



2 September 2010

CEBS's position paper on the recognition of diversification benefits under Pillar 2

Executive summary

1. The position paper has been based on a fact-oriented analysis carried out by CEBS in the first half of 2010, whose outcomes mirror the current situation, without taking into account possible future developments of both institutions' and supervisory approaches to diversification. The findings presented in this position paper should be considered as provisional and valid at the moment of publication and might change over time as economic capital models used to estimate diversification benefits evolve.
2. Although the existence of diversification benefits is accepted, given their inclusion under the regulatory Pillar 1 metrics of the Basel II capital framework, the extent to which they should be considered over and above their inclusion within the Pillar 1 models still appears to be questionable. Supervisors remain cautious about relying on methodologies developed by institutions for solvency and capital adequacy assessment purposes (including assessing and recognising diversification benefits). This is due to the inherent difficulty in capturing the "real-life" loss distributions that give the correct probabilities of tail events. Therefore, CEBS member authorities take the following cautious stance towards accepting diversification benefits in the context of the Supervisory Review and Evaluation Process (SREP):
 - i. As far as **intra-risk diversification benefits** are concerned, they refer almost exclusively to credit risk; within such risk, the adequacy of the measures provided by the Pillar 2 models is still much debated. Particular care is then recommended when considering diversification benefits within Pillar 2 capital quantifications and assessing capital adequacy in the context of the SREP. The varied evidence collated post crisis demonstrates that, at times of stress, asset correlation matrices are unlikely to be stable and correlations may in some instances head towards one. This means that pre-crisis measures of balance sheet risk are likely to significantly under-estimate the risk. Therefore, the recognition of intra-risk diversification benefits should be subject to a number of conditions presented in this report.
 - ii. As far as **inter-risk diversification benefits** are concerned, except for a very limited number of cases, the calculation methodologies developed by institutions are still at a preliminary stage. The use of subjective and, thus, vulnerable benchmarks, is still widespread;

methodologies in use do not imply a sufficient level of prudence. Against this backdrop, for inter-risk diversification benefits the comments made by the Basel Committee on Banking Supervision (BCBS) support that view. The BCBS¹, stated that *'claims about the presence of diversification effects between market and credit risk, however, should be regarded with great caution if they are not derived from an integrated ("bottom up") approach'* and suggests a "cautionary tale" as to the claims by the industry about the substantial benefits to be reaped from integrating market and credit risk. Therefore, for the time being, given the current state of modelling, inter-risk diversification benefits could only be accepted after in-depth supervisory review, where the conditions elaborated in this report for intra-risk diversification have been fulfilled, and there has been a rigorous independent internal assessment and throughout review of the models (comparable with the internal validation required by EU Directive 2006/48/EC - Capital Requirement Directive (CRD) for the advanced measurement approaches for calculating regulatory capital)². A sound and reasoned quantitative basis behind the justification and sufficient evidence in terms of the applicability to the business practice are essential.

3. Institutions are encouraged to consider further developments of their internal risk measurement and economic capital frameworks, and to make improvements to their risk aggregation frameworks and methodologies as and where necessary. This should lead to a more effective measurement and management of as well as safeguarding against material risks institutions are facing.

I. Background and introduction

4. Given the wider use and increasing importance of economic capital models used by institutions for Pillar 2 purposes and need for supervisors to agree on the outcomes of Pillar 2 under the joint decision process introduced by the revised CRD³ at its October 2009 meeting, CEBS agreed to start working on a

¹ Page 15, Working Paper No.16 'Findings on the interaction of market and credit risk' Basel Committee of Banking Supervision: http://www.bis.org/publ/bcbs_wp16.pdf

² CEBS has addressed topics of internal model validation processes in its Guidelines on the implementation, validation and assessment of Advanced Measurement (AMA) and Internal Ratings Based (IRB) Approaches of 4 April 2006. See: <http://www.c-eps.org/getdoc/5b3ff026-4232-4644-b593-d652fa6ed1ec/GL10.aspx>

³ Article 129(3) of the revised CRD, approved by the European Parliament on 6 May 2009 (2009/111/EC) and whose provisions will be applicable from 31 December 2010, requires that the consolidating supervisor and supervisors of subsidiaries involved in the supervision of an EEA cross-border banking group do everything within their power to reach a joint decision on the application of the Pillar 2 provisions related to the Internal Capital Adequacy Assessment Process (ICAAP) and to the Supervisory Review and Evaluation Process (SREP). The joint decision should cover the determination of the adequacy of the consolidated level of own funds held by the group with respect to its

possible common supervisory stance regarding the acceptance of diversification benefits under Pillar 2.

5. To this end, CEBS has conducted a general stock-take of supervisory approaches to the recognition of diversification benefits supplemented by the comprehensive analysis based on the on structured interviews of the sample of consolidating and host supervisors and addressing concrete institution specific cases of supervisory analysis and decision. In total, eight authorities have been interviewed covering their assessment of 16 cross-border banking groups and their subsidiaries.
6. The CEBS investigation has been conducted by means of structured interviews, based on a list of topics covering intra-, inter-risk diversification as well as cross-border aspect of diversification and allocation of capital and ranging from the institutions' and supervisory approaches to modelling under Pillar 2, qualitative aspects of their ICAAP frameworks to supervisory assessment and dialogue in the colleges of supervisors. To the large extent the questions have been based on some of the material developed by CEBS in CP20⁴, but in addition placing greater emphasis on analysing the results of diversification effects under crisis conditions.
7. This position paper provides a complete set of findings of the analysis of the conducted investigations complemented with elements of quantitative analysis based on the data provided by the interviewed authorities. The current paper replaces earlier CP20 and in addition to the outcomes of the analysis provides the current CEBS's stance regarding the recognition of diversification benefits under Pillar 2.
8. It is acknowledged that diversification benefits are closely related with concentration risk on both an intra- and inter-risk basis (addressed within specific CEBS guidelines⁵). The quantification of concentration risk along with diversification benefits may be generated from the same or similar framework(s) or methodology(ies). The focus of the current position paper remains solely on diversification benefits.

