Position paper on a countercyclical capital buffer

Executive summary

1. The financial crisis not only affected the liquidity of credit institutions but also had significant repercussions on their capital positions. The concern that write-downs would gradually deplete capital buffers has materialised[1], leaving a number of institutions with a need for external capital injections. The recessionary phase increases the likelihood that capital requirements shoot up as a consequence of borrowers' downgrades, possibly leading to a credit crunch. Common supervisory responses should be sought, in light of the likelihood of a cyclical downturn.

2. Work has been taken up by a number of international fora like the FSF, the Basel Committee or the EFC Working Group on pro-cyclicality. The Joint CEBS/BSC Task Force on the Impact of the New Capital Framework (TFICF) and the Capital Monitoring Group (under the Basel Committee) are examining the question of the pro-cyclicality of the Basel II/CRD Pillar 1 framework on the basis of empirical data derived from the actual application of the framework over a certain period of time.

3. Against this background, CEBS believes that it can assist supervisors across the EU by identifying where a more convergent approach could help them deal in practice with the cyclicality of banks' capital levels. The purpose of this paper is therefore to outline possible practical tools for supervisors to assess under Pillar 2 the capital buffers that banks have to maintain under the Basel II/CRD framework.

4. From the outset, there was consensus among CEBS members that any forward-looking system of capital buffers for banks should be designed within the boundaries of the existing regulatory framework. While the mechanisms identified might be alternatively employed in Pillar 1, its use under the Pillar 2 umbrella is still considered the most sensible option at this stage. Pillar 2 allows for flexibility in testing new prudential tools;

---

[1] A significant addition to the pressure on capital has come from the fact that large volumes of exposures, which banks previously had not consolidated, have come back to bank balance sheets as an effect of reputational risk.

moreover, an application in Pillar 1 would require further work and refinements.

5. Therefore, the objective is not the introduction of new supervisory tools or the amendment of the Basel II/CRD framework, but rather the identification of ways of improving the effectiveness of the way in which existing provisions are understood and implemented, building on the practices commonly adopted by most EU supervisors.

6. The focus on Pillar 2 ensures that buffers are: i) sufficiently flexible, ii) determined as the result of the dialogue between institutions and competent authorities, iii) not seen by the industry as simply a permanent raising of "minimum" requirements. Within this framework, an agreed methodology could be of help to supervisors to check what tools banks have developed to define capital buffers and challenge the results of banks' internal approaches against a common EU-wide benchmark.

7. Against the background of the ongoing discussions regarding pro-cyclicality at other international fora, CEBS believes that at this stage the options identified and put forward can and should serve as a common CEBS contribution to the discussion, but not yet as a final and complete answer.

8. This paper focuses on the cyclicality of credit risk in the banking book of IRB banks, which cover a substantial share of banking assets in most countries and whose use of internal models makes them more prone to pro-cyclical effects.

9. The approach outlined in this report should not be interpreted as a substitute for internal stress tests run by banks during the ICAAP; rather, it is intended as a tool that EU supervisors would use as part of the SREP for assessing the robustness and reliability of stress test results. Banks will be expected to comply or explain should their internal stress tests deliver results that appear excessively mild with respect to the supervisors' beliefs.

10. CEBS is also aware that there are tools beyond the Basel framework that can be used for reducing the cyclicality arising from banks' activity. Work has been taken up for example on dynamic provisioning and supplementary measures such as leverage ratios.

11. In general and consistently with the EFC and G20 decisions, countercyclical approaches should be based on automatic rules[2]. In order to overcome

---

[2] The use of an automatic adjustment of PDs is consistent with the thinking of the FSF (2008) that "*to the extent possible, policy tools that are based on rules and that limit the degree of discretion in their application and calibration are preferable. If feasible, and provided they are linked to robust and relevant aspects of the financial cycle, they leave less room for policy error. Moreover, once in place, they do not require continuous justification, and hence can act as an effective pre-commitment device. As a result, they can relieve pressure on the supervisors not to take action during the expansion phase, as a tightening of prudential standards would inevitably be seen as going*

industry or political resistance to increase buffers in good times and to provide a level playing field, there is a need for rules, which could act as a sort of automatic stabilisers. This does not preclude the exercise of discretion already envisaged in Pillar 2.

12. CEBS distinguishes two components of Pillar 2 capital buffers: the first one aiming at building sufficient additional resources (above regulatory minima) in order to deal with business cycle fluctuations; the second component aiming at covering losses arising from extreme events. At this stage, CEBS focuses on cyclical determinants of capital requirements variability and it does not deal with the issue of capital buffers against extreme events. CEBS is considering the use of mechanisms that adjust probabilities of default (PDs) estimated by banks, in order to incorporate recessionary conditions. Capital needs commensurate to adjusted PDs would serve as a benchmark for supervisors when assessing the adequacy of Pillar 2 buffers. CEBS also shares the view that adjustments which are bank-specific (i.e., based on variables at the bank level) and based on risk-sensitive concepts (in order to meet the incentive structure provided for by Basel II) have significant advantages.

13. In practice, the methodology is based on the application of an adjustment, which reflects the gap between current PDs and PDs corresponding to recessions. By construction, the size of the adjustment decreases in a recession and increases in expansionary phases. Based on the same underlying philosophy, CEBS sees two options for the calculation of the adjustment: 1) a portfolio level option, and 2) a rating-grade level (i.e., more granular) option, together with variants of each option.

14. The first option looks at the portfolio level. In the first variant of this option the PD of the portfolio at time t is calculated as the average of grade PDs weighted by the number of counterparties in each grade. The PD of the portfolio would change over the cycle as a result of the migration of borrowers across grades and of the change of grade PDs. The buffer would be determined accordingly. In the second variant the buffer is determined by making the confidence level of the risk-weight function time-varying.

15. The second option looks at each rating grade. The first variant of this option determines the buffer by using simply the recessionary PD (i.e., the highest PD) for each rating grade; the second one uses a two-step approach taking also into account rating migrations. This latter variant seems preferable, as it would deliver results that are less dependent on whether a through-the-cycle or a point-in-time rating system is used.

---

against the manifest view of the markets". Moreover, *"automatic stabilisers and discretionary measures should not necessarily be seen as mutually exclusive"*.

16. The adoption of simplified mechanisms would facilitate the dialogue between banks and supervisors during the SREP. Indeed, the buffer arising from the implementation of this approach could be used as a benchmark for assessing the adequacy of the outcome of banks' internal methods.

17. In order to gather additional evidence on merits and shortcomings as well as information on alternative approaches developed by market participants, the approach has been discussed with the banking industry in a meeting with experts nominated by the Panel and in bilateral meetings with a sample of major European banks. While not necessarily endorsing the approach and its technicalities, most banks agreed that its rationale is interesting. However several banks pointed out different issues still pending. Only one bank, during the bilateral meetings, strongly opposed the approach.

18. Although banks expressed different opinions on the approach, many agreed on some characteristics that a countercyclical tool should have. First of all, it should be bank-specific, in order to be tailored to the peculiarities of each bank's portfolios. Second, it should be based on risk-sensitive concepts in order to avoid perverse incentives and arbitrage opportunities. In other words, the tool has to be compatible with the incentive structure posed by Basel II. Third, any countercyclical device should not be excessively burdensome in terms of data needs and computational efforts. Finally, it should be transparent and clearly announced ex-ante in order to guarantee that market participants are aware that banks build up buffers in expansion and run them down in recession. In that respect, rule-based solutions seem preferable.

19. With regard to this last point a meeting with rating agencies was organized. They stated very clearly that transparency on capital adequacy is a key issue and it is a precondition for market acceptance of time-varying capital buffers. Rating agencies seem to prefer Pillar 1 solutions, considered more transparent e less prone to national discretions; however, they seem also aware that Pillar 2 would allow quicker responses and may be used for testing tools to be subsequently improved and, possibly, implemented under Pillar1.

20. Against this background, CEBS members agree that any countercyclical adjustment should be calibrated to individual banks' portfolios and based on risk-sensitive concepts. Most members also consider portfolio-level tools as preferable with respect to more granular approaches. While slightly less precise, they represent an effective and pragmatic way for dampening procyclicality and avoiding over-complex and more data-intensive mechanisms. However, one member believes that under Pillar 2 both

options can be usefully used as benchmarks by banks, either applied together or separately, in order to reduce model risk.

Content

List of terms commonly used in the report

Rating philosophy	In the IRB-framework, regulators have coined the term "rating philosophy" to describe the degree of cyclicality of the minimum capital requirements (MCRs). In purely PiT rating systems, MCRs tend to fluctuate more as the results of rating migrations. In Purely TTC rating systems, MRCs are relatively stable, but may show some volatility as the result of changes in grade-PDs, In practice, banks' rating systems sit on the spectrum between these extremes.
Portfolio	Regulatory portfolio (or asset class).
Grade-PD	According to the CRD, it is the long-term average of the default rates in a given grade.
Portfolio-PD	It is the average of grade-PDs weighted by the number of borrowers in each grade.
Downturn PD	It is the highest PD over a predetermined time-span (either at the grade or portfolio level).
Scaling factor	It is calculated as the ratio of downturn PD and current PD. It should not be confused with the 1.06 scaling factor used for calibrating the IRB formulae.

I. Introduction

1. The financial crisis not only affected the liquidity of credit institutions but also had significant repercussions on their capital positions. The concern that write-downs would gradually deplete capital buffers has materialised[3], leaving a number of institutions with a need for external capital injections. The recessionary phase increases the likelihood that capital requirements shoot up as a consequence of borrowers' downgrades, possibly leading to a credit crunch. Common supervisory responses should be sought, in light of the likelihood of a cyclical downturn.

2. Against this background, CEBS believes that it can assist supervisors across the EU by identifying where a more convergent approach could help them deal in practice with the cyclicality of banks' capital levels. The purpose of this paper is therefore to outline possible provide practical tools for supervisors to assess under Pillar 2 the capital buffers that banks have to maintain under the Basel II/CRD framework.

3. From the outset, there was consensus among CEBS members that any forward-looking system of capital buffers for banks should have been designed within the boundaries of the existing regulatory framework. While the mechanisms identified might be alternatively employed in Pillar 1, its use under the Pillar 2 umbrella is still considered the most sensible option at this stage. Pillar 2 allows for flexibility in testing new prudential tools; moreover, an application in Pillar 1 would require further work and refinements.

4. Therefore, the objective is not the introduction of new supervisory tools or the amendment of the Basel II/CRD framework, but rather the identification of ways of improving the effectiveness of the way in which existing provisions are understood and implemented, building on the practices commonly adopted by most EU supervisors. An agreed methodology could be of help to supervisors to check what tools banks have developed to define capital buffers and challenge the results of banks' internal approaches against a common EU-wide benchmark.

