswing phase of the cycle makes it necessary to increase provisions during periods of financial distress. These empirical studies support the view that if some sound provisioning rules were included in international capital regulation, they may exert a meaningful anti-cyclical effect.[48] As noted by Cornford (2001), the point is that inadequate provisioning could contribute to excessive cyclicality in bank lending, since the increased provisions following a cyclical downturn will ultimately lead to less new lending.

Figure 10 shows what would happen to our simulation results if banks were required to set aside adequate provisions against expected losses. To be precise, we have assumed that a bank is not allowed to distribute profits (or to use extra capital to increase its loan portfolio) *unless all expected losses have been covered through provisions.*[49] Note that while *actual losses* have to be charged off regardless of the bank's operating profits, provisions against *expected losses* never exceed the net margin income (so they tend to smooth the bank's profit cycle). When losses occur, provisions are the first buffer used to offset them: the bank's capital is used only when they are not enough.

As concerns corporate exposures (see panel 'a' in Figure 10), compulsory provisions would *not* alter the average profile of our 'procyclicality curves'. They would act, however, as a good 'parachute' in the worst phases of the credit cycle (see the 1990-93 period).

The reason is that, as noted above, the evolution of capital requirements in 'normal times' is driven mainly by transitions across performing states (affecting the denominator of the capital ratio), while losses hit capital (i.e. the numerator) only when

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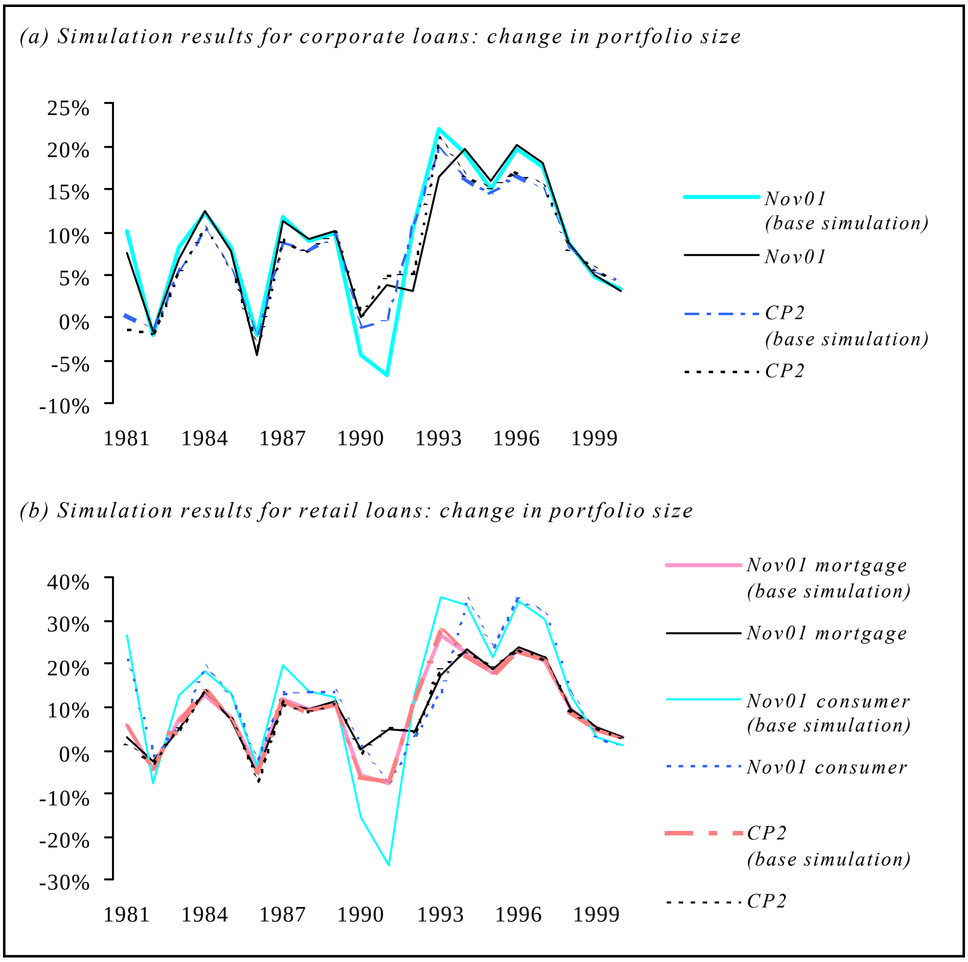
[48] Note that a system of compulsory 'statistical provisions' (i.e. provisions against future losses on today's performing loans) was introduced in Spain in 1999. See Poveda (2000) and De Lis et al. (2001) for details.