II. Diversification benefits: theory and prudential regulation

9. Diversification is commonly expected to materialise within portfolios composed of a wide variety of assets, as well as in large institutions performing various businesses in different countries. On average, diversified

financial situation and risk profile, as well as the required level of own funds, above the regulatory minimum, applied to each entity within the group.

⁴ See CEBS Consultation paper on technical aspects of diversification under Pillar 2 (CP20), 27 June 2008, http://www.c-ebs.org/getdoc/bd6102c0-71db-48c8-9dc8-84082f30ecbd/CP20_diversification.aspx

⁵ See CEBS Guidelines on the management of concentration risk under the supervisory review process (GL31): <http://www.c-ebs.org/documents/Publications/Standards---Guidelines/2010/Concentration-risk-guidelines/Concentration.aspx>

institutions are considered to be exposed to lower idiosyncratic risk than very specialised and local institutions. From an economic point of view, diversification smoothes out idiosyncratic risk events in a portfolio or an institution, so that the positive performance of some investments will neutralise the negative performance of others. For instance, an economic downturn may not affect two countries in the same way, thus theoretically allowing diversification benefits between activities performed in those two countries. However, diversification is not expected to reduce systemic risk⁶.

10. The current Basel II framework already recognises diversification benefits to some extent in its Pillar 1. In particular, the Internal Ratings Based (IRB) approach is based on given assumptions on asset correlation between counterparts. Furthermore, intra-risk diversification is usually part of internal modelling of operational and market risks respectively. Advance Measurement Approaches (AMA) models developed for operational risk purposes take into account, in the process of aggregation, diversification among different operational risk events (e.g. an external event such as an earthquake may not occur in a similar time horizon as a large scale fraud), whereas VaR models automatically include the dependency structure between different risk factors. In these two cases, AMA and VaR may include intra-group diversification too, if the capital charge is computed - after offsetting of local positions - at a consolidated level.

11. Diversification can be split into three components, which are discussed in this report:

- Intra-risk diversification referring to diversification within a particular risk type (e.g. credit risk, market risk etc);
- Inter-risk diversification referring to diversification between different risk types (e.g., between market risk and operational risk; credit risk and business risk);
- Intra-group diversification which refers to diversification potentially generated between different business lines/activities and/or entities of cross-border institutions, primarily from their operation in various geographies, markets and sectors.

III. Description of institutions' approaches to modelling diversification benefits

12. The group of institutions analysed was diverse in terms of business model, risk management framework and risk appetite; their geographical coverage differs significantly. Generally, these institutions operate mostly in their home countries with a few smaller subsidiaries or branches abroad. Some groups, however, have opened up a second or third home market. These groups can have up to 50% of activity in markets other than their own home market. The

⁶ See Andrew G. Haldane, "The \$100 billion question", March 2010, <http://www.bankofengland.co.uk/publications/speeches/2009/speech374.pdf>

differences in geographical coverage have led some institutions to take a different approach to modelling.

13. All the institutions within the sample show capitalisation levels far higher than minimum regulatory requirements. In a number of cases, own funds have been increased to mitigate the effects of the crisis and higher market expectations by means of public placings and, in some instances, through public bodies' interventions. The Tier 1 capital adequacy ratio (total capital adequacy ratio) of the banks in the assessment sample as of end of 2009 was on average 10% (13.5%), with a minimum of 8% (11.6%), and a maximum of 12.6% (17%). In none of the observed cases have the supervisors assessed the capital levels of institutions with respect to their risks as being inadequate. This allows consolidating supervisors to be generally more relaxed about, slightly higher, on average, capital levels in the subsidiaries.
14. To model diversification benefits, institutions tend to rely on an economic capital framework, which needs to integrate different interrelated components, that is, the:
 - i. definition of a measurement framework;
 - ii. aggregation of the various risk factor components; and
 - iii. use of results/outputs in the (risk) management process and decision-making.

Definition of a measurement framework

15. The risk classification, the scope, the risk measure, the evaluation horizon and the confidence level are arguably the most important elements in a risk measurement framework; each of these elements in turn will be briefly considered.⁷
16. In the reference framework provided by the CRD, Pillar 1 risk categories (market, credit and operational risk) are included in the scope of all economic capital models of the surveyed institutions. Furthermore, all institutions included the Pillar 2 interest rate risk in the banking book and business risk. Some institutions include other risks such as real estate risk, pension risk and the treatment of participation risk (risk related to investments in other entities) is not uniform. For operational risk, banks generally used the same model for both Pillar 1 and their economic capital model.
17. In Pillar 1 risk models, some degree of intra-risk diversification is already acknowledged, even more so for the more advanced approaches. For credit risk models, temporary floors have been agreed upon to allow for a more gradual transition, but they are typically removed by banks within the Pillar 2 Internal Capital Adequacy Assessment process (ICAAP) framework. Banks not using the Advanced IRB models as a baseline, generally use a Moody's KMV (-

⁷ The modelling frameworks have been described in much more detail in, for instance, BCBS Range of practices and issues in economic capital frameworks (2009), see <http://www.bis.org/publ/bcbs152.pdf>

like) engine. In some credit risk models banks discern between exposures by sector or geography. Thus, diversification between exposures in different categories can be computed.

