

## **PRINCIPLES FOR THE MANAGEMENT OF CONCENTRATION RISK**

### **A. INTRODUCTION**

1. Concentration risk is one of the specific risks required to be assessed as part of the Pillar 2 framework - the Supervisory Review Process (SRP) set out in the Capital Requirements Directive (CRD) - Directive 2006/48/EC. The CEBS had originally addressed concentration risk through the issue, on 17<sup>th</sup> December 2006, of the relative Guidelines. Within the local scenario, these Guidelines were transposed into Principles (Annex 2G) forming part of Banking Rule BR/12 - The Supervisory Review Process. Revised Guidelines on concentration risk have been published by CEBS on 2<sup>nd</sup> September 2010 and this latest version of Annex 2G reflects these amended Guidelines.
2. This Annex addresses all aspects of concentration risk. It should be noted that in addition to the specific references to concentration risk included in the CRD, institutions will continue to be subject to the statutory requirements on monitoring and control of large exposures focusing on concentration of exposures to a single client or group of connected clients. In this regard, institutions are required to take due cognizance of the provisions of Banking Rule BR/02 - Large Exposures, when assessing their risk to concentrations such as through large exposures.
3. Concentration risk has been traditionally analysed in relation to credit activities. However, concentration risk refers not only to risk related to credit granted to individuals or interrelated borrowers but to any other significant interrelated asset or liability exposures which, in cases of distress in some markets/sectors/countries or areas of activity, may threaten the soundness of an institution.

### **B. DEFINITION OF CONCENTRATION RISK**

4. Concentration risk can be defined as any single (direct and/or indirect) exposure or group of exposures that may arise within or across different risk categories throughout an institution with the potential to produce:
  - (a) losses large enough to threaten the institution's health or ability to maintain its core operations; or
  - (b) a material change in an institution's risk profile.
5. In these principles, the following terms are used to describe two relationships between risk concentrations:

- **Intra-risk concentration** refers to risk concentrations that may arise from interactions between different risk exposures within a single risk category;
- **Inter-risk concentration** refers to risk concentrations that may arise from interactions between different risk exposures across different risk categories. The interactions between the different risk exposures may stem from a common underlying risk driver or from interacting risk drivers.

Inter-risk concentrations may also arise where exposures to one entity or closely related groups of exposures (for example industry or geographic area) are not booked in the same place (e.g. exposures in the banking book and trading book). Where risks have a common risk driver that causes them to crystallise simultaneously or successively, correlations between risk exposures that were assumed to be low may materialise as high during a stress period.

6. Concentration risk can have an impact on institutions' capital, liquidity and earnings. These three aspects do not exist in isolation, and institutions' risk management frameworks should address them adequately.
7. In addition to concentrations within and across different risk types, an institution may be concentrated in its earnings structure. For example, an institution highly dependent for its profits on a single business sector and/or a single geographic area may be affected to a greater extent by sectoral or regional business cycles. Different sources of income may not be independent of each other. These interdependencies should be taken into account when assessing concentration risk.
8. However while business concentration may increase vulnerability with regard to specific cycles, business and geographic specialisation may still enhance the performance of institutions, since focusing on specific sectors, products or regions may generate specialised expertise. A balanced view thus has to be taken when assessing business concentration risk.

## **C. GENERAL CONSIDERATIONS AND PRINCIPLES FOR CONCENTRATION RISK MANAGEMENT**

***CRM 1. The general risk management framework of an institution should clearly address concentration risk and its management.***

9. The requirements for general risk management frameworks are elaborated in Appendix 1 and Annex 2H to this Rule.
10. In particular, institutions are expected to adequately address concentration risk in their governance and risk management frameworks, to assign clear responsibilities, and to develop policies and procedures for the identification, measurement, management, monitoring and reporting of concentration risk.