5. Against the background of the ongoing discussions regarding pro-cyclicality at other international fora, CEBS believes that at this stage the options identified and put forward can and should serve as a common CEBS contribution to the discussion, but not yet as a final and complete answer.

---

[3] A significant addition to the pressure on capital has come from the fact that large volumes of exposures, which banks previously had not consolidated, have come back to bank balance sheets as an effect of reputational risk.

6. This paper focuses on the cyclicality of credit risk in the banking book of IRB banks, which cover a substantial share of banking assets in most countries and whose use of internal models makes them more prone to pro-cyclical effects.

7. CEBS is considering the use of mechanisms that rescale probabilities of default (PDs) estimated by banks, in order to incorporate recessionary conditions. Capital needs commensurate to adjusted PDs would serve as a benchmark for supervisors when assessing the adequacy of Pillar 2 buffers. CEBS also shares the view that any adjustment should be bank-specific and based on risk-sensitive concepts in order to meet the incentive structure provided for by Basel II.

8. In practice, the methodology is based on the application of an adjustment, which reflects the gap between current PDs and PDs corresponding to recessions. By construction, the size of the adjustment decreases in a recession and increases in expansionary phases. Based on the same underlying philosophy, CEBS sees two options for the calculation of the adjustment: 1) rating-grade level, and 2) portfolio level together with variants of each option.

9. The first option looks at each rating grade. The two variants of this option determine the scaling factor either as the ratio between the recessionary PD (i.e., the highest PD) and the current PD (i.e., the long run average of one-year default rates) for each rating grade or by additionally taking into account rating migrations. This latter variant seems preferable, as it allows in a transparent manner to close the gap between through-the-cycle and point-in-time rating systems.

10. The second option looks at the portfolio level. In the first variant of this option the PD of the portfolio at time t is calculated as the average of grade PDs weighted by the number of counterparties in each grade. The PD of the portfolio would change over the cycle as the result of the migration of borrowers across grades and the change of grade PD. The scaling factor would be determined accordingly. In the second variant the buffer is determined by making the confidence level of the risk-weight function time-varying.

11. The approach outlined in this paper should not be interpreted as a substitute for internal stress tests run by banks during the ICAAP; rather, it is intended as a tool that EU supervisors would use as part of the SREP for assessing the robustness and reliability of stress test results. Banks will be expected to comply or explain should their internal stress tests deliver results that appear excessively mild with respect to the supervisors' beliefs.

II. Rating philosophies and cyclicality

12. At the heart of the IRB framework is the idea that regulatory capital requirements should be determined by the risk of default (as well as the relevant risk parameters) in a firm's portfolios and, more specifically, that exposures with similar default risk should be allocated to the same rating grade. The input to the IRB formula is the annual PD expected to be incurred in that grade (computed as the long-run average of one-year default rates). Correct initial allocation to a grade, as well as appropriate movement between grades thereafter, is an essential requirement of a risk-sensitive framework.

13. PD is typically assigned in a two stage process: (i) a PD/rating is assigned to a counterparty; (ii) a PD is assigned to an individual rating grade. Cyclicality in capital requirements can result from rating migrations (i.e., individual counterparties are assigned higher or lower ratings), from recalibration of the rating grade to PD mapping (i.e., counterparties in a given rating grade will be assigned a different PD) or from both of them. Not all rating approaches measure risk in the same way. And the choice of rating approach has implications for the volatility of capital requirements under the IRB approach. There are two stylised extreme rating systems (see BCBS, 2005):

- A point in Time (PiT) rating system is one in which firms seek to explicitly estimate default risk over a limited future period, typically one year. A consequence of the use of such an approach is that the increased default risk in a downturn results in significant borrowers' migration from better to worse grades. The result of this combination of borrowers' migrations and stable PDs for each grade is higher IRB capital requirements;

- Through the Cycle (TTC) rating systems tend not to adjust ratings in response to changes in macroeconomic conditions. Borrowers in the same grade are likely to share PDs that incorporate adverse economic conditions, which can be expected over a business cycle. Therefore, in a pure TTC rating system the volatility of capital requirements can in principle be avoided by conditioning on a sufficiently adverse state of the economy. However, in practice, there might be some remaining volatility in capital requirements deriving from changes of grade-PDs.

14. Under a stylised TTC system, changes in default rates due to movements in the cycle are reflected in volatility of actual defaults in each grade around the long run average and capital requirements are flat. Whereas under a stylised PiT system, the default rate in each grade should not

vary over time as changes in default risk (whether for cyclical or other reasons) would automatically result in the migration of exposures to other grades.

15. In the IRB world regulators have coined the term "rating philosophy" to describe where a rating system sits on the spectrum between these extremes. What we generally observe in practice are actual rating systems that lie between these two stylised extremes and which are defined as "hybrids". In such systems, the volatility of capital requirements is expected to be between that of a pure PiT and that of a pure TTC rating system.

III.   National approaches for dealing with cyclicality

16. According to a stock-take conducted within CEBS[4], national authorities deal with the cyclicality of Basel II capital requirements primarily by using the tools provided for by the CRD. Domestic supervisory guidelines indicate to banks how to mitigate the possible effects of the dynamics of the economic cycle on capital needs, both in Pillar 1 and Pillar 2.

17. First of all, under Pillar 1, most authorities have encouraged institutions to implement through-the-cycle (TTC) approaches, rather than point-in-time (PiT) approaches. For instance, banks are invited to carefully assess the relative weight of the different sets of information they usually combine in the estimation of statistical models, in particular the balance-sheet variables versus the behavioural indicators. However, the development of TTC models is somewhat limited due to data constraints and methodological challenges. Furthermore, purely TTC approaches tend to be incompatible with the need to use the rating system for internal purposes, e.g. in the pricing process.

18. Therefore, the smoothing of Pillar 1 minimum capital requirements fluctuations is more frequently pursued through long-term estimations of most of the risk parameters. Consistently with the CRD provisions, supervisors envisage two main tools: the use of long-term averages for computing PDs and the estimation of a downturn LGD. Generally speaking, robust quantification of long-run averages requires that banks have sufficiently long time-series of the risk-parameters and their drivers. Since data shortages are common across banks, prudent margins of conservatism may be added to the estimates.

---

[4] See CEBS 2008 217 rev2

19. As far as PDs are concerned, in the calibration process (i.e. in defining grade PDs), banks are required to use long-run averages of one-year default rates. This is the input for calculating Pillar 1 capital requirements. In some cases, supervisors also provide some further details on what a long-run average is. For instance, the Bank of Spain asks banks to consider a whole business cycle[5] (see Annex 3). Banks that do not have internal default data covering this time-span are required to make statistical adjustments, which allow them to take into account the unobserved part of the business cycle.[6] If migrations are significant banks have to take into account this fact when estimating the long-run default frequency associated to the portfolio. Despite that, it should be noted, however, that the migration of borrowers across different rating classes leaves room for increases of the capital requirement when economic conditions deteriorate even if account is taken of migrations when computing long-run adjusted PDs. The impact of all migrations and future changes in portfolio's composition is assessed under Pillar 2, within the analysis of capital adequacy.

20. Automatic stabilizers for smoothing capital requirements fluctuations are rarely used. Only the UK FSA allows mortgage banks – provided that they meet a series of criteria – to transform the PD estimates produced by PiT models to long-run average PDs, based on the relationship between long-term and current default rates for the portfolio (or a subset). A typical approach is to apply a scaling factor which varies with the state of the cycle. If the current average portfolio default rate is lower than the long-run average each PiT PD would be scaled up; in a recession, where the current default rate higher than the long term average, the PiT PDs would be scaled down (see Annex 4).

21. As for the LGD, banks are requested to use LGD estimates that are as much as possible estimated for an economic downturn (where these are more conservative than the long-run average).

22. Banks' compliance with Pillar 1 provisions is assessed during the validation process. The assessments are generally carried out by supervisors through on-site inspections, aiming at checking the robustness of the methodologies and the reliability of the results. During the assessment, the supervisors also determine whether and to what

---

5 The time period from 1/1/91 until present has been considered as an initial approximation to a complete business cycle for portfolios in Spain. As far as expected losses are concerned, Spanish banks have also to comply with the regulations on dynamic provisions.

6 The choice of the specific procedure to make this adjustment is left to banks, but the common approach is based on the estimation of a statistical relationship between the observed default rates and the business cycle and the application of that relation in order to extrapolate the default rates for years not included in the observation period.

extent the estimation of the risk parameters depends on the economic conditions prevailing in the period of time used for the estimation.

23. When banks are not able to meet supervisory requirements (e.g., because internal data are not sufficient), authorities may either require banks to employ more conservative assumptions or impose add-ons. As an example, supervisors frequently ask banks to include some degree of conservatism in their estimates, when they are carried out using data from a period of particularly favourable economic conditions.

24. As far as Pillar 2 is concerned, banks should include in their internal capital adequacy assessment process (ICAAP) specific computations of the likely cyclicality of their capital requirements. This might be based on simulations of rating migrations through the cycle. This is assessed within the supervisory review and evaluation process (SREP).

25. Within Pillar 2 banks are requested to perform stress tests on credit risk (as well as on other significant risk types). Even though supervisors do not usually prescribe banks as to how they should perform stress tests, they refer to the CEBS guidelines and provide some high level principles. Cyclicality is clearly one of the drivers of stress tests; the simulation of the impact of a mild recession is requested.

26. The results of banks' stress tests are assessed within the SREP. While the outcome of such assessment is defined on a case-by-case basis, some authorities also introduced flexible capital targets/target solvency ratios in order to guarantee that banks build up adequate capital buffers in good times. Failure to meet those targets may trigger supervisory responses.

27. Beyond CRD provisions, many supervisory authorities (or central banks) perform top-down stress tests from a financial stability perspective. These include a number of scenario and sensitivity analyses to take account of the various aspects of credit risk. While these stress tests are by no means a substitute for banks' internal stress testing, their outcome can be used for cross-checking banks' results.

28. Along with capital regulations, some countries also consider other tools aiming at reducing the cyclicality of banks' operations. In Spain, the dynamic provision system is based on the cyclical position of the economy: in good times, when problem loans and specific provisions are low, the dynamic provision increases; in bad times, when problem loans and specific provisions are high, the dynamic provisions free funds from the previously built reserves.

IV. An approach for dealing with cyclicality

29. As mentioned above, the approach considered in this paper builds on Basel II/CRD provisions and their implementing measures, including CEBS guidelines on the Supervisory Review Process (GL03) and the technical annex on stress testing (CP12).

30. The goal is not the introduction of new supervisory tools, but rather the identification of better ways for implementing already existing provisions. CEBS members also believe that improved risk management practices and more rigorous credit standards, particularly in periods of boom, play an important role in smoothing cyclicality. CEBS is also aware that there are other tools, beyond the Basel framework, that can be used for reducing the cyclicality of banks' activity. Those tools are currently examined by other CEBS work streams.