18. For those institutions that go beyond using Pillar 1 models in their capital management, the scope of the models used in the economic capital framework differs. Thus, for some portfolios, a bank might use a standardised approach for Pillar 1 purposes, but an Advanced IRB-like model for economic capital purposes. As both the scope and the degree of acknowledged intra-risk diversification differs between Pillar 1 and economic capital it has proven to be difficult to single out the effect of allowing or disallowing diversification.
19. In choosing a risk metric, most banks use variations on Value at Risk (VaR) as the primary risk metric; one bank integrates its stress tests into its capital management framework.
20. The confidence level chosen differs widely between institutions and, in some cases, between risk types within an institution. This choice, amongst other things, reflects different business models and risk appetites. The evaluation horizon chosen is invariably one year. This horizon aligns well with the budgeting cycle, although for some risks, such as market risk, this horizon is much longer than used to price and manage these risks. To make the horizon consistent across risks, most banks use a square root of time calculation. This makes the rather strict assumption that management does not react for the whole year. But allowing for management intervention introduces challenges as to the effectiveness and adequacy of such interventions (which could fail to materialise in stressed circumstances).
21. In summary, it is difficult to make a straightforward comparison between Pillar 1 and Pillar 2 outcomes as there are differences in:
 - a) Perimeters/scope: as they can stem from two different viewpoints: (i) cases in which the validated scope of application of Pillar 1 models does not coincide with that of Pillar 2 (because of roll-out and/or permanent-partial-use portfolios treated according to the standardised approach under Pillar 1 and included in the Pillar 2 internal model); (ii) cases in which the risk perimeter is defined differently in Pillar 1 and Pillar 2 (e.g. when including the market risk definition under the Pillar 2 assets in the banking book);
 - b) Confidence intervals: prudential regulation establishes specific confidence intervals for credit, operational and market risk which usually do not match with those defined by institutions under Pillar 2;
 - c) Time horizon: explicitly in relation to market risk, which under Pillar 1 is calculated according to a holding period of 10 days, extended up to one year under Pillar 2;
 - d) Possible adjustments by management: within market risks, management allow for consideration of the possible changes in the trading portfolio composition and the investment strategies within a given investment horizon.

Aggregation of the risk components

22. Once risks have been identified and quantified they need to be aggregated in order that an overall capital assessment might be arrived at. As to the risk aggregation techniques employed, institutions included in the sample use three different approaches:

1. Simple summation. This approach assumes that all inter-risk correlations are equal to one and that each risk component should receive equal weight⁸;
2. Variance-covariance matrices. In this approach, the risks are assumed not to be occurring all at the same time but to depend on – pairwise – correlations. These are linear and fixed over time;
3. Copulas. These are functions that allow for much flexibility in combining the marginal risk contributions of each of the discerned risks into a single (loss) distribution.

23. A sizable group of banks in the sample analysed by CEBS do not compute inter-risk diversification benefits as they apply simple summation. For those institutions that do allow for diversification in aggregation, the majority use the variance-covariance method. Typically, the variance-covariance matrix is populated for a few high level risk categories. Between some risks the correlation used is estimated by correlating well-accepted risk drivers with long time series (e.g. GDP and stock market indices for credit and market risk, respectively). In other cases, it proves to be more difficult to identify the proper risk driver for a particular risk category (e.g. business risk). Some institutions, therefore, revert to expert judgment to define correlations; this approach is questionable, especially as, estimating and keeping these estimates up to date can be quite a challenge. In one case, a bank needed to fill 90,000 cells; this is clearly an unrealistic endeavour. The correlations found are generally rounded to convenient multiples and some institutions use 'stressed correlations' by notching up.

24. The variance-covariance matrix is useful in that it is relatively simple to use. However, it can possibly lead to overestimation of diversification benefits as it only measures the average dependency between two variables and does not capture dependency of variables in the tail.

Governance and use of model outputs

25. Finally, results of the risk aggregation process are acted upon by the institutions. These results can, for instance, be used in pricing or remuneration decisions. Within the interviews, the team has focused primarily on the allocation of the resulting diversification numbers and have so far observed varying approaches: some institutions do not allocate the benefits

⁸ It is assumed to be conservative, although 'wrong-way risks' could prove this to be a fallacy, see T. Breuer, M. Jandacka, K. Rheinberger and M. Summer, Does adding up of economic capital for market and credit risk amount always to conservative risk estimates?, *Journal of Banking and Finance* 34 (2010), pp. 703–712

to lower levels of the organisation while others attempt to allocate the benefits to individual desks/legal entities. One bank used tail-VaR as a measure of risk and was, therefore, capable of allocating capital to sub-group level, which, in contrast, would not be allowed by a VaR approach. Overall, however, banks did not rely overly on their economic capital model to allocate capital within a group's entities / business lines. Even banks, which, due to their geographic spread, would benefit most from (geographic) diversification, often stressed local autonomy (in capital, but also in liquidity terms).