11. The Board of Directors and senior management should understand and review how concentration risk derives from the overall business model of the institution. This should result from the existence of appropriate business strategies and risk management policies.
12. Institutions should derive a practical definition of what constitutes a material concentration in line with their risk tolerance level(s). Moreover, institutions should determine the level of concentration risk arising from the different exposures they are willing to accept (i.e. determine their concentration risk tolerance level(s)), with due regard to (inter-alia) the institution's business model, size and geographic activity.
13. Thus, the institution's concentration risk policy should be adequately documented explaining how intra- and inter-risk concentrations are addressed at both group and solo levels. The concentration risk management framework and underlying policy(ies) should be embedded in the institution's risk management culture at all levels of the business. It should be subject to regular review, taking into account changes in risk appetite and in the business environment.
14. Any exceptions from the policies and procedures should be properly documented and reported to the appropriate management level. Institutions are expected to have procedures for independent monitoring (from the business, such as the risk function) of any breaches of policies and procedures, including the monitoring and reporting of breaches of limits. Any breaches of policies and procedures, including breaches of limits, should be subject to appropriate escalation procedures and management actions.

***CRM 2. In order to adequately manage concentration risk, institutions should have an integrated approach for looking at all aspects of concentration risk within and across risk categories (intra- and inter-risk concentration).***

15. Intra-risk concentrations should be adequately captured either as a separate discipline, or fully embedded in the institution's risk management framework including identification, measurement, monitoring, reporting and governance of the underlying risk areas.
16. Inter-risk concentrations stemming from interdependencies between risk types may not be fully considered when risks that are identified and measured on a stand-alone basis ("silo" approach) are combined (added up) in a simple way, e.g. by adding up Value-at-Risk figures. In this case, inter-risk concentrations via single factors driving the risks of different business lines may not be captured. Institutions should have frameworks for identifying such factors and how they may affect the various risk types. Institutions should also consider how risk mitigation techniques may play out under stressed market conditions.
17. In the integrated approach to concentration risk management, institutions should also pay due attention to feedback effects, i.e. indirect effects on an institution's exposure caused by changes in the economic environment. For example, an additional loss may arise from the

inability to liquidate some assets following a sharp decrease in the value of those assets; in such circumstances inter-risk concentrations may become apparent.

***CRM 3. Institutions should have a framework for the identification of intra- and inter-risk concentrations.***

18. Risk drivers which could be a source of concentration risk should be identified. Furthermore, the institution's risk concentration identification framework should be comprehensive enough to ensure that all risk concentrations which are significant to the institution are covered, including on- and off- balance sheet positions and committed and uncommitted exposures, and extending across risk types, business lines and entities. It follows that an institution should have adequate data management systems to enable it to identify concentrations arising from different (types of) exposures. Institutions should identify elements of concentration risk which have not been adequately addressed with the help of established models.
19. As an institution does not operate in isolation, it should consider economic developments that influence the financial markets and their actors and vice versa. An important element to consider is system-wide interactions and feedback effects and how such effects may impact the institution. The analysis of these potential interactions and feedback effects should be thorough enough to enable the institution to implement a forward-looking approach to its concentration risk management.
20. An institution should constantly monitor the evolving interplay between the markets and the economy to facilitate the identification and understanding of potential concentration risks (at both group and solo levels) and the underlying drivers of these risks. In its monitoring, the institution should go further than first-order observations, as mere observation of the changes in market and economic variables will not give the institution the required insights in order to implement a forward-looking approach to its concentration risk management.
21. Stress testing in the form of both sensitivity analysis and more complex scenario stress testing is a key tool in the identification of concentration risk. The analysis should be performed on an institution-wide basis and transcend business unit (or entity) or risk type focus on concentrations, to which it can be a useful complement<sup>(1)</sup>. In addition, stress tests may allow institutions to identify interdependencies between exposures which may become apparent only in stressed conditions, including complex chain reaction type events that involve the successive occurrence of contingent risks (for example liquidity), and second, third etc. order events.
22. Use of stress testing as a way of identifying concentration risk does not necessarily mean that stress tests should be conducted solely for the purposes of concentration risk management. Although some specific sensitivity analyses targeted on behaviour of known concentrations in a portfolio or single risk type level may improve institutions' knowledge

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<sup>(1)</sup> More details on stress testing, including concentration risk stress testing, are available from the revised Annex 2D to this Rule.

about concentration risk, holistic stress tests looking at the risks being faced by the organisation as a whole (firm-wide stress tests) may be especially useful in the identification of concentration risk.