31. CEBS distinguishes two components of Pillar 2 capital buffers: the first one aiming at building sufficient additional resources (above regulatory minima) in order to deal with business cycle fluctuations; the second component aiming at covering losses arising from extreme events. At this stage, CEBS focuses on cyclical determinants of capital requirements variability and it does not deal with the issue of capital buffers against extreme events.

32. In particular, CEBS considers the adoption of simplified mechanistic approaches, which apply the same apparatus considered in Pillar 1 (i.e., regulatory formulae and PDs) within the Pillar 2 SREP framework. For the time being the focus is on a Pillar 2 tool for creating capital buffer, which is consistent with the role attributed to Pillar 2 of covering non-Pillar 1 risks and helping supervisors and banks marry the micro and macro perspectives. In addition, since problems of structural breaks may emerge in banks' time series of PDs or portfolios (for example, because of M&As), Pillar 2 flexibility leaves room for ad-hoc adjustments. More generally, Pillar 2 allows for flexibility in testing new prudential tools and would preserve the informative content of minimum regulatory capital. This approach takes into account that the implementation of a Pillar 1 tool would most likely take several years and that in the meantime a Pillar 2 tool would not only provide an immediate supervisory response to pro-cyclical effects but could also be used to test a potential future Pillar 1 tool.

33. Indeed, the approach provides conceptual ideas for a potential design of a Pillar 1 adjustment. In its current form, it would require, however, further work to become applicable in Pillar 1. The approach is motivated as a stress-testing concept which can well justify using the historically worst case scenario (maximum average PD) in order to determine the required

capital buffer. For a Pillar 1 adjustment, however, requiring a permanent buffer based on the worst case scenario may be perceived as too conservative; moreover, some more rigorous modelling standards should be achieved.

34. The use of measurement tools such as the IRB capital requirement formula (with the necessary PD input) for measuring unexpected losses for calculating time-varying, forward-looking capital buffers as part of a Pillar 2 adjustment has several advantages. It would preserve the informative content of minimum regulatory capital as advocated by Gordy and Howells (2006). In addition, the adoption of simplified mechanisms would facilitate the dialogue between banks and supervisors during the SREP. Indeed, the buffer arising from the implementation of this approach would be used as a benchmark for assessing the adequacy of the outcome of banks' internal methods. Since calibrated to individual banks' portfolios (e.g. by relating the adjustment to the individual banks' historical credit risk profile) and based on risk-sensitive concepts, such a mechanism would not suffer the shortcomings of adjustments based on aggregate data and would avoid the risk of regulatory arbitrage arising if non-risk sensitive adjustment are applied.

35. While the members of CEBS acknowledge that there are various possible ways, including prudential risk management and lending policies, for dealing with cyclicality and that banks are actively working for developing internal tools that can be used for quantifying capital needs in recessionary times, they agree that an automatic adjustment of PDs (or confidence levels) is one of the meaningful ways to address the issue of capital requirements fluctuations over the business cycle and probably the easiest to implement at this stage. This is also consistent with the thinking of the FSF (2008) that "*to the extent possible, policy tools that are based on rules and that limit the degree of discretion in their application and calibration are preferable. If feasible, and provided they are linked to robust and relevant aspects of the financial cycle, they leave less room for policy error. Moreover, once in place, they do not require continuous justification, and hence can act as an effective pre-commitment device. As a result, they can relieve pressure on the supervisors not to take action during the expansion phase, as a tightening of prudential standards would inevitably be seen as going against the manifest view of the markets*". Moreover, "*automatic stabilisers and discretionary measures should not necessarily be seen as mutually exclusive*".

36. The outlined approach envisages mechanisms that compute buffers based on the difference between banks' current PDs and PD estimates corresponding to recessionary conditions. The methodology is more

specifically based on the application of a scaling factor to current PDs, which reflects the gap between PDs based on current economic conditions and PDs corresponding to recessions. An alternative is the use of time-varying confidence levels that automatically adjust as the result of changing credit cycle conditions.

37. The calculation of the scaling factor can be carried out at different levels of aggregation: 1) portfolio level, 2) rating-grade level. These variations around a common methodology allow to understand how the scaling factors would behave depending on the differences in banks' internal models and, possibly, to identify the preferred approach in terms of effectiveness and feasibility.

1. *Portfolio level adjustments*

a. PD scaling factor

38. The PD of the portfolio at time t is calculated as the average of grade PDs weighted by the number of counterparties in each grade:

$$\text{Time t: portfolio PD}^p = \frac{\sum_{g=1}^{k} PD^g N^g}{\sum_{g=1}^{k} N^g}$$

where PD^g is the PD of each grade "g" (1, ... , k) and N^g is the number of counterparties in grade "g".

Example: portfolio with 2 rating grades (good, bad); 2 borrowers (A and B); two time-periods (t, t-1); for simplicity grade-PDs do not change. Assume that between t-1 and t borrower A moves from bad-grade to good-grade:

Rating Grade	Grade-PD	Time t	Time t-1
Good	1%	Borrower A	Empty
Bad	4%	Borrower B	Borrowers A and B

According to the portfolio approach, the scaling factor for the portfolio would be equal to 1.6, i.e. the ratio between portfolio PD at t-1 ($\frac{0 \times 1\% + 2 \times 4\%}{2} = 4\%$)

and portfolio PD at t ($\frac{1 \times 1\% + 1 \times 4\%}{2} = 2.5\%$).

39. The PD of the portfolio would obviously change over the cycle as the result of two different factors: i) migration of borrowers across grades (which is more pronounced in more PiT rating systems); ii) change of grade PD (which is more pronounced in more TTC rating systems). This methodology therefore aims at ensuring that the adjustments are neutral with respect to the philosophy of the rating methodology.

40. Then, the scaling factor for the entire portfolio is:

$$SF^p = PD^p_{downturn} \,/\, PD^p_{current}$$

which is close to 1 in a recession and assumes values higher than 1 in expansionary phases.

41. Again, it is possible to adjust grade-PDs using the scaling factor determined for the portfolio. In that case, grade-PDs would be rescaled using the scaling factor for the whole portfolio.

42. The following example shows how the buffer would be built up and run down over the cycle by two banks with the same portfolios. The example is purely illustrative and its results should not be interpreted as an analysis of the quantitative impact of the scaling factor approach. The following assumptions have been made:

- Both banks' portfolios are made of two grades (bad and good);

- Both banks use a hybrid rating system (therefore, both changes in grade-default rates and migrations take place);

- Both banks have the same migration of ratings;

- Bank "a" is more TTC and uses a very long-term average of default rates for quantifying current grade-PDs, whereas bank "b" is more PiT and uses shorter time-series of default rates as PDs;

- For simplicity, the time series span across identical business cycles.

43. In terms of evolution of the buffers, it is worth noting that they would be built up gradually over time; in the case of an inversion of the cycle they would be employed for absorbing increasing MRC needs.

**Evolution of Pillar 2 Buffers over the cycle**
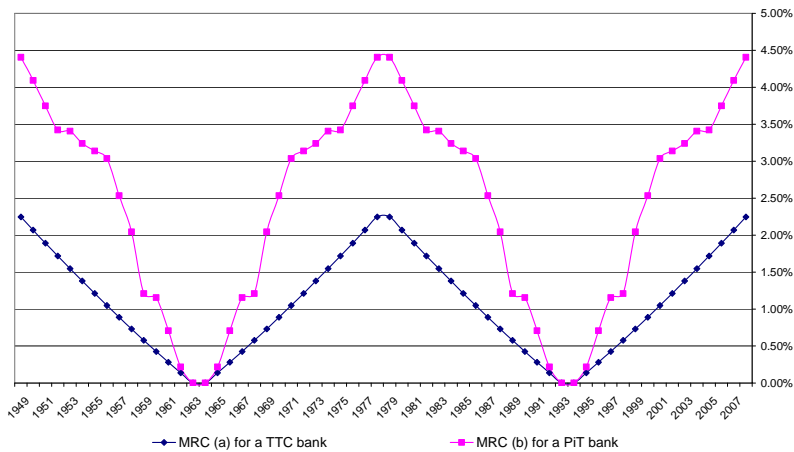
44. In the example (panel above), both banks would accumulate buffers between 1963 and 1978, deplete them entirely from 1978 to 1993, and restart restoring additional resources in 1994. However, while more-TTC banks would need relatively low buffers (since their MRC fluctuates to a lesser extent), more-PiT banks would need higher buffers. The next two panels draw the composition of banks' total capital resources in different phases of the business cycle. The panels show that the application of this approach, while maintaining the risk-sensitiveness of Basel II, would make the sum of MRC and buffer as stable as in Basel I.

Pillar 1 MRC vs Pillar 2 Buffer over the cycle - Bank a
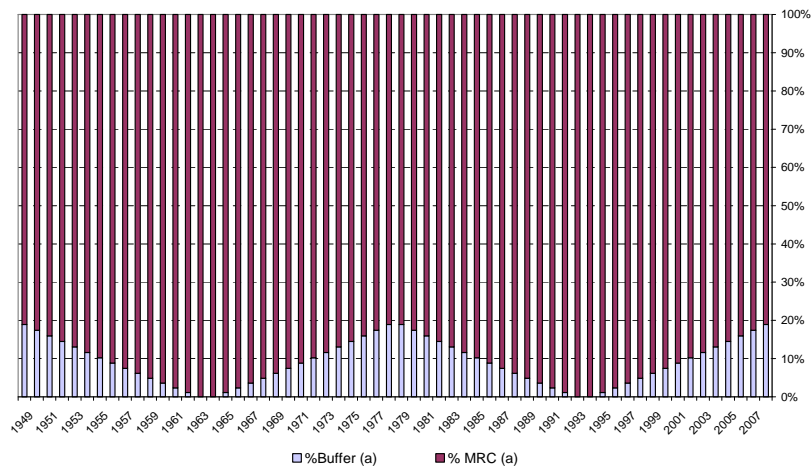
Pillar 1 MRC vs Pillar 2 Buffer over the cycle - Bank b

□ % Buffer (b)   ■ % MRC (b)
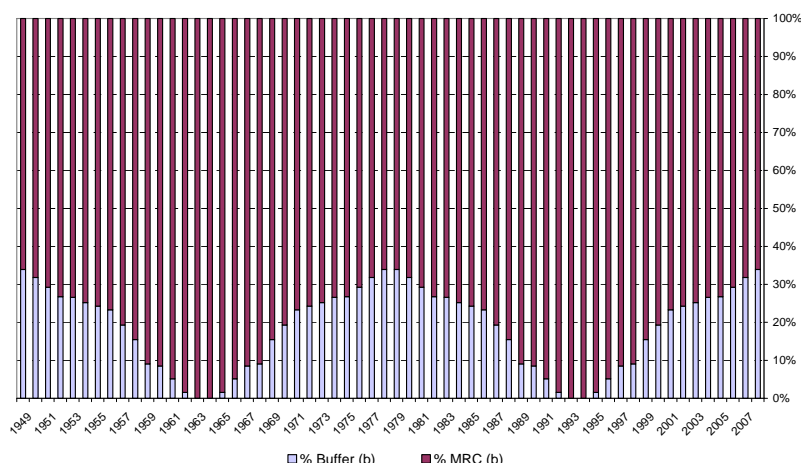
b. Time-varying confidence levels

45. A variant to the scaling factor is to make the confidence level of the risk-weight function time-varying. The main idea is to compute the IRB capital charge in a bad year (economic downturn) and to adjust the confidence level of the IRB risk weight function upwards in a good year (economic upswing) so as to achieve the same level of capital. The calculation would be carried out at a portfolio level; afterwards, the adjusted confidence level would replace the 99.9% level for the calculation of banks' capital requirements of each rating-grade.