[49] Note that, strictly speaking, these provisions are not capital, in that they are not raised from shareholders but are deducted from past earnings; however, although this has not been done in our simulation, *capital charges should be reduced* when a bank increases its provisions, to avoid covering expected losses twice.

credit risk actually strikes. Compulsory provisions against expected losses, although they cannot smooth the capital charges due to rating transitions, provide the bank with a buffer to partially isolate its capital from actual losses.

Figure 10. Effects of compulsory provisions on procyclicality



Panel 'b' in Figure 10 shows some more simulations concerning retail weights. Note that these are for illustrative purposes only, since S&P transition data are based on corporate bonds and do not provide us with a reliable representation of consumer credit cycles. Nevertheless, it is interesting to see that compulsory provisions would significantly smooth loan supply even for this class of exposures (where the weighing functions set up by the Basel committee are generally less steep than for corporate facilities).[45]

Moreover, from panel 'b' one can clearly see that the anti-cyclical effect of EL-based provisions would be especially strong for consumer loans, under the approach outlined by the Basel Committee in its November 2001 note (that is, when bank capital is

[50] Note that the three-year maturity used in our model might be overly pessimistic for consumer loans. For credit cards, for instance, banks usually may change their rates and exposures on very short notice, but a three-year maturity could not be too unrealistic for standard instalment loans (excluding mortgages).

required only against unexpected losses). This reinforces our belief (see section 3.2 above) that if expected losses in the retail market were to be covered entirely through future margin income, procyclicality effects might worsen significantly.[51]

4.2 Some effects of the NBCA for the banking firms

The previous section highlighted the major effects of the NBCA for the financial system as a whole. Before concluding our report, we now try to sketch the main consequences that the new Accord is likely to exert on individual banks and on their competitive equilibria.

The effects on individual banks. Implementation costs are the first, and most certain channel through which the NBCA is going to affect the profitability of individual banks. Complexity is one of the most striking features of the new Accord, and setting up some "Basel-compliant" risk-control systems is going to be a major challenge, both for bankers and their supervisors.

As highlighted, for example, by Lannoo (2001), complexity costs are expected to be particularly high in the European Union, where the implementation process is going to be especially cumbersome, since a new directive (or a substantial amendment of the existing ones) will be needed to translate the Basel principles into practice. The interaction between the European Commission, the Council of Ministers, the European and national Parliaments and, finally, national supervisors is likely to produce a complex network of requirements, not only for banks but for also for other firms operating in the financial services industry.

IIF (2001) produced a rough estimate of the implementation costs of Basel II[54] (see Figure 11). Supposing that about 30,000 banks in the world have to stand compliance costs due to the NBCA, and that the average cost ranges between \$0.5 and \$15 million a year for five years, the net present value of these costs (computed using a 5% reference rate) might well exceed \$1,000 billion (left-hand scale).

As shown by the right axis, this amounts to a considerable share of the total tier 1 capital held by all banks in the world (which IIF estimates at about \$2,000 billion). Implicitly, these figures suggest that, at least in the short-term, the first effect of a regulatory reform supposed to improve the banks' capital adequacy might be that of eroding a considerable portion of it.

Hopefully, such costs are going to be offset by adequate rewards. These are not to be found only in the 'capital savings' (i.e. the reductions, relative to the 'standard' 8%

[51] Note that the three-year maturity used in our model might be overly pessimistic for consumer loans. For credit cards, for instance, banks usually may change their rates and exposures on very short notice, but a three-year maturity could not be too unrealistic for standard instalment loans (excluding mortgages).

[52] The anti-cyclical effects of compulsory provisions have also been shown by De Lis et al. (2001) in a simulation exercise based on Spanish data, which include both corporate and retail loans.