23. Institutions should identify concentration risks when planning to enter into new activities, in particular those resulting from new products and markets.

***CRM 4. Institutions should have a framework for the measurement of intra- and inter-risk concentrations. Such measurement should adequately capture the interdependencies between exposures.***

24. The measurement framework should enable the institution to evaluate and quantify the impact of risk concentrations on its earnings/profitability, solvency, liquidity position and compliance with regulatory requirements in a reliable and timely manner. Frequency of measurements should be proportionate to the scale and complexity of the institution's operations. The measurement framework should be regularly reviewed and reflect changes in the external environment as well as possible changes in the risk profile of the institution, taking into account its current and projected activities.
25. Multiple methods or measures may be required to provide an adequate view of the different dimensions of the risk exposure. Scenario stress testing may be a particularly appropriate tool for developing forward looking approaches by introducing views on potential financial market and economic evolutions into the institution's risk measurement methods and to translate these views in terms of risks. If performed outside the standard aggregation methods, the scenario stress testing exercises could be an appropriate tool for assessing the standard methods used.
26. The Board of Directors and senior management should be aware of the major limitations and underlying assumptions of the measurement framework. The risk control function should adequately take into account all limitations and assumptions of models and their calibration, particularly via the application of stress tests.

***CRM 5. Institutions should have adequate arrangements in place for actively controlling, monitoring and mitigating concentration risk. Institutions should use internal limits, thresholds or similar concepts, as appropriate.***

27. Active management of risk exposures is required to mitigate the potential emergence of undesired concentrated exposures within portfolios. Note though that this active management may lead to subsequent risks that may be difficult to deal with (e.g. asset liquidity risk). Also constant assessment and adjustment of business and strategic goals is required to avoid the build-up of undesired long-term risk concentrations.
28. An institution should set top-down and group-wide concentration risk limit structures (including appropriate sub-limits across business units or entities and across risk types) for exposures to counterparties or groups of related counterparties, sectors or industries, as well as exposures to specific products or markets.

29. The limit structures and levels should reflect the institution's risk tolerance and consider all relevant interdependencies within and between risk factors. The limit structures should cover both on- and off-balance sheet positions and the structure of assets and liabilities at consolidated and solo levels. The limit structures should be appropriately documented and communicated to all relevant levels of the organisation.
30. Institutions should carry out regular analyses of their portfolios and exposures, including estimates of their trends, and should take account of the results of these analyses in setting and verifying the adequacy of the processes and limits, thresholds or similar concepts for concentration risk management. Examples of elements of such analysis, although not exhaustive are:
- undertaking a more detailed review of the risk environment in particular sector(s);
  - reviewing with greater intensity the economic performance of existing borrowers;
  - reviewing approval levels for business;
  - reviewing risk mitigation techniques, their value and their legal enforceability;
  - reviewing outsourced activities and contracts signed with third parties (vendors);
  - reviewing the funding strategy, so as to ensure the maintenance of an effective diversification in the sources and tenor of funding; and
  - reviewing the business strategy.
31. Where issues of concern are identified, institutions should take appropriate mitigating action. Possible actions could include, for example:
- reducing limits or thresholds on risk concentrations;
  - adjusting the business strategy to address undue concentrations;
  - diversifying asset allocation or funding;
  - adapting the funding structure;
  - buying protection from other parties (e.g. credit derivatives, collateral, guarantees, sub-participation);
  - selling certain assets; and
  - changing outsourcing arrangements.
32. With regard to concentration funding risk, limits may include:
- limits related to funding from inter-bank markets; and
  - limits related to maximum or minimum average maturities.
33. In addition, other limits restricting concentrations of liquidity may be considered, for example:
- limits concerning maturity mismatches, especially limits concerning cumulated liquidity gaps; and
  - limits referring to off-balance sheet positions.