46. The approach is implemented as follows. For a given "bad" year t (e.g. the worst out of N years with N covering a full business cycle), the maximum portfolio PD is:

$$\overline{PD}_{\max,t} \equiv \max_{0 \leq i \leq N-1}\left(\overline{PD}_{t-i}\right)$$

47. Denote by $RW_{\alpha}\left(PD\right)$ the IRB risk weight of an asset with a probability of default PD and confidence level α; hence $RW_{99.9\%}\left(PD\right)$ is the regulatory IRB minimum capital. The time-varying confidence level $\alpha(t)$ of year t is determined to fulfil: [7]

$$RW_{99.9\%}\left(\overline{PD}_{\max,t}\right) = RW_{\alpha(t)}\left(\overline{PD}_t\right)$$

48. As long as $\overline{PD}_{\max,t} > \overline{PD}_t$, the confidence level is above 99.9%.

---

[7] Consistency with the model technically requires a (downward) adjustment of the IRB maturity adjustments if the confidence level is changed. Not taking this effect into account in the interest of tractability is always conservative and provides an upper bound for capital. Furthermore, one might argue that less rigor is required for a benchmark in pillar 2 than would be necessary in pillar 1.

49. If the portfolio had a uniform (but time-varying) PD, the portfolio based PD adjustment and the adjustment of the confidence level would coincide and boil down to a historical maximum of risk weights. In practice, they will diverge since PDs are not homogenous but assigned depending on the rating bucket of the borrower/exposure. If applied to PDs proxied by averages of Moody's default rates, the two rescaling methods provide quite similar results as demonstrated in the next Chart.

Evolution of capital (measured in risk weights (RW)) for PD scaling and scaling of the confidence level; PDs are 5-year averages of Moody's default rates (1970–2008); representative, heterogeneous portfolio
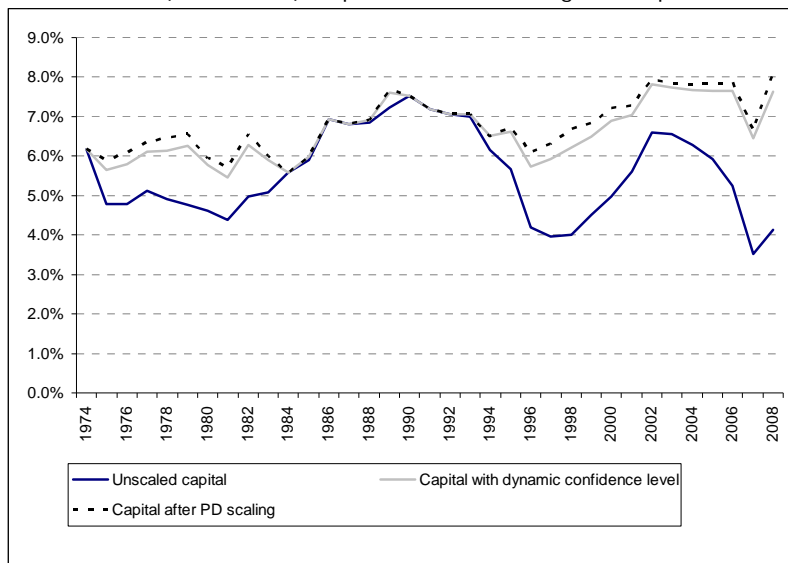
50. The simulation is based on Moody's default rates of different rating categories from 1970 to 2008 and refers to a portfolio of "average credit quality" with a constant exposure distribution across rating categories[8]. Within each rating bucket, the attached PD that is used for the calculation of the IRB capital charge is calculated as a five-year average of historical default rates. The total portfolio quality changes only by the change of rating-specific PDs. Although the static distribution across rating buckets prohibits rating migrations, this setup can be interpreted as equivalent to a rating system with constant PD labels of rating buckets ("rating master scale") where changes in credit quality happen only through rating

---

[8] See M. Gordy (2000), A comparative anatomy of credit risk models, JBF 24, 119-149, Table 1.

migrations[9]. For the calculation of the IRB capital charge we assume that assets have a uniform maturity of 2.5 years and an LGD of 45%.

2. *Grade level adjustments*

a. One-step PD scaling factor

51. Under this option, the scaling factor (SF_g) would be determined as the ratio between the recessionary PD and the current PD for each rating grade. Since the CRD states that "credit institutions shall estimate PDs by obligor grade from long run averages of one-year default rates", current grade-PDs are the long-run average of obligors' default rates in that grade and the downturn PD is the highest PD observed for the same grade over a predetermined time period.

52. Since current grade-PD is the long-run average of obligors' default rates and the downturn PD is the highest PD observed over a give time-span, no "tail" default rates are plugged in the IRB formulae, rather the approach is based on average figures.

53. In principle, supervisors should define a uniform length for the time-series to be used. However, banks with longer time series, which include more than one recession, might be allowed to use an average of the highest PDs. Banks not having sufficiently long time-series, including recessionary default data, should infer recession data in a conservative way.

54. Therefore, only two inputs are required:

$PD^g_{current}$ = long run average of one-year default rates per grade at time t

$PD^g_{downturn}$ = highest PD per grade

55. Then, the scaling factor is:

$$SF^g = PD^g_{downturn} / PD^g_{current}$$

which decreases in a recession and increases in expansionary phases. It should be underlined that the scaling factor would be lower, *ceteris*

---

[9] Because of the static distribution across rating buckets our setup corresponds to a TTC rating system with PDs changing through time. However, it could also be interpreted as a PIT rating system on a continuous scale where only few (actually 7) PDs buckets are actually filled in, with constant PDs.

paribus, for banks that already include recessionary conditions in the estimation of grade-PDs (since PD$^g_{current}$ would be higher).

56. The scaling factor is used to adjust grade-PDs. Applying the scaling factor on the pooled PD of a rating bucket effectively means that the internal PD estimate is replaced by a downturn PD. The capital buffer would be the difference between the amount of minimum required capital (MRC) computed using the original grade PD and the one computed using the rescaled grade PD. This is clearly an approximation, but the computational burden is kept to a minimum.

57. In expansion:

$PD^g_{current}$ < PD$^g_{downturn}$ $\Rightarrow$ for each grade, PD$^g_{downturn}$ is used $\Rightarrow$ building up of buffers

58. In recession, buffers decrease since $PD^g_{current}$ and PD$^g_{downturn}$ are closer

59. The approach based on a grade-level scaling factor tends to be non-neutral with respect to the rating philosophy. Indeed, the scaling factor approaches 1 the closer the rating system is to the PiT rating philosophy (since changes in the economic cycle are captured by borrowers migrating among rating classes through the cycle while grade-PDs remain, by construction, constant over time). The approach would therefore provide wrong incentives to banks.

b. Two-step PD scaling factor

60. This problem may be overcome by using a two-step procedure that takes explicitly into account rating migrations. In particular, in addition to calculating downturn PDs for each grade one should introduce, in a first step, rating migrations. A possible option is to compute a grade-level modified PD, "mod PD" as follows:

$$\mod PD^g_t = (1 - \alpha - \beta)PD^g_t + \alpha PD^{g+1}_t + \beta PD^{g-1}_t$$

where α is the share of counterparts rated "g" at the date t-1 that migrated to the rating "g+1" at the date t, and β the share of counterparts rated "g" at the date t-1 that migrated to the rating "g-1" at the date t[10].

61. In that way, if the rating system leads to a significant impact of rating migrations (PiT rating system), mod PDs' developments would largely be driven by the coefficients α and β; if the rating system is based on PDs variation for a given rating (TTC rating system), mod PDs developments

---

[10] One assumes here that migrations by 2 ratings or more are neglected. Otherwise, the formula could be expanded.

would mainly be driven by the variations of the grade-level PDs, given that α and β are near zero: $(\alpha, \beta) \approx (0,0)$.

62. Let us denote T the length of historical data, available at the time t of the analysis: for this year t, for each grade, the downturn modified PD is the maximum of modified PD computed over the past T periods[11]:

$$\mod PD^g_{downturn,t} \equiv \max_{t-T \le i \le t} (\mod PD^g_i)$$

63. A generally more conservative variant as regards the computation of the modified PD for each grade is to take the maximum observed (i.e. downturn) coefficients α and β over the length of historical data T and apply them to current PDs. The calibration of these $\alpha_{downturn}$ and $\beta_{downturn}$ in order to compute a downturn mod PD should correspond to the least favorable case i.e. that corresponding to the highest (resp. lowest) transition from grade "g" to grade "g-1" (resp. "g+1")

64. Regardless of the variant, the buffer would be computed as the difference between IRB capital requirement using downturn mod PD and current PD.

65. The following charts illustrate the advantage of using such a modified grade-level approach. For the sake of simplicity, they only examine the variant of paragraph 63. Two fictitious portfolios A and B are simulated over five years, with two hypothetical downturns, the first in the second year, and the second in the fifth year. On an aggregate 'portfolio' level, both portfolios exhibit exactly the same developments in their overall PD. The difference lies in their rating nature: in portfolio A, all the developments in the aggregate PD come from *rating migrations*, the PD by grade remaining the same throughout the simulation. On the contrary, in portfolio B, the breakdown by grade remains the same, the developments in the overall PD stemming from the *variations of grade PDs*.

66. In case A, the buffer implied by the original grade-level approach is zero[12]. The buffer implied by the modified grade-level approach is zero in downturns, but significant in upturn and, in our example, close to (though, in general, higher than) the one implied by the portfolio level approach.

---

[11] For the sake of reliability, it is necessary that the historical data include at least a full business cycle. (This is also true for other approaches, e;g. the portfolio approach).