[53] Note that the three-year maturity used in our model might be overly pessimistic for consumer loans. For credit cards, for instance, banks usually may change their rates and exposures on very short notice, but a three-year maturity could not be too unrealistic for standard instalment loans (excluding mortgages).

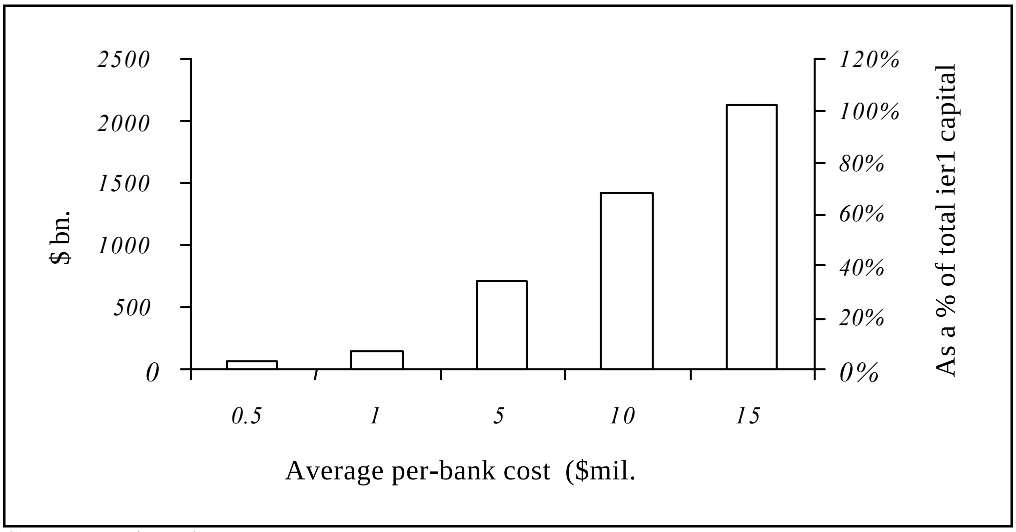
[54] As noted by Lannoo (2001), *complexity costs* may not be just *implementation costs*. As banks move away from the simple, accountable rules of Basel I, this lack of transparency will bring about some costs of its own, since capital adequacy evaluations will grow more uncertain and obscure.

capital ratio) that some high-quality banks should be able to achieve when they set up adequate internal rating systems.

The main advantages should lie in the efficiency gains brought about by new risk management methodologies: a more objective and stable assessment of credit risk, sounder pricing and provisioning practices and better reporting standards through which the different rings of the 'value chain' inside the bank may be separately spotted and analysed.

Moreover, as the pricing of loans (although still based on a subjective appraisal of the borrower's creditworthiness) becomes more transparent, and standard rules emerge for the computation of the risk premia required to different obligors, it will be easier to create, widen and maintain a secondary market of bank loans. Credit origination and lending will become more and more distinct. Banks will be increasingly able to set up credit facilities, then to 'package' them in a standardised form and to pass on the risk to final investors. The gap between banks and markets, although it will by no means disappear, is likely to decrease. Fair-value accounting of bank loans will become less unusual, and the degree of accountability of the decisions taken by bank managers will substantially increase.

Figure 11. Implementation costs for a population of 30,000 banks (5-year NPV)



Source: IIF (2001).

As concerns the banks' internal organisation, the credit department will still be responsible for the creation of new facilities, and for the management and enhancement of customer relationships. However, the measurement of total credit risks, as well as the validation of the rating procedures through which day-to-day operations are carried out, will be the responsibility of a separate function. This might be either the risk management office or some new department supervising the whole credit policy of the bank, and checking that risk diversification and capital adequacy plans are carefully planned and executed. Those are not going to be purely technical roles, as they will get fully involved in the top management's strategic decisions.

The effects on competitive equilibria. The implementation of the NBCA is likely to make the competitive behaviour of banks both more uniform and more patchy.

A stronger uniformity will be the result of the adoption, by many banks, of the same risk-management tools and procedures. This might prove beneficial, if financial institutions are forced to move towards the 'efficient frontier' by adopting more sophisticated and rigorous practices; unintended consequences might follow, however, that reduce the degree of efficiency and stability of the system.