34. Other useful instruments are indicators and triggers (internal liquidity ratios) which, as with limits, are targeted at certain thresholds, but usually are established at more conservative levels than limits. They are introduced to warn against potential difficulties and should result in the taking of preventative actions to avoid exceeding limits.
35. Mitigation techniques used by institutions should be adequate, manageable and fully understood by the relevant staff. The institution should ensure that when mitigating concentration risk, it does not overly rely on specific mitigation instruments, thereby substituting one kind of concentration for another, by taking into account the character and quality of the mitigating instruments.
36. An institution should be careful not to diversify into business activities or products where it may lack the necessary expertise, for which the structure or its business model is not appropriate, or which are not in line with the institution's risk appetite. The risk mitigation strategy can lead to a preference for some forms of concentration over diversification, for example concentrating in good-quality assets compared to diversifying (for the sake of diversification) into lower quality assets, thus increasing the overall risk profile. It should be acknowledged that a reduction of concentration risk should not lead to an increase in overall risk profile of underlying exposures (portfolio), i.e. the quality of diversified exposures should be of the same or higher quality as the original exposures.
37. An institution should have adequate arrangements in place for the internal reporting of concentration risk. These arrangements should ensure the timely, accurate and comprehensive provision of appropriate information to the Board of Directors and senior management about levels of concentration risk.
38. An institution should have in place a reliable, timely and comprehensive monitoring and reporting framework for risk concentrations which will facilitate efficient decision-making. This could be part of an existing monitoring and reporting framework. The management reports should provide qualitative and, where appropriate, quantitative information on intra-risk and inter-risk concentrations, as well as on material risk drivers and mitigating actions taken. The reports should include information at both consolidated and solo levels, as appropriate and follow the established limit structure, spanning business lines, geographies and legal entities.
39. The frequency of the reporting should reflect the materiality and nature of the risk drivers, especially with regard to their volatility. Ad hoc reports can be used to supplement regular reporting.
40. An institution should have adequate management information systems to enable it to monitor concentrations arising from different (types of) exposures against approved limits. The results of such monitoring of limits (limit utilisation) should be included in management reports and operational reports for users of limits. Institutions should have appropriate escalation procedures to address any limit breaches.

***CRM 6. Institutions should ensure that concentration risk is taken into account adequately within their ICAAP and capital planning frameworks. In particular, they should assess, where relevant, the amount of capital which they consider to be adequate to hold, given the level of concentration risk in their portfolios.***

41. An institution should take concentration risk into account in its assessment of capital adequacy under ICAAP and be prepared to demonstrate that its internal capital assessment is comprehensive and adequate to the nature of its concentration risk. If an institution is able to demonstrate to the Authority that concentration risk (both intra- and inter-risk) is adequately captured in the capital planning framework, it might not be necessary and, given the models employed by institutions, not always possible to explicitly allocate capital to concentration risk as a separate risk category within Pillar 2 (show capital estimate attribute to concentration risk as a single line). However, in any event, internal capital estimation should cover all material risks an institution is exposed to, including intra- and inter-risk concentrations.
42. An institution should take into account mitigation in its assessment of its overall exposure to concentration risk. In assessing the mitigation, an institution may take into account a range of relevant factors including the quality of its risk management and other internal systems and controls, and its ability to take effective management action to adjust levels of concentration risk.
43. While the role of capital should be assessed within this broader context, keeping in mind that the weight attached to the different factors will vary from one institution to another, the expectation is that the higher the levels of concentration, the greater the onus will be on institutions to demonstrate how they have assessed the resultant implications in terms of capital.

**D. MANAGEMENT AND SUPERVISION OF CONCENTRATION RISK WITHIN INDIVIDUAL RISK AREAS**

**I. Credit Risk**

44. Institutions should derive a concise and practical definition of what constitutes a credit concentration. The definition should encompass the sub-types of credit concentrations being addressed, including exposures to same counterparties, groups of connected counterparties, and counterparties in the same economic sector, geographic region or from the same activity or commodity, the application of credit risk mitigation techniques, and including in particular risks associated with large indirect credit exposures (e.g. to a single collateral issuer)<sup>(2)</sup>.