26. One of the possible applications of the economic capital model is use in the computation of stress tests. These tests are sometimes applied to test the framework itself under less benign circumstances. More often however, users are interested in capital levels needed under particular, well-defined stress tests. Not all institutions use their economic capital framework for this.
27. In some cases, the supervisor suggested the institution present to senior management both the estimates with (net) and without (gross) the diversification benefits. It was unclear, however, how this affected management's decision process.
28. Whilst all supervisory authorities recognise that economic capital models are a useful tool for informing the regulatory process, there remains an inherent conflict as to the purpose such models seek to fulfil. Economic capital seeks to obtain the desired level of capital from the point of view of an institution (and consequently the shareholders) and does not take into account the broader goals that regulatory capital seeks to achieve. Thus, the choice of confidence level, the evaluation of the model in terms of going concern versus gone concern, the relative merit from a supervisory perspective of tail-VaR over VaR, the definition of what constitutes loss absorbing capital, and the implications of converging economic capital models on systemic risk might all be aspects which a regulator would regard differently.

IV. Diversification benefits: quantitative analysis

29. As data provided for the CEBS analysis was limited, it was not possible to conduct a detailed analysis of the size and impact of diversification benefits. Out of the 16 institutions analysed during the project, granular quantitative data regarding diversification benefits were available only for 10 banks and summarised in the chart below.
30. The chart provides the decomposition of the institutions' internal capital estimate (aggregate for 10 banks) and its relation to the regulatory capital charge for Pillar 1 risks and total capital available (Tier 1 and total own funds).
31. As can be seen from the chart, moving from the regulatory minimum capital figures totalling 207bn Euros and in most of the instances computed using regulatory approved internal models (IRB and AMA models), institutions, on aggregate, see a dramatic reduction of the ICAAP capital for the same Pillar 1 (credit, market and operational) risks (167.9bn EUR). The difference between regulatory Pillar 1 capital and internal capital estimates for Pillar 1 risks can

be partially explained by the different confidence levels used, the wider perimeter (e.g. internal models applied to portfolios which are on a standardised approach for regulatory purposes), and the different time horizons for the market risk capital charge (see also paragraph 17). In addition to these factors, the difference can also be explained by intra-risk diversification benefits.

32. Decomposing the difference between the internal and the regulatory capital charge for Pillar 1 risks, one sees a dramatic reduction in the internal capital estimate for credit risk, which is approximately 36% lower than the regulatory capital, whereas, internal capital estimates for market and operational risks are generally higher compared to regulatory capital charges.
33. The lower internal capital estimate for Pillar 1 risks is offset by the capital attributed to Pillar 2 risks, including interest rate risk from non-trading activities, real estate, pension, settlement, securitisation, participation and business risks totalling 53bn for 10 banks. Supplemented by the stress testing and other capital buffers of 27.2bn EUR (stress testing and other capital buffers are available only for four out of the 10 institutions), total internal capital estimate without inter-risk diversification benefits reaches 248.1 bn EUR. Eight out of the 10 banks analysed take account of inter-risk diversification benefits, which reduces the level of total aggregate internal capital estimate by 32bn to a level of 215.7bn EUR.
34. The aggregate level of internal capital estimate (ICAAP capital) taking into account both intra- and inter-risk diversification benefits is higher than that of the level of regulatory capital charge, and is fully covered by Tier 1 capital (244.2bn EUR for 10 banks analysed), and the overall level of own funds of 323bn creates a capital "cushion" of 107.3bn EUR.

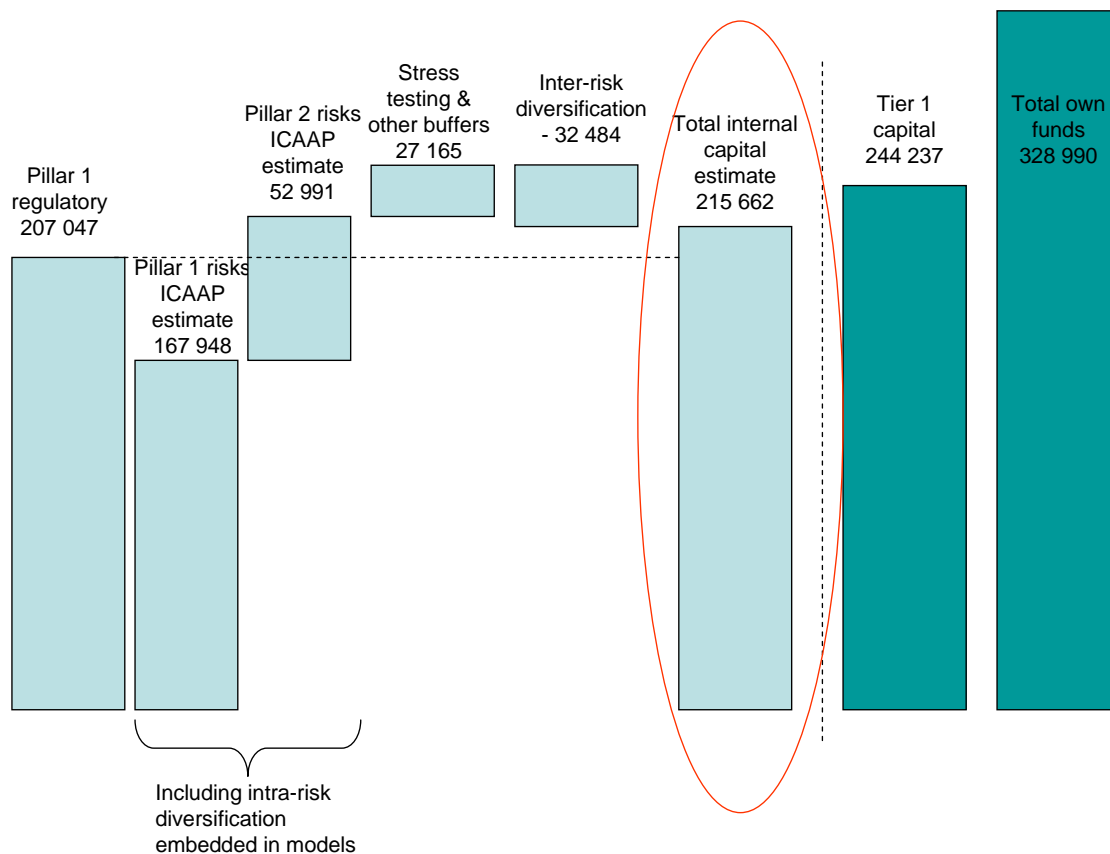


Chart 1. Decomposition of internal capital estimate and comparison between Pillar 1 regulatory capital charge, ICAAP capital estimate and available Tier 1 and total own funds for the 10 institutions analysed.