As far as stability is concerned, we noted in section 4.2 that the adoption of a uniform risk-assessment model by all market participants is likely to magnify the swings in the economic and financial cycle. As for the banking system's efficiency, a more pervasive regulation (think of the second pillar, enabling supervisors to influence and shape the banks' risk-evaluation practices) risks reducing the role of markets, cancelling out the differences between 'good' and 'bad' bankers.

While the behaviour of large banks, adopting internal rating systems along the guidelines dictated by the NBCA, should become more uniform, the landscape might also become more patchy as concerns smaller institutions, forced to stick to the 'standard' weights or implementing simplified versions of the IRB approach.

Thus, the gap between small and larger intermediaries is likely to widen. This might lead to a sort of 'winner's curse', jeopardising the future profitability and stability of local banks. Such banks, in fact, might increase their market shares only to find out, in the following years, that they have supplied credit to the wrong borrowers (i.e. to borrowers deemed unprofitable by their larger competitors).

To avoid this adverse-selection effect, even small banks will be forced to invest in sound credit-risk measurement systems, which, in turn, will increase the 'implementation' costs[55] mentioned earlier in this section.

5. Concluding remarks

The NBCA is going to exert some far-reaching effects on the day-to-day behaviour of banks and credit markets. Some seemingly 'technical' choices, such as parameter calibration and recovery-risk treatment, are going to affect credit supply and economic cycles heavily. This is why research contributions aimed at validating and refining the mechanisms on which the Accord will be founded should be welcome not only by scholars and academics, but also by practitioners and policy-makers.

In this report, we tried to provide the reader with a complete, up-to-date, critical picture of the NBCA by summarising its structure and possible changes.

We first focused on the risk of a generalised increase in capital levels, a danger that would have been quite real if CP2 weights had not been carefully discussed, and amended in recent months. We have seen that the use of lower asset correlation coefficients for riskier borrowers represents a reasonable way of making the weighing function less steep, reducing the threat of a generalised increase in the cost of credit for 'typical' bank borrowers.

[55] Note that these are not, strictly speaking, implementation costs, since an IRB-system will not be required for small banks. Since the use of an IRB approach by larger competitors is going to push local banks towards it, however, this can be regarded as a sort of 'indirect implementation cost'.

So capital requirements may be eased to account for the risk-diversification benefits due to the idiosyncratic nature of small obligors. Meanwhile, however, they may also need to be tightened, since ignoring the correlation between default and recovery risks might lead to a structural underestimation of future credit losses. We have seen that a 70% correlation between default rates and LGDs was found on the US bond market. If similar values were to exist for banking loans, the use of a regulatory model based on independence between PD and LGD might be seriously questioned. Moreover, we have shown that, if banks adopting the 'advanced' approach to internal ratings should update their LGD estimates based on the credit risk cycle, the procyclicality effects of the new Basel protocol might be stronger than expected.

To contrast such procyclicality dangers, the new regulation should fully acknowledge the difference between expected and unexpected losses, and supervisors should ask banks to make use of this distinction in their pricing and provisioning practices. Through a simulation exercise we have shown that by imposing compulsory provisions against expected losses, the risk of credit rationing in 'bad' years could be significantly reduced (although procyclicality effects due to rating transitions would still exist).

On the other hand, if the distinction between EL- and UL-linked capital should be used to make capital requirements less demanding (e.g. for consumer loans), procyclicality might increase, because one cannot fully rely on future assets to pay the bill for losses generated by today's portfolio (in this sense, the crisis of PAYG pension schemes seems to have much to teach).

Summing up, asset correlation issues, recovery risks, bank provisions and procyclicality represent four sensitive areas in which no mistakes can be allowed, if the New Basel Capital Accord is to represent a significant step towards better risk assessment techniques and financial stability. The huge implementation costs of the Accord (and the deep organisational changes that banks will have to undergo to embrace the new paradigm) mean that the NBCA must bring along some clear, tangible benefits, and no drawbacks.