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<sup>(2)</sup> See also Annex 2B to this Rule.



***CRM 7. Institutions should employ methodologies and tools to systematically identify their overall exposure to credit risk with regard to a particular customer, product, industry or geographic location.***

45. The infrastructure used to aggregate and consolidate credit exposures and manage credit risk limits should be sufficiently robust to capture, on an institution-wide basis, the complexity of the credit portfolio from an obligor relationship and subordination perspective.
46. For example, institutions with exposures having the support of guarantees (unconditional, partial or letter of support) or utilising other forms of credit enhancement (such as monoline insurance or CDS protection) can have complex inter-obligor relationships. Such subordination issues can complicate the production of an aggregate credit exposure list, particularly for consolidated group purposes, and can thus compromise the process of identifying credit concentration risk.
47. In addition, credit concentration risks may arise from the structure underlying complex financial products, such as securitised products.
48. Also, credit concentration risks may arise in both the banking and trading books (or stem from a combination of the two), with the latter arising in terms of counterparty risk and significant exposure to particular instrument types exposed to the same idiosyncratic risk.
49. Finally, interdependencies between creditors due to shared counterparties, links via supply chains, shared ownership, guarantors, etc., which may go beyond sectoral or geographic links, may only become apparent under stressed circumstances. Hence, stress testing can be a helpful tool for gauging the size of possible hidden concentrations in the credit portfolio.

***CRM 8. The models and indicators used by institutions to measure credit concentration risk should adequately capture the nature of the interdependencies between exposures.***

50. Model risk can be substantial in the modeling of credit concentration risk. A fundamental factor underlying the modelling of borrower interdependencies concerns the type of model. Models may have fundamentally different structures (e.g. reduced form versus structural models) or may be run in different set-ups (e.g. in default mode versus mark-to-market mode). Since the choice of model has significant impact on the credit concentration risk assessment of an institution, institutions need to have a full understanding of the underlying assumptions and techniques embedded in their models.
51. Institutions should demonstrate that the model structure chosen fits the characteristics of their portfolios and the dependency structure of their credit exposures. Not all models will capture different types of interdependencies equally well. Failing to include relevant portfolio characteristics may result in underestimation of credit concentration risks.
52. As an example, when modelling interdependencies for retail or SME exposures, where no market data is available, institutions may often have to rely on data that may not be

representative for such exposures. In addition, the assumptions, e.g. concerning the dependency structure among borrowers, may only hold 'locally' or may be violated under adverse circumstances.

53. Another area of concern is the extent to which the sample period that is used to calibrate the model is sufficiently reflective of severe economic circumstances and leads to robust estimates. Institutions should demonstrate how an adequate degree of conservatism is included, especially in cases where the time series used for estimation do not cover years of economic downturn.
54. Finally, challenges also arise in the measurement of credit concentration risk from aggregating (different types) of credit exposures to similar counterparties over all the business units of an institution. Exposures could emerge from different activities in different parts of the organisation, for example, loan origination, counterparty credit risk from trading activities, collateral management and the issuance of credit lines.