Source: Information provided to CEBS by national supervisory authorities

V. Description of supervisory approaches to assessing diversification benefits

35. The CEBS analysis highlighted an apparent taxonomy in the different ways regulatory authorities conduct Pillar 2 (and thus the SREP), which has a direct implication on the way authorities consider diversification benefits. The authorities covered by the survey can be divided into three categories:

- a) Those interpreting Pillar 2 on the basis of a “Pillar 1 plus” logic, where the SREP results in capital measurements quantified by the supervisor by means of Pillar 1 regulatory metrics plus add-ons;
- b) Those following more qualitative approaches, where the supervisory review does not conclude with the determination of a “SREP capital estimate” measurement other than that one quantified by institutions in their ICAAP; and
- c) Those authorities using analysis under Pillar 2 to determine “SREP capital estimate” measurements, which, unlike authorities under (a), do not estimate the capital adequacy measure solely through Pillar 1 metrics.

36. Even if, for sharply contrasting reasons, the authorities in (a) and (b) groups have treated diversification benefits with disregard/neutrality; in particular, in the case of the authorities under (a), the economic capital models of institutions have not been thoroughly analysed in the SREP process and the debate with banks on this point has been rather limited. In such instances, institutions have expressed the view that there is no incentive to invest in the calculation methodologies of internal capital and on the related management processes. This is evident in the lack of any application for regulatory recognition of diversification benefits and by the rather limited usage.
37. The authorities under (b) carry out analyses on Pillar 2 internal models and their the internal capital estimates, are provisioned with an appreciable degree of detail. However, the information gathered is used qualitatively in the SREP process to assess the quality of the institution's management, internal controls, and governance mechanisms. The supervisory review process does not lead to a capital measure determined by the supervisory authority itself, this, rather, is determined by the institutions themselves.
38. The authorities under (c) carry out a risk-weighted assessment on capital adequacy broader than the examination of Pillar 1 capital requirements alone, entailing in most cases an overall assessment of the risk profile of the institution and its capital needs. For this category of authorities the analysis of the diversification benefits can prove to be significant both in terms of work required and the effect of diversification, even though it depends tangibly on the way capital needs are calculated. Indeed, the calculation is not always based on the review of the internal model results and the diversification benefits implied, which was considered by some institutions as generating few incentives to invest in the calculation methodologies of internal capital. In some cases, the SREP capital is calculated through a less analytical approach, based on the capital target calculated by institutions according to their risk appetite, their development plans, and external constraints (e.g. rating). These targets do not necessarily take into account the economic capital measures and the diversification benefits.
39. All the interviewed authorities stated that Pillar 1 capital requirements represent the absolute minimum in terms of own funds to be held by institutions.
40. However, whilst there are differences in the approach to Pillar 2 risks and the basis upon which the SREP is conducted amongst different supervisory authorities, diversification has featured as a topic in all SREP discussions. However, the review of the diversification benefits and economic capital models is of a low priority for supervisors, unlike other subjects such as stress testing analysis.
41. The investigation did reveal some examples where authorities have gone through both targeted analysis and on-site examinations because of the importance of the diversification benefits analysis for the SREP. In these cases, approaches similar to those adopted for the validation of the Pillar 1 internal models have been followed (IRB, AMA, Market risk VaR); arguably, judgements on the adequacy of economic capital models for any purpose

(including estimating diversification benefits) should only be made where there has been an extensive analysis.

42. Where there has been some review of the economic capital models of institutions, they are still considered to be very much in their “infancy”, especially for inter-risk diversification. Interestingly, the interviews demonstrated instances where institutions themselves expressed a lack of confidence about the sophistication of their models and the continued use of such models.

VI. Home-host dialogue within colleges of supervisors

43. At the moment of the CEBS investigation, evidence suggests that the discussions relating explicitly to diversification benefits in colleges have been relatively scarce. When diversification benefits and modelling assumptions have been discussed by colleges, no material divergence in college members’ views has appeared due to the conservative stance adopted by the consolidating supervisor (no diversification benefits were recognised at group level). Also, the discussions relating to the use and allocation of diversification benefits across legal entities have remained limited and uncontroversial, partly due to the fact that, generally, the considered banking groups have been sufficiently capitalised at consolidated and solo levels. The future implementation of the new joint decision process could, however, further influence supervisory college practices in this field.

44. More generally, college meetings have been used as a platform for discussing various issues related to Pillar 2 supervisory approaches. One example was presented in which a meeting was organised between the bank concerned and the college to present its ICAAP and methodological issues.

45. From a host supervisors’ perspective, a prerequisite for considering the acceptance of diversification benefits is a thorough understanding of the group’s economic capital model and its underlying assumptions. Supervisors, especially host supervisors, are reluctant to accept diversification claims stemming from “black-box” economic capital modelling engines. In a number of interviews the strength and competence of the local risk management, the level of integration to the group’s risk management practises and extensive local knowledge of the group’s models were highlighted as key factors affecting the assessment of the group’s economic capital methodologies and the recognition of diversification benefits.