[12] In this example, the capital buffer is presented in percentage of MRC computed under pillar 1 formula for corporate with LGD equal to 45%. Moreover, this capital buffer is computed at the level of each rating bucket. The capital buffer is finally the difference between the amount of minimum required capital (MRC) computed using the original grade PD and the one computed using the modified grade PD.

% of MRC (pillar 1)

Legend: grade level — modified grade level — portfolio level
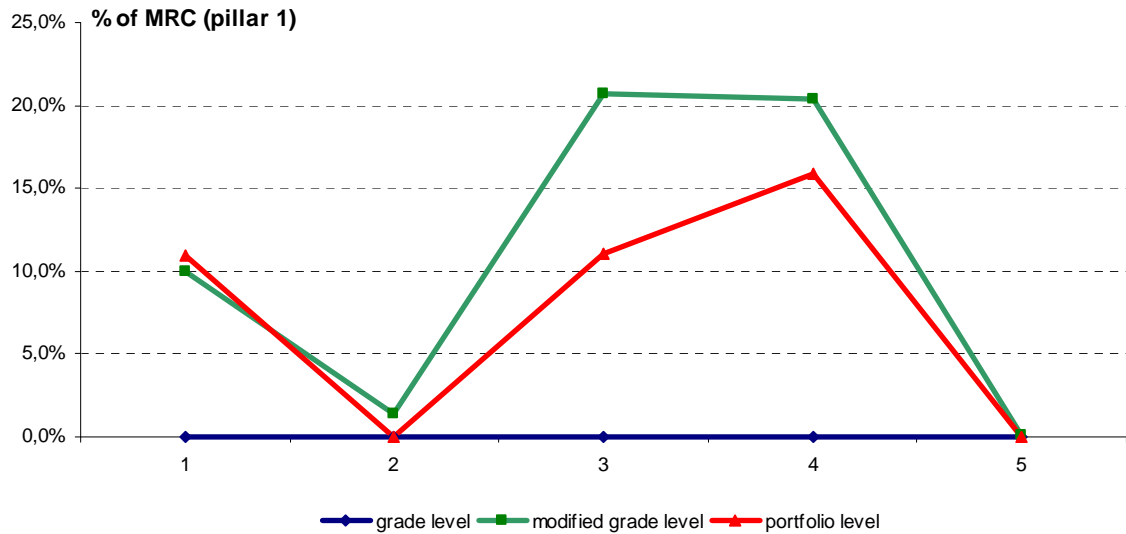
67. This graph shows that, in year 2, the buffer is almost nil. But, in year 3 and 4, it represents around 20% of pillar 1 MRC for credit risk in the modified grade approach and around 15% in the portfolio level approach.

68. In case B, the buffer in the grade-level approach and that in the modified grade-level approach remain the same since there is no rating transition.

% of MRC (pillar 1)

Legend: portfolio level — grade level
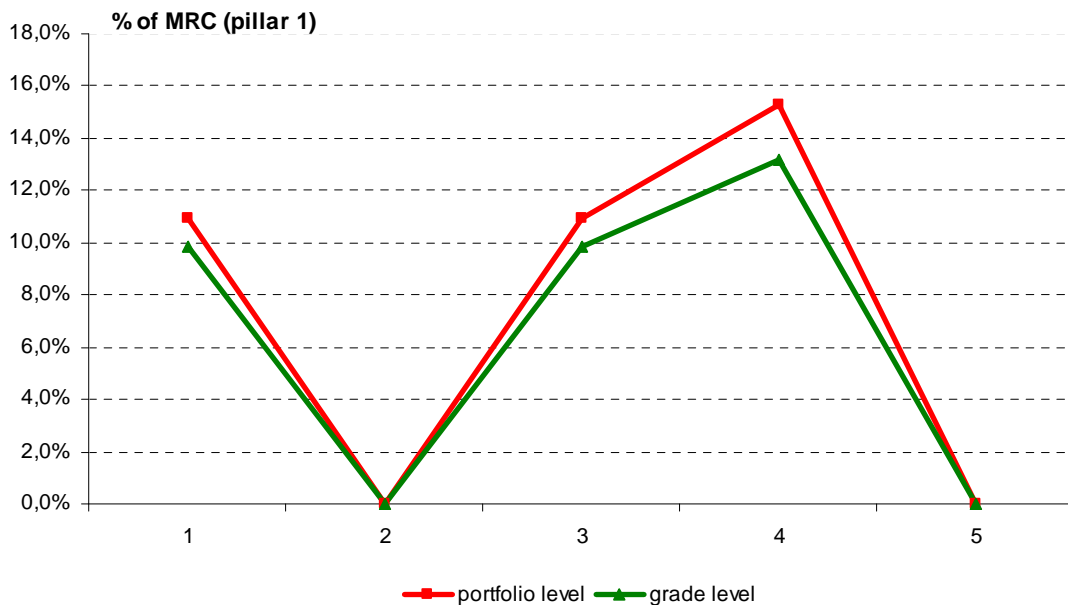
69. All in all, as shown by this simulation, the modified PD grade-level is likely to reconcile the advantages of explicit modelling of both PDs changes and rating transitions as well as granularity, in particular relaxing the

assumption of portfolio invariance, with the range of outcomes of the portfolio approach.

3. *Comparison of different options*

70. The different alternatives share some common characteristics.

71. All methods assume that any change of PDs is due to cyclical fluctuations. This is clearly a strong assumption since credit risk may also vary as the result of idiosyncratic events (such as a M&A or changes in lending policies). These are issues that the supervisor and the bank may discuss when the results of the ICAAP and internal stress tests are compared with the output of the SREP re-scaling mechanism.

72. The robustness of the scaling-factor / time-varying confidence level depends on the use of sufficiently long time-series (including recessionary conditions), which are not easily available to banks. Time series should ideally include one full business cycle or more. However, the problem of data shortages is expected to be temporary and it is common to any stress testing framework. In that respect, the impact of the current crisis on credit risk should make problems of data availability less important.

73. Notwithstanding some similarities, the different options do work differently depending on the philosophy of the rating system adopted by each bank. In particular, as mentioned above, while the one-step grade-level scaling factor is not effective for purely point-in-time PDs, the two-step grade-level and, especially, the portfolio-level are more neutral with respect to the rating philosophy. Also, the adjustment is expected to be lower for banks that use long time-series of the default rates for determining grade PDs.

74. The impact of factors idiosyncratic to single borrowers is expected to be negligible in the portfolio-level approaches since idiosyncratic migrations tend to cancel each other out (see example below).

Example: Portfolio level; portfolio with 3 rating grades (good, bad, very bad); 2 borrowers (A and B); two time-periods (t, t-1).

Assume that between t-1 and t borrower A moves from bad-grade to good-grade and B moves from good-grade to bad-grade. This is clearly an idiosyncratic movement, otherwise A and B would move in the same direction (for instance, in recession, A would move from bad-grade to very bad-grade and B from good-grade to bad-grade):

Rating Grade	Grade-PD	Time t	Time t-1
Good	2%	Borrower A	Borrower B

Bad	4%	Borrower B	Borrower A
Very Bad	8%	Empty	Empty

75. Ideally, the scaling factor should not vary as the result of idiosyncratic migrations. Indeed, applying the portfolio approach, the scaling factor for the portfolio in the example would not change since the PD of the portfolio, which is equal to the average of grade-PDs weighted by the number of borrowers (i.e. 1x2%+1x4%+0x8%) remains constant over time.

76. A limit of the portfolio-level scaling factor is that the computation of the scaling factor might be affected by possible structural changes of banks' portfolio strategies. The magnitude of the latter factor, again, can be discussed by banks and supervisors under the SREP.

77. On the other hand, the two-step rescaling mechanism tends to be complex and data intensive. In addition, it may be unduly conservative if the worst periods in terms of migrations towards riskier rating-grades and increases of grade-PDs do not coincide.

78. Trading off pros and cons of the two options, most CEBS members share the view that portfolio-level tools are preferable as opposed to more granular approaches. While slightly less precise, they represent an effective and pragmatic way for dampening procyclicality while avoiding over-complex and more data-intensive mechanisms. However, one member believes that under Pillar 2 both options can be usefully used as benchmarks by banks, either applied together or separately, in order to reduce model risk.

79. The following table summarizes the advantages (+) and disadvantages (-) of the three options.

Characteristics	Description	One-step grade-level	Two-step grade-level	Portfolio adjustments
Simplicity/manageability	Conceptually simple	Yes (+)	No (-)	Yes (++)
Granularity	Adjustments applied on rating grade basis	Yes(++)	Yes (++)	No (-)
Neutrality	Neutral with respect to the rating philosophy	No (--)	Yes (++)	Yes (++)
Data requirements	Problems with data availability (migration matrices)	No (+)	Yes (-)	No (+)
Macroeconomic forecasting	There is a need to estimate statistical relationships between PDs and the business cycle	No (+)	No (+)	No (+)
Portfolio's idiosyncratic changes	Idiosyncratic factors affect the size of the adjustment	Partly (-)	No (+)	No (+)

V. Industry's reaction to the proposal

80. On 21 January 2009, the CEBS met industry representatives nominated by the Consultative Panel in order to discuss the interim Report "Supervisory response to cyclicality" and particularly the idea of automatic mechanisms for building up Pillar 2 capital buffers. More precisely banks discussed options 1a) and 2a) since options 1b) and 2b) have been developed at a later stage; another option (cohort level approach), also discussed with banks, has been removed from this report since considered by most banks and CEBS members as hardly feasible.

81. During the meeting, some industry representatives raised concerns on the proposal, both very general and more detailed ones. In order to collect more focused comments and suggestions from banks, CEBS organized bilateral meetings with a selected sample of large institutions. Meetings took place between February and April 2009, with six major European banks.

82. Overall, the meetings have been very fruitful. The attitude of banks towards the CEBS approach has been very open. They appreciated the opportunity to discuss in detail merits and limitations of the scaling factor methodology. While not necessarily endorsing the approach and its technicalities, most banks agreed that its rationale is interesting. However several banks pointed out different issues still pending. Only one bank strongly opposed the approach and suggested instead to develop time-varying regulatory curves, based on variable confidence-intervals, in order to reduce fluctuations of Pillar 1 minima.

83. The outcome of the meetings can be summarized as follows.

- **Pillar 1 versus Pillar 2 tools**. Most banks, particularly those that already use TTC rating systems, underlined that the problem of procyclicality in the capital requirements would be mitigated by the use of TTC methodologies. However, they highlighted that purely TTC PDs and/or ratings would not be fully consistent with internal management purposes and therefore might fail the Basel II "use test" requirement. Some banks motivated a preference for interventions under Pillar 1 with the consideration that this approach would reduce the authorities' discretion.