## **II. Market Risk**

55. Market concentration risk can arise either from exposures to a single risk factor or exposures to multiple risk factors that are correlated. It may not always be apparent that multiple risk factors are correlated as this may only be revealed under stressed market conditions. Institutions should identify all material risk factors and understand, in particular through stress testing and sensitivity analysis, how their market risk profiles and the value of their portfolios may be affected by changes in correlations and non-linear effects. In particular, concentrations can arise from exposures in the trading and non-trading books.
56. Many institutions use a VaR model and related limits to monitor the positions that are exposed to market risk. VaR models can use unstressed correlations among risk factors. In stressed conditions however, interdependencies change and the benefits of asset diversification in the trading portfolio may be overestimated. In addition, prices used in models might not be based on true market prices but be the result of valuation techniques based on market observables or non-observable assumptions of limited validity in times of stress, thereby not representing the true concentration risk of an instrument. Concentration risk can also arise as a result of actions by other market participants. Systemic risk can also be a significant source of concentrations and this can be underestimated by the models.
57. Traditional VaR models may not capture the whole range of market risk concentrations, in particular, those that emerge in stressed conditions. An institution's VaR measure may not reflect stressed market conditions and as such, concentrations will not be identified. In particular, net positions may potentially conceal large gross underlying positions that can give rise to significant concentration risk. Therefore, the measures used to monitor concentration risk should have the potential to anticipate and detect the build-up of concentrated positions in one or multiple risk factors.

***CRM 9. An institution's assessment of concentration risk should incorporate the potential effects of different liquidity horizons that can also change over time<sup>(3)</sup>.***

58. Market liquidity risk is the risk that a position cannot easily be unwound or offset at short notice without significantly influencing the market price because of inadequate market depth or market disruption.
59. An institution should assess its concentration risk assuming different liquidity horizons. Given the impact that liquidity may have on concentration risk, careful assessment of liquidity horizons in normal and stressed market conditions is needed. This should be considered when an institution sets its risk limits.

### **III. Operational Risk**

60. Operational risk concentration (OPRC) means any single operational risk exposure or group of operational risk exposures with the potential to produce losses large enough to worsen the institution's overall risk profile so that its financial health or its ability to maintain its core business is threatened. It may not always be apparent that multiple risk factors are correlated, as this may only be revealed under stressed market conditions.
61. The concept of OPRC is relatively new and both supervisors' and institutions' understanding of it and its similarities with other forms of concentration risk are in the early stages of development.
62. Accordingly, principles 10 and 11 can be considered to provide only a first set of recommendations on OPRC and are structured to promote dialogue and the exchange of experience between supervisors and institutions.

***CRM 10. Institutions should clearly understand all aspects of OPRC in relation to their business activities.***

63. Institutions should identify, as part of their operational risk management framework, the main sources of OPRC and clearly understand both the realised and potential effects.
64. All sources of OPRC should be considered. Institutions should consider the possibility that the sources are linked to the characteristics of the institution's activities or organisational structure.
65. For example, institutions with large payments and settlements functions or that are active in high frequency trading or that are dependent on one or few external suppliers/providers for key aspects (e.g. IT platforms/suppliers, outsourcers, insurance undertakings) are potentially exposed to OPRC.

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<sup>(3)</sup> Refer also to the discussion on liquidity risk in paragraphs 79 to 90 of this Annex.

66. Other potential sources of OPRC (for example a business decision to carry out a campaign of “aggressive selling” that later produces losses through refunds to clients), may be more clearly identifiable for their negative consequences and their negative impact on the institution’s overall risk profile.
67. Many high frequency/medium impact (HFMI) loss events and low frequency/high impact (LFHI) loss events could be classified as OPRC events. The frequent repetition of medium impact events can – if they remain unmitigated - jeopardise an institution’s survival in the long run, while events with low probability of occurrence but with high impact may cause the immediate default of an institution.
68. Although not all the HFMI and LFHI loss events are related to OPRC, their proper recognition and treatment is crucial to understanding the operational risk profile within the institution. HFMI and LFHI loss events should be considered as contributing to concentration risk if they have a common cause (e.g. inadequate controls or procedures).
69. Frequently the HFMI and LFHI loss events stem from multiple time losses and multiple effect losses<sup>(4)</sup>. Given that such losses usually stimulate organisational responses and mitigation actions for operational risk, all institutions should define appropriate principles and set specific criteria and examples to correctly identify, classify and treat multiple time losses and multiple effect losses within their business and organisational structure.