46. Practically all interviewed authorities recognised the existence of diversification benefits in some form or another (e.g. geographical, across business lines or legal entities). However, host supervisors remain cautious with regard to accepting the allocation of diversification claims to local subsidiaries. In a number of discussions, the question of transferability of capital and the sufficiency of local capital resources have been raised as motivation for the cautiousness. The crisis has accentuated the role of local capital buffers. As long as the responsibility in a crisis situation remains with the host supervisor, the local capital buffers continue to play an essential role

in risk and capital adequacy assessments as well as in the recognition of diversification benefits.

47. The outstanding issue from a home-host perspective that remains to be tackled is the recognition of intra-group diversification benefits at the consolidated level and their subsequent allocation to local entities. A supervisor acting as a consolidating authority may be keen to allow approaches based on a top-down view, where the economic capital models, based on consolidated data and capital outcomes, estimated for the group as a whole, are then broken down to an entity level in proportion to its marginal contribution to the risks. Host supervisors are, on the other hand, more interested in a bottom-up perspective, where the capital buffer held at the subsidiary level is aligned with and captures the risks it bears on a solo basis. It remains a challenge to align the top-down and bottom-up views for the evaluation of economic capital models and ICAAP estimates.
48. A possible way forward could be to follow an approach, where institutions and supervisors would perform some sort of double-assessment. This approach could imply the computation by institutions of a risk metric on a solo basis (i.e. the legal entity). Unfortunately, the legal entity does not always correspond to the business unit structure that is in place to manage the business. Since the risk model is generally aligned with the business model structure it can prove challenging to provide supervisors with information relevant to their jurisdiction. However, given the importance of such exercises, institutions should be encouraged to develop their modelling methodologies to enable such partitioning of risks. In particular, one supervisor explained how both approaches were considered and reconciled in its jurisdiction.

VII. Main findings and remarks

49. The outcomes of the CEBS analysis mirror the current situation emerging from the interviews, without taking into account possible future developments of both institutions and supervisors. Therefore, findings have to be considered as provisional.
50. The detailed interviews with the supervisory authorities and in one case, with institutions undertaking during the CEBS analysis provided useful information for (i) devising the main characteristics of the business model of the involved institutions; (ii) understanding the main features of the overall framework behind diversification benefits calculation (methodologies; performance measurement and use test); (iii) clarifying the supervisory authorities' approach in the application of Pillar 2 and in the relative assessment methodologies. All such factors need to be taken into account when defining a regulatory stance in the field of diversification benefits.

Business models of the institutions

51. Diversification does not have to be questioned in theory. It results from the existence of many risk factors which are not perfectly correlated such as the type of business and the differences in geographical contexts and industries.

52. From this perspective, the analysis of diversification benefits with a view to their possible prudential recognition within Pillar 2 cannot avoid considering the operational, business and geographical characteristics of institutions. In this regard, the interviews highlighted the fact that the degree of specialisation in business type and/or sector of activities of the institutions within the peer group has shown significant differences, which should be reflected in the diversification benefits and economic capital measure.
53. For instance, it is reasonable that the institutions in Central and Eastern Europe, operating mainly in retail banking, should make much more conservative assumptions as to diversification benefits compared to global institutions which may operate across several continents.
54. Supervisors ought to have a clear picture of the business model of institutions before examining diversification benefits calculation methods, supported, for instance, by detailed evidence on assets distribution and the share taken in the income statement by the different business segments (geographical areas, type of business). For those institutions operating mainly in economically highly integrated areas, supervisors' evaluations should be very prudent (a clear link to macro-prudential analysis is needed).

Findings on diversification benefits calculation by institutions

55. The CEBS analysis confirmed that the main diversification driver, including those related to the capital estimated by institutions under Pillar 2, is credit risk. This conclusion is in line with expectations and is explained by the following: (i) credit risk is by far the main risk of the surveyed institutions; (ii) Pillar 2 diversification benefits for this type of risk are higher on account of the differences in calculation in respect of the Pillar 1 regulations. Including a high number of risk factors in the portfolio models as a substitution for the single factor in the prudential formula results in a drop of the correlation between counterparties and a reduction of economic capital.
56. Albeit with some differences in the implementation (e.g. different granularity of the geographical and sectoral clusters in the survey), most institutions using alternative approaches to the regulatory formula employ portfolio models stemming from Moody's KMV methodologies. The correlations adopted consider the dependence among the different portfolio clusters (e.g. geography, sector and size) and among the different risk drivers (e.g. GDP, unemployment rate, etc), which are estimated on the basis of available proxies on time horizons varying by institution. Stress and downturn periods are taken into account differently by institutions.
57. The second most important diversification benefits driver is inter-risk diversification, which turns out to be material in size; it should be underlined, however, that the information gathered during the interviews does not allow for a decomposition of such benefits, i.e. the identification of the sources of inter-risk diversification benefits; in many cases, there was no evidence on the marginal contribution of each single risk to the inter-risk diversification as a whole. Nevertheless, the anecdotal evidence demonstrates that credit risk benefits from a higher importance.