Appendix. Details of the Procyclicality Simulations

As mentioned in the text, our simulation exercise mimics the evolution over time of capital and assets of a bank, using one-year transition matrices (based on static pools) released by Standard & Poor's for the years between 1981 and 2000. The generic transition matrix $\mathbf{T}$ can be seen as follows:

$$\mathbf{T} = \begin{bmatrix} \mathbf{T}_p & \mathbf{d} \\ \mathbf{0}' & 1 \end{bmatrix} \qquad [A.1]$$

where $\mathbf{T}_p$ denotes transitions across non-defaulted ("performing") states, while $\mathbf{d}$ is a vector of default rates. The bottom row (all zeroes and a "1") simply indicates that defaulted loans cannot go back to a performing state.

Let $\mathbf{c}_t$ be the vector (such that $\sum_j c_j = 1$) describing the composition, by rating class, of the bank's performing loans at the end of year t. Using transition matrices one can compute the default rate experienced by the bank in the following year simply as $\mathbf{d}'_{t+1}\mathbf{c}_t$, while the distribution of loans across performing states, at the end of the following year, will tend to $\mathbf{T}'_{p,t+1}\mathbf{c}_t$

However, the bank loans considered in our simulation are not perpetual. We assume that they have a three-year maturity, so every year 1/3 of total loans expires, and has to be replaced through new issues (we assume that those new issues are chosen according to the bank's initial portfolio composition, $\mathbf{c}_t$). Moreover, defaulted loans also have to be replaced, to leave the portfolio size unchanged.

Hence, the actual composition of the bank's performing loans portfolio at the end of year t+1 must be computed as:

$$\mathbf{c}_{t+1} = \frac{2}{3}\mathbf{T}'_{p,t+1}\mathbf{c}_t + \left(\frac{1}{3} + \frac{2}{3}\mathbf{d}'_{t+1}\mathbf{c}_t\right)\mathbf{c}_t \qquad [A.2]$$

(the bank's portfolio composition at time *0,* $\mathbf{c}_0$, must be set arbitrarily, as described in Table 6 in the text).

Further, we can compute the vector of capital weights $\mathbf{w}$ associated with different rating classes using the standard formula stated in equation [15]. To do so, we must know the default probabilities attached to the different classes, the maturity and the LGD of the loans. We use a three-year maturity and a 50% LGD. Table A.1 shows the PDs associated with our rating scale (also called vector $\mathbf{p}$[56] in the following) and the weights dictated by different calibration options (note that these are basically the same values shown in Figures 5 and 7 in the text)

[56] These PDs are long-term averages of S&P's one-year default rates, as reported in Standard & Poor's (2001). Note that **p** (expected default probabilities) is conceptually different from **d** (actual default rates).

Table A.1 Default probabilities and risk weights of the rating classes

		CP2 weights		November 2001 weights		
	p_j	Corporate	Retail	Corporate	Mortgage	Consumer
AAA	0.005%	0.41%	0.18%	0.60%	0.09%	0.09%
AA	0.010%	0.60%	0.27%	0.84%	0.16%	0.15%
A	0.042%	1.37%	0.62%	1.72%	0.50%	0.48%
BBB	0.233%	3.97%	1.89%	4.14%	1.91%	1.71%
BB	1.072%	10.44%	5.37%	8.17%	5.79%	4.35%
B	5.939%	29.20%	17.53%	16.01%	17.34%	7.64%
CCC	25.259%	58.74%	43.93%	33.44%	35.87%	11.42%

To keep things simple, each rating class has a default probability that is stable over time. In other words, the default risk associated with each grade does *not* change over time, but represents a long-term value that is not revised by the bank as the cycle changes.[57] Therefore, vector **w** depends on how function [15] is calibrated by regulators, not on t.

The spread (m_j) on the risk-free rate (r^f) required by the bank on a class-j loan is set in such a way that the expected income on the loan

$$(1 + r^f + m_j)(1 - p_j) + p_j LGD$$

equals total funding costs (including the cost k_e on the amount of capital w_j that the bank has to set aside to comply with supervisory requirements).

$$(1 + r^f)(1 - w_j) + k_e w_j$$

Solving for m_j we get[58]

$$m_j = \frac{p_j\left(LGD + r^f\right) + w_j\left(k_e - r^f\right)}{1 - p_j} \qquad \text{[A.3]}$$

However, this pricing rule is applied only to new loans. Facilities issued in previous years keep their spread unchanged when they migrate into a different rating class.