- While there are clearly mixed views on whether cyclicality should be dealt with under Pillar 1 or Pillar 2, there is a broader consensus that a tool based on a buffer equal to the difference between current and downturn IRB credit requirements (as the CEBS approach is) would

better fit under Pillar 2. Many institutions agree that the CEBS benchmark may increase the degree of transparency and objectivity of the SREP.

- Also banks that support Pillar 1 interventions recognize that the CEBS approach may provide banks with the right incentives to use less volatile risk parameters for calculating IRB capital requirements. In that respect, they see some rationale in CEBS's approach and they acknowledge its potential contribution to the level playing field during the SREP.

- **Rating agencies' and analysts' expectations**. The interaction with market participants is a main source of concern to all banks. They are sceptical on the actual possibility to run down the buffers when recessionary conditions materialize. Some banks claimed that, at this very moment, market analysts and rating agencies seem to have taken over from supervisors in setting optimal solvency levels. Market requests for higher capital in stressed times have obviously the potential to worsen the crisis. Therefore, they would welcome strong communication policies from supervisors in order to make it clear, ex-ante, that capital buffers may decrease in bad times and that this is indeed the only way to make banks' capital less cyclical. In that respect, they see some merit in CEBS's approach, provided it is accompanied by proper and very active communication strategies.

- **Relation between the CEBS approach and banks' stress tests**. All banks consider internal stress tests to be more accurate and reliable (in terms of both scenario design and methodologies) than any automatic mechanism. However, as already mentioned, they do recognize that the implementation of a common benchmark (such as the scaling factor) that all EU supervisors could use for challenging banks is a valuable option.

- Many banks would prefer that supervisors rely more on stress scenarios, which they find the most useful capital planning tool, possibly providing operational guidelines and challenging banks with benchmark scenarios.

- Some banks claimed that internal stress tests are more forward-looking than a buffer based on past recessionary events, since they are based on conditional expectations. On the other hand, those banks tend also to agree that this approach may produce over-optimistic scenarios in good times.

- Most banks do not consider the fact that Pillar 2 is based on economic rather than regulatory capital as grounds to object to the CEBS approach. In that respect, some noted that banks should in any case be

able to reconcile economic and supervisory capital within the SREP dialogue with supervisors.

- **Dynamic provisions versus capital buffers**. Most banks seem very open to the introduction of dynamic provisioning inspired to the Spanish approach. Also, they do not envisage specific problems arising from the interaction between dynamic provisions, aiming at covering expected losses, and capital buffers, targeted to unexpected losses. Banks also have a common view that the two tools can effectively complement each other.

- **CEBS approach and TTC rating systems**. All banks agree that the portfolio-level scaling factor is neutral with respect to the rating philosophy (i.e. it requires higher buffers of banks using PiT ratings and lower buffers of more TTC oriented banks). Therefore, there is some consensus that the approach sets the right incentives to use less volatile inputs for the IRB formulae, since its impact tends to be limited for banks that already use TTC PDs and/or rating. In that respect, some banks underlined that any rescaling should be bank-specific, while country-level adjustments would be counterproductive since they would penalize more TTC banks.

- In the bilateral meetings, in particular, the following possible technical shortcomings of the CEBS approach were discussed: i) the assumption of portfolio invariance; ii) the difficulty in distinguishing between systemic and idiosyncratic determinants of PD changes; iii) problems due to the convexity of the regulatory formulae.

- It is not clear how important banks consider these issues. They observed that the assumption of portfolio invariance is not a problem specific to the CEBS approach. Rather, it is linked to any statistical estimation and forecasting, including the rating system itself, economic capital models and stress tests. Some banks did mention that disentangling the impact of cyclical and non-cyclical fluctuations of PDs can be difficult; however, others noted that the role of idiosyncratic factors is not a key problem since on average they should cancel out. Also the issue of convexity is not perceived as a problem specific to the CEBS approach, even though some banks mentioned that it might produce some bias depending on the characteristics of the rating system and borrowers' bucketing.

- As regards the practical implementation of the approach, most banks are concerned by the **data** needs. This is an open issue to be further discussed by CEBS.

- **Preferred options**. While not all banks explicitly stated their preferred option among those outlined by CEBS it seems that most banks would disregard most computational burdensome approaches. One bank also mentioned the possibility to use the grade approach explicitly combined with rating transitions.

- **First time application**. Most banks raised the issue of the timing of the introduction of the CEBS approach. There is consensus that the approach should be applied after the normalization of credit markets and should be implemented gradually.

- **Other sources of cyclicality**. Many banks noted that there are other possible sources of cyclicality, which may have been much more important than the Basel II rules on credit risk. In particular, they noted that, at this stage, fair value accounting, re-intermediation as well as counterparty risks remain the most important causes of capital requirements fluctuations. This means that, in their view, the trading book has been the most cyclical portfolio in recent times and that countercyclical tools need to address this. However, they also acknowledge that an increase in credit risk-related capital requirements will emerge as the recession becomes deeper, in particular because of rating downgrades.

84. While banks expressed different opinions on the approach, many agreed on some characteristics that a countercyclical tool should have. First of all, it should be bank-specific, in order to be tailored to the peculiarities of each bank's portfolios. Second, it should be based on risk-sensitive concepts in order to avoid perverse incentives and arbitrage opportunities. In other words, the tool has to be compatible with the incentive-structure posed by Basel II. Third, a countercyclical device should not be excessively burdensome in terms of data needs and computational efforts. Finally, it should be transparent and clearly announced ex-ante in order to guarantee that market participants are aware that banks build up buffers in expansion and run them down in recession. In that respect, rule-based solutions seem preferable.

85. Inputs have also been collected from the major credit rating agencies during a meeting on 29 May 2009. Rating agencies stated very clearly that transparency on capital adequacy is a key issue and it is a precondition for market acceptance of time-varying capital buffers. Rating agencies seem to prefer Pillar 1 solutions, considered more transparent and less prone to national discretions; however, they seem also aware that Pillar 2 would allow quicker responses and may be used for testing tools to be subsequently improved and, possibly, implemented under Pillar1.

VI.   Advantages with respect to other countercyclical tools

86. The use of the mechanisms presented in this paper, either based on downturn PDs (at any level for aggregation) or time varying confidence intervals, has the following advantages.

87. The use of automatic quantitative mechanisms implies that no discretion is required of supervisors in order to have a common quantitative benchmark. As highlighted by the FSB "policy tools that are based on rules and that limit the degree of discretion in their application and calibration are preferable. If feasible, and provided they are linked to robust and relevant aspects of the financial cycle, they leave less room for policy error. Moreover, once in place, they do not require continuous justification, and hence can act as an effective pre-commitment device. As a result, they can relieve pressure on the supervisors not to take action during the expansion phase, as a tightening of prudential standards would inevitably be seen as going against the manifest view of the markets";

88. While such mechanisms might possibly be implemented in Pillar 1, after all the amendments and refinements deemed necessary, their use under Pillar 2 is preferable at least initially and seems also consistent with the role attributed to Pillar 2 (i.e., covering non-Pillar 1 risks and helping supervisors and banks marry the micro and macro perspectives). In addition, since problems of structural breaks may emerge in banks' time series of PDs or portfolios, i.e. RWAs (for example, because of M&As), Pillar 2 flexibility leaves room for ad-hoc adjustments. The introduction of such mechanisms allows shifting the burden of the proof on buffer adequacy from supervisors to banks (e.g., banks have to demonstrate structural changes in their portfolios). More generally, Pillar 2 allows for flexibility in testing new prudential tools.

89. The mechanisms are easy to implement and, since they do not require any macroeconomic forecasting, they are more manageable than approaches that imply econometric estimations; accordingly, they are suitable also for international banks, whose risk is affected by the business cycles in different countries;

90. Since they are calibrated to individual banks' portfolios, such mechanisms would not suffer the shortcomings of adjustments based on aggregate data or "one-fits-all" measures (like those based on assets' growth or even aggregate default rates). Indeed, the adjustment is tailored to the portfolio riskiness of each bank.

91. The approaches do not pose perverse incentives and arbitrage opportunities, since they are based on Basel II risk-sensitive concepts, and they aim at being neutral with respect to the rating philosophy adopted by banks. More prudent banks in terms of risk management are required to hold lower buffers (this is not the case for other countercyclical mechanisms – such as those based, for instance, on asset growth);

92. PD and confidence interval rescaling are suitable for any IRB bank (while, for example, equity-index / spread based multipliers assume that financial market are efficient and that most firms are listed, which is not necessarily true for most European countries);

93. Compliance with the use-test is ensured (while purely TTC PDs and/or ratings may not suit banks' internal purposes).

ANNEX 1: Review of a selected literature

1. This annex reviews a selected literature concerning likely patterns of capital requirements and capital buffers under the new prudential framework, and the different policy options proposed for addressing potentially pro-cyclical aspects under the Basel II/CRD framework.

The cyclicality of Pillar 1 capital requirements

2. The Basel Committee on Banking Supervision (BCBS) addressed the issue of the cyclicality of Pillar 1 capital requirements in its Dynamic Operation Project (DOP-BCBS, 2006). The DOP report examined several academic papers that employed simulation approaches to estimate the magnitude of the cyclical variations of Basel II requirements over the business cycle. These simulation studies construct a representative portfolio of exposures and examine how these exposures' ratings and the corresponding capital charges would vary over a business cycle[13]. Most simulations show significant and sizable cyclical behaviour of Pillar 1 minimum required capital under Basel II. Moreover, in most studies cyclicality is found to be considerably larger under the assumption of a PiT rating method than under a through-the-cycle TTC method. At the same time, PiT estimates of cyclicality were found to vary markedly across studies, due to methodological and sampling differences. These differences relate to: (i) portfolio composition – i.e. the credit quality chosen for the original sample portfolio and the portfolio management strategy in downturns; (ii) methodology – i.e. handling of missing observations and handling of defaulted obligors. Other possible limitations of this literature are mentioned in Masschelein (2007), such as the lack of possible cyclical effects that can come from time-varying LGDs and EADs or from considering other portfolios (retail, mortgages, SMEs, banks, sovereign etc.); the possible (anti)cyclical effects that could come from exposures which are hedged using the new CRT instruments or from extending the analysis to the second Pillar.

3. Further, the DOP report assembled evidence from other sources that have the benefit of deriving in part or in whole from real data supplied by banks. According to the majority of the group, the evidence shows that cyclicality of Pillar 1 capital requirements under Basel II will be large, in the range between 20% and 45% of Basel I capital requirements.

---

13 The studies reviewed in the DOP report are: Catarineu-Rabell, Jackson and Tsomocos (2005), Goodhart, Hofmann and Segoviano (2004), Kashyap and Stein (2003), Marcelo and Scheicher (2005).