58. For all other risks – under both Pillars 1 and 2 – diversification benefits calculated by institutions are not significant.
59. A feature common to all interviewed institutions is the lack of appropriate methodologies for measuring the performance of Pillar 2 models and assessing ex-post the estimates of diversification benefits. Only in one case, and at a preliminary stage, did one institution propose backtesting-like methodologies calculated from the income statement results so as to highlight the imperfect correlations among profits and losses arising in the different geographical areas of activities. This is of particular concern given that there is evidence to suggest that these estimations have not been upheld as in times of stress correlations may in some cases head towards one.
60. Alongside the lack of ex-post performance measurement of the Pillar 2 models, there is a widespread lack of model recalibration so as to factor in the economic downturn context of the last two years. The parameter adjustments, where available, aimed at taking into account the stress scenario, are made on a judgemental basis.
61. The CEBS analysis does not encountered evidence of institutions developing new economic capital models in reaction to the crisis. On the contrary, some institutions have reverted to regulatory models for some of their risk (e.g. credit risk) due to the institution's diminished confidence in the outputs. In this particular case, the institution stopped using the Moody's KMV model as it was considered too complex and difficult to explain internally and insufficiently captured the risk. Some institutions also decided to focus on - and allow resources to - the modelling improvements required by new international regulations adopted in reaction to the crisis (e.g. IRC modelling for market risk), instead of investing in their EC models.
62. The internal use of Pillar 2 models highlights a high level of variability among the interviewed institutions. In some cases, the economic capital calculated, taking into account diversification, is allocated up to the single business units, thus contributing to the determination of the risk-weighted performance measures. The latter are included in budgeting, capital needs planning as well as in the determination of incentives for remuneration schemes.
63. In other cases, instead, the relations between economic capital and the institution management are weaker. In general, the range of internally-used models is narrower for the measures of inter-risk diversified capital.
64. Problems specific to management use (use test) have been noted with respect to the allocation of economic capital to the analysed groups' foreign subsidiaries. In such cases supervisors have reported serious shortcomings caused, among other things, by the limited (local) knowledge of models and underlying logics.

Findings on the assessment of diversification benefits by supervisory authorities

65. The CEBS analysis suggests that a thorough assessment of diversification benefits implies a significant commitment of specialised resources and data. The estimate of such commitment can be higher than that needed for the

validation of Pillar 1 internal models, since for Pillar 2 models: (i) there are no regulatory standards to serve as a benchmark for the review; (ii) the scope of the analysis is broader as it includes a wide range of risk factors; (iii) there are no external benchmarks reliable enough, most importantly as regards the estimation of the inter-risk diversification.

66. Not surprisingly, the analysis has shown that the supervisory authorities investing more in the diversification benefits analysis include those with an approach to Pillar 2 aimed at quantifying the SREP capital estimate.
67. Given the lack of a readily available benchmark to assess diversification benefits, many supervisors have used regulatory metrics as a reference, though only for Pillar 1 risks.
68. Outcomes of the CEBS survey showed that comparison between Pillar 1 and Pillar 2 quantifications can provide those institutions using internal models for calculating credit (IRB), operational (AMA) and market (VaR) risks requirements with the first elements of the analysis. The adoption of internal models indeed entails the validation process by the supervisor, during which the aspects crucial to the correct quantification of risks (statistical methodologies, organisational processes, IT systems) are closely examined with reference to the CRD standards and as indicated by the guidelines in such matter. Consequently, the more similar the Pillar 1 and Pillar 2 models are, the higher the confidence level of supervisors.
69. In this regard, the analysis has shown that using the methodologies of Pillar 1 models also under Pillar 2 is the prevailing practice for operational and market risks. As regards credit risk, the link between Pillar 1 and 2 is given by the more frequent use of the parameters estimated through Pillar 1 models (PD, LGD, EAD) within Pillar 2. Moreover, the determination of capital needs is based on very different methodologies, building on different assumptions as to risk factors and diversification.
70. Apart from the methodological similarities, some differences in the implementation of the models persist that are liable to invalidate the comparison between Pillar 1 and Pillar 2 models and to make the comparison rather complex, partly because some of the effects can counterbalance each other, with uncertain effects on the overall result. In general, interviewed authorities have highlighted non-negligible difficulties in reconciling Pillar 1 and Pillar 2 measures, as also shown by the quantitative analyses made by the team (see section IV).
71. The great majority of interviewed supervisors would expect the internal Pillar 2 capital estimate, when including diversification benefits to be higher than the sum of Pillar 1 capital requirements.
72. In general, although differences persist among institutions, respective supervisors highlighted some deficiencies in the overall framework for the quantification of diversification benefits by institutions, regarding the underlying modelling assumptions, the lack of historical data and weaknesses in the estimation of model parameters. The relevance and applicability of data was at times questionable and in some instances institutions applied a degree of 'expert judgement' where data was unavailable. Further deficiencies have

been detected in the validation of diversification benefits, especially between risk types - especially as there was very little evidence to suggest that there had been any robust back-testing of models to see how they had performed in the crisis – and in an inadequate integration of economic capital frameworks to daily risk management practices (risk measurement, capital allocation, remuneration etc.).

73. As far as inter-risk diversification is concerned, supervisors appear to be even more cautious as the relative approaches are at a very preliminary stage, both in terms of methodology and underlying assumptions, and robust validation of the claimed benefits seems to be practically non-existent.

VIII Conclusions and CEBS's common stance

74. The existence of diversification benefits cannot be questioned since they stem from the institutions' scope of operations, business and geographical mapping and as a result of their inclusion under the regulatory Pillar 1 metrics. However, the extent to which they should be considered over and above their inclusion within the Pillar 1 models and the approach that should be used to measure them from the perspective of an institution and supervisor is questionable.

75. What the analysis has highlighted is the existence of differences between institutions' characteristics and supervisors' approaches, thus making it difficult to define a stance, applicable to all different cases and situations on the ground.