57 This means that changes in the overall portfolio quality are modelled through transitions from one class to another, not by updating the risk characteristics of each class. Note that this might be too simplistic, as the PD of each rating class is likely to be revised upwards in bad times, and downwards in quiet years (this is the norm for rating agencies working 'through the cycle', as pointed out e.g. by Treacey and Carey, 2000). However, such a behaviour would surely contribute to make cyclical changes even deeper, so if such a mechanism were included in our simulations, the procyclicality effects we found in the text would only become stronger.

58 Note that this is a one-year rate, while the loan portfolio used in this simulation has a maturity of three years. An expression for the yearly spread associated with a three-year horizon could be derived following the same logic used for the one-year spread (see e.g. Resti, 2000, for details). However, this would make our simulation more complex and less transparent, without adding much to the final results.

Thus, to compute the net margin income earned by the bank we need to estimate the composition of its loan portfolio *by original rating,* that is, ignoring migrations of 'seasoned' loans. At the end of year *t,* this composition can be reasonably approximated as follows:

$$\mathbf{c}_t^* = \frac{1}{3}\mathbf{c}_{\mathbf{t-2}}\left[\mathbf{I} - diag(\mathbf{d}_{\mathbf{t-1}})\right]\left[\mathbf{I} - diag(\mathbf{T}_{\mathbf{p,t-1}}\mathbf{d}_{\mathbf{t}})\right] + \\ + \left(\frac{1}{3} + \frac{2}{3}\mathbf{d}'_{\mathbf{t-1}}\mathbf{c}_{\mathbf{t-2}}\right)\mathbf{c}_{\mathbf{t-2}}\left[\mathbf{I} - diag(\mathbf{d}_{\mathbf{t}})\right] + \left(\frac{1}{3} + \frac{2}{3}\mathbf{d}'_{\mathbf{t-1}}\mathbf{c}_{\mathbf{t-1}}\right)\mathbf{c}_{\mathbf{t-1}} \qquad [A.5]$$

Multiplying by the spread vector, $\mathbf{m} = [m_j]$, gets the (unit) margin income for the following year:[59]

$$M_{t+1} = \mathbf{m}'\mathbf{c}_t^* \qquad [A.6]$$

(equations [A.5] and [A.6] try to model the fact that bank margins are 'sticky', since price adjustments affect only new loans).

Losses suffered in year t+1 can be computed simply as

$$L_{t+1} = LGD(\mathbf{d}'_{t+1}\mathbf{c}_t) \qquad [A.7]$$

When the bank makes no provisions against future losses, the endogenous change in its capital is just the difference between these two quantities. If capital at time *t+1* (i.e. $\mathbf{w}'\mathbf{c}_\mathbf{t} + M_{t+1} - L_{t+1}$) is more than the minimum requirement $\mathbf{w}'\mathbf{c}_{\mathbf{t+1}}$, the bank will be able to expand its loan portfolio. Conversely, if capital is less than the required minimum, a reduction in loans will be required.

This change in loan supply can be used as an indicator of procyclicality.[60] Another good indicator is given by the adjustment in the average spread required by the bank on new loans. While the former measures credit availability, the latter estimates the effect of economic cycles on credit prices.

[59] Note that we are implicitly assuming that defaults and portfolio adjustments take place at the end of the year; this might be unrealistic, but helps us keep our simulation exercise manageable. Moreover, we assume that portfolio adjustments are instantaneous and costless, which is an overly optimistic approach: when defaulted loans have to be replaced by new issues, this takes time (i.e. foregone spreads) and screening efforts (that is, operating costs).

[60] Alternatively, one might measure the exogenous capital flow ($f_{t+1} = \mathbf{w}'(\mathbf{c}_{\mathbf{t+1}} - \mathbf{c}_\mathbf{t}) - M_{t+1} + L_{t+1}$) needed to match 'endogenous' capital and regulatory capital.

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