4. After the release of the DOP report, looking particularly at mortgage portfolios, Saurina and Trucharte (2007) compare point-in-time, through-the-cycle, long-run averages, cyclically corrected, and acyclical ratings. These different measures of credit risk translate into fluctuations of capital requirements that depend on the rating philosophy: huge for point-in-time ratings, much less for TTC ratings.

5. The cyclicality of the Basel II capital requirements should not come as a surprise. The Basel II framework has the objective of making capital requirements more risk-sensitive; therefore, by construction the Basel II capital requirements will be more cyclical, i.e. co-moving with the cycle, than under the previous approach. As noted in FSF (2008), it is less clear, however, to what extent this cyclicality in the Pillar 1 minimum capital requirement produces pro-cyclicality in financial markets and broader economic activity, i.e. causes negative feedback dynamics which further amplify financial market volatility, illiquidity or economic cycles.

The cyclicality of bank lending and the need for time-varying capital buffers

6. Irrespective of the type of capital regulation (i.e. Basel I or II), Jimenez and Saurina (2006) find strong evidence of banks applying more lenient credit standards during boom periods, both in terms of screening of borrowers and in collateral requirements, than in recessions.

7. Excessive risk-taking during expansions, which leads to the build-up of vulnerabilities, is one example of a "fundamental" source of pro-cyclicality, i.e. of mechanisms through which the financial system can amplify business fluctuations that are particularly disruptive during an economic downturn or when the financial system is facing strains.[14] To address this problem, Jimenez and Saurina (2006) focus their proposal on an additional flow of loan loss provisions (in addition to specific and general provisions) which is positive when the bank's loan portfolio grows above its average historical growth rate and is negative otherwise. The system is designed to address the future increase in credit risk deriving from too lenient credit standards during boom periods.[15] Given that the provision is positive in boom periods and negative during recession, it should also have a counter-cyclical impact on banks' lending policies. A similar suggestion is contained in Goodhart, Hofmann and Segoviano (2004) and, more recently, in

---

14 For a discussion on the concept and sources of pro-cyclicality, see BIS (2008).

15 Compared to the "statistical" or "dynamic" provisions, this rule has the advantage of producing *total* provisions that are not completely smooth along the business cycle but show a cyclical pattern, relatively high in the peak of the lending boom but with a maximum reached around the recession, when impaired assets also are at their maximum.

Goodhart and Persaud (2008). In the past, the rate of growth of bank lending to the private sector has been a good predictor of financial crises, i.e. it is unusually high before a crisis; bubbles in asset prices tend to be characterized by accelerating prices before the peak is reached and the crisis starts. Consequently, bank capital requirements could be related to the rate of change of bank lending and asset prices in the relevant sectors (e.g. the capital adequacy requirement on mortgage lending could be linked to the rise in both mortgage lending and housing prices). The purpose would be to build up reserves and to restrain bank lending during asset price booms, so to release them during asset price depressions.[16]

8. While it is costly to hold excess capital, it is also difficult or costly for banks to raise fresh external capital in response to adverse market conditions. Banks, then, may wish to increase capital when conditions are favourable, i.e. during upturns, which might be used to fulfil a likely increase in requirements in a downturn. This behaviour would reduce possible pro-cyclical effects.

9. Whether the buffers that banks maintain over regulatory minima will move pro- or counter-cyclically is still an open question; similarly, it is not clear how the cyclical pattern is related to the specific features of the capital regulation.

10. Repullo and Suarez (2008) argue that capital buffers will endogenously respond to the characteristics of capital regulation and, in a dynamic equilibrium model of relationship lending and costly equity financing, analyze the effects on capital buffers of moving from risk insensitive (Basel I) to risk sensitive (Basel II) capital requirements. Consistently with Ayuso, Perez and Saurina (2004), they find the same cyclical pattern under Basel I: the cyclical variation in PDs has a rather small impact on capital decisions, although excess capital tends to be larger in recessions, when loan losses can be expected to cause a larger reduction in future lending capacity.

11. Under Basel II they find greater variability of both total capital and capital buffers. Interestingly, the cyclical pattern of the buffers gets reversed. Banks anticipate that shocks to their earnings as well as the cyclical position of the economy can impair their capacity to lend in the future and, as a precaution, maintain capital buffers during expansions.[17]

---

16 Incidentally, in such a regime the floor to capital requirements should be lower and simpler, say 3 per cent on a ratio of capital to total liabilities or assets (a leverage ratio); the bulk of the risk sensitivity requirement should be related to growth rates of bank lending and asset prices.

17 The result depends on the interaction of relationship lending (which makes some borrowers dependent on the lending capacity of the specific bank with which they establish a relationship) with frictions in banks' access to equity markets (which makes some banks' lending capacity a function of their historically determined capital positions and the capital requirements imposed by regulation).

12. However, according to the authors' numerical analysis, the higher buffers maintained in expansions are not able to off-set the insufficient availability of capital due to higher capital requirements; specifically, despite banks taking precautions and holding larger buffers during expansions in order to have a reserve of capital for the next recession (when capital requirements rise), the onset of recessions is normally associated with a sizeable credit crunch, as capital-constrained banks are induced to ration credit to some of their dependent borrowers. Therefore, they suggest modifying the cyclical profile of the confidence level of the IRB formula in a way that lessens the target in those situations in which credit rationing turns out to be the highest under the Basel II/CRD regime. They find that these adjustments may achieve significant reductions in pro-cyclicality without major costs in terms of banks' long-term solvency.

13. Kashyap, Rajan and Stein (2008) raise some doubts on the efficiency of the current guiding principle for policy intervention, i.e. to build up buffers in the system during expansions and to provide for their controlled run down during periods of stress. The authors acknowledge that time-varying capital requirements represent a potentially important improvement over the current time-invariant approach in Basel II, because "they allow some of the rainy-day fund to be spent when it rains", thereby reducing the pressure on banks to liquidate assets, and the associated negative spillovers for the rest of the economy. However, time-varying capital requirements are problematic on a cost dimension. If banks are asked to hold significantly more capital during normal times – which, by definition, is most of the time – their expected cost of funds will increase, with adverse consequences on the general level of intermediation activity and, consequently, on economic activity.

Proposals to dampen the cyclicality of Pillar 1 capital requirements

14. According to Kashyap and Stein (2003), the IRB Basel-II approach of having a single time-invariant "risk curve" is, in general, sub-optimal. From the perspective of a social planner who cares not just about bank defaults per se, but also about the efficiency of bank lending, it is more desirable to have a family of risk curves, with the capital charge for any given degree of credit-risk exposure being reduced when economy-wide bank capital is scarce relative to lending opportunities (as in a recession), thereby giving importance to the bank lending function. A regulator that has an objective function that explicitly incorporates both considerations, (i) the creation of positive NPV loans (i.e. loans on which the return exceeds the appropriate discount rate; (ii) the additional social costs of lending constraints, should be able to design a credible, transparent formula that links capital requirements to some measure of aggregate economic conditions.

15. Similarly to Kashyap and Stein (2003), Gordy and Howells (2006) argue that the best option for regulators is to smooth the final capital requirements deriving from the IRB formula (i.e. the output of the formula) instead of acting on the inputs (i.e. the PDs that enter the IRB formula, e.g. adopting TTC rating systems) or further flattening the formula in order to reduce the sensitivity of capital charges to changes in PD. Dampening only the output of the IRB formula will serve to lessen cyclicality in capital requirements while still preserving the informativeness of PiT rating systems for active portfolio management and as inputs to rating-based pricing models.[18]

16. They consider and discuss two different smoothing rules. The first is an autoregressive rule that smoothes required capital independently for each bank using a time-series filter. Intuitively, the AR smoothing rule causes the regulatory capital requirement to adjust slowly over time to a shock today in the bank's economic capital requirement. The second is a counter-cyclical indexing rule that applies a time-varying multiplier to the IRB formula. The multiplier is large (over one) in good times and small (under one) in bad times. It is announced in each period by the national regulator, and applied to all banks under its jurisdiction; for example it could be tied to a moving average of the aggregate default rate for bank commercial borrowers. Gordy and Howells conclude favouring the second option wherever data on the state of national credit markets are available and reliable.

Discussion

17. As mentioned above and discussed in BIS (2008), all those concerned with pro-cyclicality share the opinion that in normal times there are forces in the financial system (the so-called fundamental sources of pro-cyclicality) – such as limitations in the measurement of risks and distortions in incentives – that contribute to the growth in risk-taking and leverage that normally precedes financial crises[19]. The issue is to realise that "lending policies mistakes" occur in good times and may be equally distorting for the proper functioning of the financial system; as such, they seem to merit an appropriate answer by any regulator. Pro-cyclical bank lending, therefore, has been a concern already under the Basel I Accord. Financial innovations (namely lending through the originate-to-distribute-model) and the evolution of accounting standards (namely a wider use of mark-to-

---

18 Further flattening of the capital formula would have the disadvantage of distorting relative capital charges across loans (and do so at every point in the business cycle). This would pave the way for continued regulatory capital arbitrage.

19 For a thorough discussion on these issues, see Borio, Furfine and Lowe (2001)

market valuation) are relatively new factors which some commentators say may also contribute to the overall complexity of the pro-cyclicality debate.

18. CEBS has narrowly focused on an additional potential driver, namely greater volatility of regulatory capital requirements. Given the complexity of the issue, a forward-looking risk management approach is the key to the solution. This can include not only prudential lending standards but also early funding provisions. Removing incentives to excessive lending caused by lower regulatory capital requirements in the upturn can also contribute to dampen pro-cyclical effects.

19. Therefore, the idea of building time-varying buffers has the objective of restraining the build-up of risk-taking and any balance sheet overextension during the expansion phase, and in so doing, of limiting the costs of financial distress in the contraction phase.

20. On the whole, the surveyed literature: (i) acknowledges the need for cyclical capital buffers in particular from a macro prudential view point; (ii) is supportive of the idea that regulatory capital requirements should properly be viewed as a composite of formulaic Pillar 1 rules and Pillar 2 buffers; (iii) suggests that Pillar 2 might be the most suitable tool for dealing with the behaviour of banks' own resources during the expansionary stages of the business cycle in order to prevent potential negative effects should a sudden cyclical correction occur; (iv) has a preference for transparent, automatic mechanisms that would not interfere with banks' own risk management systems and the proper functioning of Pillar 3 disclosure.

21. List of selected references

- Ayuso, Perez, and Saurina (2004), Are capital buffers pro-cyclical? Evidence from Spanish panel data, Journal of Financial Intermediation, 13, 249-264.

- BCBS (2005), Studies on the Validation of Internal Rating Systems, WP 14.

- BCBS (2006), Report on the impact of macroeconomic conditions on the Global Quantitative Impact Studies, OC/QIS Dynamic Operation Project, restricted circulation.