76. Therefore a common framework to consider diversification benefits would benefit supervisory authorities also in the light of the future convergence in Pillar 2 practices and which in turn would be enhanced by joint assessment and decision on a level of own funds of the consolidated group and its entities as required by Article 129(3) of the revised CRD.

77. As regards intra-risk, evidence shows that the diversification benefits theme is somewhat exclusive to credit risk. Although some examples of reference frameworks already exist (Moody's KMV model, albeit some institutions show a high-level of discomfort using this model post-crisis), the way that the models have been tailored to the different institutions remains questionable due to the lack of direct applicability of the reference data. For the time being, a possible stance would entail recommending close supervisory attention and detailed analysis when considering diversification benefits within SREP capital quantifications. This is largely due to the evidence that has been collated post crisis which demonstrates that, *at times of stress, asset correlation matrices are unlikely to be stable and correlations invariably head towards one⁹* and that *pre-crisis measures of balance sheet risk are likely to be significant under-estimates*".

⁹ Andrew Haldane "Why Banks failed the stress test" February 2009 (page 10) <http://www.bankofengland.co.uk/publications/speeches/2009/speech374.pdf>

78. The recognition of intra-risk diversification benefits in the SREP assessment should be subject to two preconditions. Firstly, the modelling of diversification benefits should be scrutinised by supervisors, on-site as well as off-site, as part of the ICAAP-SREP dialogue. Secondly, the following conditions should be met:

- a) The cross-border debate among supervisors should be included in the assessment;
- b) Supervisors should base their assessment on a thorough understanding of the institution's business model and scope of operations (e.g. by geography, sector and products);
- c) Institutions should be urged to provide their supervisors with the necessary evidence to enable them to verify and assess, possibly through quantitative measures, the accuracy of Pillar 2 models and diversification benefits estimates throughout the different phases of the economic cycle, including both expansion and contraction phases;
- d) Institutions would have to prove to supervisors that the parameters and the methodologies used to calculate diversification benefits have also incorporated such prudential margins as to take into account the recession phases of the economic cycle. Supervisors should challenge institutions on the adjustment criteria;
- e) Supervisors should challenge institutions to provide, for Pillar 1 risks, a comparison between regulatory requirements and Pillar 2 estimations, taking into account the caveats under paragraph 21.
- f) A solid proof of use of the models in the decision making ("use test") should be demonstrated by institutions and assessed by supervisors.

79. As regards inter-risk calculation methodologies, except for a very limited number of cases, they are still at a preliminary stage. The use of subjective and, thus, vulnerable benchmarks is still widespread; methodologies in use do not imply a sufficient level of prudence and are still far from achieving reliability standards.

80. Against this backdrop, for inter-risk diversification benefits, the comments made by the Basel Committee on Banking Supervision (BCBS) should be supported. The BCBS stated¹⁰ that *'claims about the presence of diversification effects between market and credit risk, however, should be regarded with great caution if they are not derived from an integrated ("bottom up") approach'*. Furthermore, the analysis conducted by the working group set up by BCBS to consider the interaction of market and credit risk ('IMCR') suggests a *"cautionary tale"* as to the claims by the industry about the substantial benefits to be reaped from integrating market and credit risk. The BCBS further state that *'supervisors confronted with the aggregation methodologies of banks should be alert to the fact that diversification benefits*

¹⁰ Page 15, Working Paper No.16 'Findings on the interaction of market and credit risk' Basel Committee of Banking Supervision: http://www.bis.org/publ/bcbs_wp16.pdf

*are by no means a foregone conclusion. Careful supervisory validation of estimated diversification effects is fully justified, especially when they are derived from top-down methods and involve simple correlations*¹¹.

81. Inter-risk diversification benefits ultimately stem from the risk aggregation process, which currently shows inherent difficulties, and thus needs improvements. Therefore, for the time being, given the current state of modelling, inter-risk diversification benefits could only be accepted in cases where an in-depth supervisory check has shown that:

- a. **the above conditions elaborated for intra-risk diversification have been fulfilled;**
- b. **there has been a rigorous independent internal assessment and throughout review of the models (similar to the requirements of the CRD concerning the internal validation of advanced models for the calculation of the regulatory capital charge for Pillar 1 risks) by the institution;**
- c. **there is a sound and reasoned quantitative basis behind the justification; and**
- d. **there is sufficient proof that the diversification assumptions are in line with the specific business model of the respective institution.**

82. The experience obtained during this CEBS survey confirms the highly complex nature of the diversification benefits analysis. Looking ahead, further in-depth scrutiny will be considered by CEBS and its members as economic capital models and the modelling of diversification assumptions evolve over time. Cooperation among supervisors will allow for comparison among the results of different institutions, thus creating benchmarks. Moreover, the analysis of diversification benefits will have to go hand in hand with further examination by supervisors of concentration risk, building on the CEBS guidelines recently issued and the practical experience obtained by CEBS members and colleges of supervisors in their reviews of institutions' ICAAP and economic capital frameworks.

¹¹ Most often, the underlying models for aggregation purposes are based on normally distributed returns, or in the banks that follow more advanced approaches, on the Gaussian copula. The output, however, may be subject to considerable model uncertainty because of individual component risk measurement inconsistencies, the instability of estimated correlations or an inappropriate assumption of Gaussian copula aggregation (for example, because of non-linear or asymptomatic dependencies between risks). Working Paper No.16 'Findings on the interaction of market and credit risk' Basel Committee of Banking Supervision: http://www.bis.org/publ/bcbs_wp16.pdf