- BIS (2008), Addressing financial system procyclicality: a possible framework, Note for the FSF Working Group on Market and Institutional Resilience, restricted circulation.

- Borio, Furfine and Lowe (2001), Procyclicality of the Financial System and Financial Stability: Issues and Policy Options, in "Marrying the macro and microprudential dimensions of financial stability", BIS working paper, no. 1.

- Catarineu-Rabell, Jackson and Tsomocos (2005), Procyclicality and the new Basel Accord-banks' choice of loan rating system, Economic Theory, 26:537-557.

- Financial Stability Forum (2008), Addressing procyclicality in the financial system, September, restricted circulation.

- Goodhart, Hofmann and Segoviano (2004), Bank regulation and macroeconomic fluctuations, Oxford Review of Economic Policy, vol. 20, no. 4.

- Goodhart and Persaud (2008), A proposal for how to avoid the next crash, Financial Times, January, 31.

- Gordy and Howells (2006), Procyclicality in Basel II: Can we treat the disease without killing the patient?, Journal of Financial Intermediation, 15, 395-417.

- Jimenez and Saurina (2006), Credit Cycles, Credit Risk, and Prudential Regulation, International Journal of Central Banking, vol.2, no.2.

- Kashyap, Rajan and Stein (2008), Rethinking Capital Regulation, paper prepared for the Federal Reserve Bank of Kansas City symposium on "Maintaining stability in a Changing Financial System", Jackson Hole, August.

- Kashyap and Stein (2003), Cyclical Implications of the Basel-II Capital Standards, working paper, University of Chicago.

- Marcelo and Scheicher (2005), Capital requirements for corporate risk in the EU, mimeo, February.

- Masschelein (2007), Monitoring pro-cyclicality under the capital requirements directive, National Bank of Belgium, WP no. 120.

- Repullo and Suarez (2008), The procyclical effects of Basel II, CEPR Discussion Paper, no. 6862, June.

- Saurina and Trucharte (2007), An Assessment of Basel II Procyclicality in Mortgage Portfolios, Journal of Financial Services Research, 32:81-101.

ANNEX 2: Existing provisions dealing with downturn scenarios

1. The Basel II/CRD framework – along with CEBS guidelines – contains a number of provisions specifically designed to dampen potential cyclicality associated with the introduction of more risk sensitive capital requirements.

2. During the Basel Committee's preparatory work, specific solutions have been adopted in order to reduce the possible procyclical impact of the new framework. First of all, the shape of the regulatory curves, which allow calculating the capital requirements using the estimated risk parameters as inputs, is concave. It means that the elasticity of the capital requirements to PD changes decreases for higher values of the PD, making the capital requirements less sensitive to rating downgrades. Also, for some portfolios, such an effect has been strengthened using regulatory formulae that assume lower asset correlation for some counterparties, typically small and medium enterprises, (based on the fact that in this case credit risk is mainly driven by idiosyncratic factors rather than systematic ones).

3. The uncertainty regarding the actual impact of the new discipline on the levels of capital requirements over the cycle has led the European legislator to explicitly require that specific monitoring activities be carried out. Capital monitoring aims at understanding i) whether banks continue to operate with adequate capital buffers and ii) the consequences of the new rules on the allocation of financial resources and, thus, on the non-financial sector as a whole. The Joint CEBS/BSC Task Force on the Impact of the New Capital Framework (TFICF) is working on the first report on the impact of the CRD.

Pillar 1 provisions

4. The Basel II/CRD framework allows a broad range of rating philosophies with different consequences in terms of cyclicality (see Section IV). Various provisions however aim at dampening these consequences.

5. Wherever the Basel II/CRD framework allows institutions to use own estimates of risk parameters, like PD, LGD, conversion factors or EL, it requires these estimates to be based, as far as possible, on long data series in order to ensure sufficient confidence in the accuracy and robustness. Downturn LGD and conversion factors should be used if they are more conservative than the long-run average.[20]

---

20 See Annex VII, Part 4, points 74 and 88 of Directive 2006/48/EC, paragraph 468 of Basel II

6. Institutions are required to put in place sound internal standards which require them to reassess their estimates in case of significant deviations of realised PDs, LGDs, conversion factors and expected losses from expectations. These standards shall in particular take account of business cycles.[21]

7. Institutions are required to use stress tests, subject to supervisory review, to assess the adequacy of their capital, considering at least the effect of mild recession scenarios.[22]

8. Regarding specifically equity exposures the estimate of potential loss shall be robust to adverse market movements relevant to the long-term risk profile of the institution's specific holdings and requires them to demonstrate to supervisors that the shock employed provides a conservative estimate of potential losses over a relevant long-term market or business cycle.[23] In addition, a rigorous and comprehensive stress-testing programme is required to be in place.[24]

   Pillar 2 provisions

9. Both Basel II and CRD contain specific Pillar 2 provisions that are relevant for addressing cyclical fluctuations. Institutions "subject to regular internal review" are required to "have in place sound, effective and complete strategies and processes to assess and maintain on an ongoing basis the amounts, types and distribution of internal capital that they consider adequate to cover the nature and level of the risks to which they are or might be exposed" (*Internal Capital Adequacy Assessment Process - ICAAP*)[25]. The ICAAP encompasses all the key elements of capital planning and management and generates an adequate amount of capital to set against those risks.

10. Competent authorities "shall review the arrangements, strategies, processes and mechanisms implemented by the credit institutions to comply with this Directive and evaluate the risks to which the credit institutions are or might be exposed […]". This *Supervisory Review and Evaluation Process (SREP)* shall inter alia include the results of the stress tests carried out by the credit institutions applying an IRB approach[26].

---

21 See Annex VII, Part 4, point 114 of Directive 2006/48/EC

22 See Annex VII, Part 4, points 40-42 of Directive 2006/48/EC. And paragraphs 434-437 of Basel II

23 See Annex VII, Part 4, point 115 (a) of Directive 2006/48/EC

24 See Annex VII, Part 3, point 115 (g) of Directive 2006/48/EC, paragraph 527 (b) and (j) of Basel II

25 See also paragraph 726 of Basel II

26 Annex XI, point 1 (a) of Directive 2006/48/EC, paragraph 746 of Basel II

11. Provided the SREP shows that the capital of an institution is not adequate with regard to the institution's risks, competent authorities have the possibility to require additional capital in addition to the Pillar 1 minimum capital requirements[27].

12. Complementing the Basel II/CRD provisions, CEBS has issued guidelines on the *Application of the Supervisory Review Process under Pillar 2* (CP03 revised)[28] and on the *Technical Aspects* of *stress testing under the Supervisory Review Process* (CP 12).[29] CEBS guidelines make clear the standards that banks are expected to observe and the supervisory practices that supervisory authorities apply. They envisage that under the Pillar 2 processes banks enhance the link between their risk profiles, risk management and risk mitigation systems, and capital. Institutions are required to develop sound risk management processes – including stress tests – that adequately identify, measure, aggregate and monitor their risks.

---

27 Article 136 (2) of Directive 2006/48/EC and paragraph 757 of Basel II

28 http://www.c-ebs.org/getdoc/00ec6db3-bb41-467c-acb9-8e271f617675/GL03.aspx

29 http://www.c-ebs.org/getdoc/e68d361e-eb02-4e28-baf8-0e77efe5728e/GL03stresstesting.aspx

ANNEX 3: The Banco de España's Approach

1. The CRD requires that "Credit institutions shall estimate PDs by obligor grade from long run averages of one-year default rates". According to the Bank of Spain, "long run" should be interpreted as a whole business cycle (as an initial approximation to a complete business cycle for portfolios in Spain it has been considered the time period from 1/1/91 until present).

2. Since most banks do not have internal default data covering this period of time, they are required to make an "adjustment to the cycle" to take into account the unobserved part of the business cycle. While the choice of the specific procedure to make this adjustment (under Pillar 1 capital requirements) is left to the banks themselves, the Bank of Spain envisages some steps. First, for each portfolio, a relationship between annual observed default rates and explanatory variables (representative of the business cycle) is estimated. This relationship is then applied in order to determine the (unobserved) default rates for years not included in the time-series. After that, a long run average default rate for that portfolio is estimated by using both observed and estimated default rates. If migrations in that portfolio are significant, banks have to take into account this fact when estimating the long run default frequency associated to the portfolio. Finally the adjustment is then tailored to obtain specific rating grade's PDs coherent with both the observed default frequencies at rating class level and the default frequency (long run average) for the portfolio

3. The Bank of Spain provided banks with guidelines in order to carry out this "adjustment to the cycle". In particular, banks need to consider possible changes in lending policies and monitor the evolution of PDs adjustments; also, they can neither consider changes in the behaviour of borrowers nor employ different weights to data of different years.

4. Banks have also to assess the degree of cyclicality of their rating systems (how much point in time or through the cycle they are) and evaluate capital requirements fluctuations due to rating migrations. The impact of all migrations and future changes in portfolio's composition are assessed under Pillar 2 within the analysis of capital adequacy.

ANNEX 4: The FSA's Approach

5. In the UK, the FSA allows banks to use methodologies aiming at smoothing capital requirements fluctuations in residential mortgages portfolios. Banks can therefore adopt methodologies that transform the PD estimates produced by point in time (PiT) models to 'long run average PDs', based on the relationship between long term and relatively current default rates for the portfolio, or a subset thereof. This is as opposed to estimating a long run average default rate for each grade or pool, which is what is envisaged for the IRB approach.

6. While this is carried out in different ways, a typical approach is to apply a scaling factor which varies with the state of the cycle. If the current average portfolio default rate is lower than the long run average each PiT PD would be scaled up; in a recession, where the current default rate higher than the long term average, the PiT PDs would be scaled down. A major consequence of, and to varying degrees the motivation for, this mechanism is to reduce cyclicality in capital requirements which would otherwise result from the use of the underlying PiT estimates.

7. The FSA considers this approach acceptable provided: i) banks meet 4 principles aiming at ensuring that the considerable conceptual and technical challenges of the approach are properly overcome and the adjustments are carried out in an appropriate way[30]; ii) banks' stress testing include an additional "once in 25 years" stress test based on the PDs of the underlying PiT rating system, in addition to the stress test based on the parameters used in the Pillar 1 capital calculation; iii) and banks are able to understand and articulate up-front how the scaling factor would vary over time in order to achieve the intended effect.

---

30 The four principles are the following: 1) both the initial calculation of and subsequent changes to the scalar must be able to take account of changes in default risk that are not purely related to the changes in the cycle; 2) a firm must be able to accurately measure the long run default risk of its portfolio even if there were no changes in the business written; 3) a firm must use a data series of appropriate length in order to establish the long run default risk; 4) a firm must be able to demonstrate the appropriateness of the scaling factor being used across a portfolio.