***CRM 11. Institutions should use appropriate tools to assess their exposure to OPRC.***

70. All institutions should take into account possible risk concentrations when they evaluate their operational risk exposure. The assessment tools should be proportionate to the size and complexity of the institution, as well as to the type of method used for the purpose of calculating the operational risk capital figure.
71. In particular, the analysis of patterns of frequency and severity of loss data (internal and/or external) can reveal the major determinants and effects of OPRC.
72. ‘Near-misses’ and also operational risk gains<sup>(5)</sup> on one hand and scenario analysis or similar processes containing expert judgements on the other, can give a more forward looking perspective on the exposure to OPRC inherent in the current environment or related to new areas of business, changes in the institution’s structure, or recent management decisions, etc.

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<sup>(4)</sup> “Multiple time losses” and “multiple effect losses” are a group of subsequent losses occurring in different periods of time, but relating to the same operational risk event and a group of associated losses affecting different entities or business lines, units, etc., but relating to the same root event. The associated losses should be aggregated in one cumulative loss before being used by the AMA institutions for capital calculation purposes.

<sup>(5)</sup> The terms “near-miss event” and “operational risk gain event” can be used to identify, respectively, an operational risk event that does not lead to a loss and an operational risk event that generates a gain.

73. Operational risk managers and internal control functions, where appropriate, should be involved in the assessment of an institution's exposure to OPRC. The collection of loss data should also form part of that assessment.
74. Sound internal processes and systems and sufficient human resources are crucial to avoiding unnecessary risk concentrations. However, banking businesses will usually be exposed to some OPRC and therefore an appropriate internal control system is paramount to mitigating those risks.
75. The CRD stipulates that contingency plans and continuity plans should be established by institutions in order to ensure their capacity to operate on a continuous basis and to restrain losses due to serious interruptions of their activities. These plans are crucial for concentration risk management, especially with regard to events with a low probability of occurrence, but associated with severe losses resulting from business disruptions.
76. OPRC can also be addressed by the use of risk mitigation techniques such as the adoption of insurance programmes to cover losses caused by, for example, fraud, an aggressive selling campaign or the inability of external providers to offer their services.
77. The use of risk mitigation techniques may give rise to other risk types (e.g. credit risk) that may render overall risk reduction less effective (e.g. legal risk or other additional operational risk). This could also be considered as a secondary OPRC. Such a concentration risk may arise if a bank insures its risks or concentrated risks at only one insurance company which either does not have sufficient capacity to cover all the different operational risks transferred by the bank or is not able to find eligible co-insurers and re-insurers to pool and share those risks.
78. In using risk mitigation techniques for OPRC, institutions should consider the residual risk which may remain with the institution and whether additional risks, including OPRC itself, associated with risk mitigation tools have been acquired.

#### **IV. Liquidity Risk<sup>(6)</sup>**

79. Concentration risks may be a major source of liquidity risk as concentrations in both assets and liabilities can lead to liquidity problems. A concentration in assets can disrupt an institution's ability to generate cash in times of illiquidity or reduced market liquidity for certain asset classes. A liability concentration (or funding concentration) exists when the funding structure of the institution makes it vulnerable to a single event or a single factor, such as a significant and sudden withdrawal of funds or inadequate access to new funding. The amount that represents a funding concentration is an amount that, if withdrawn by

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<sup>(6)</sup> This section should be read in conjunction with the CEBS's technical advice on liquidity risk management (second part), September 2008, [http://www.eba.europa.eu/documents/10180/16106/CEBS\\_2008\\_147\\_\(Advice+on+liquidity\\_2nd+part\)%20final.pdf](http://www.eba.europa.eu/documents/10180/16106/CEBS_2008_147_(Advice+on+liquidity_2nd+part)%20final.pdf); Liquidity Identity Card, June 2009, <http://www.eba.europa.eu/documents/10180/16166/CEBS+2009+127+final+%28Liquidity+ID%29.pdf>; and CEBS Guidelines on liquidity buffers and survival period (see <http://www.eba.europa.eu/documents/10180/16094/Guidelines-on-Liquidity-Buffers.pdf>).

itself or at the same time as similar or correlated funding sources would require the institution to significantly change its day-to-day funding strategy.

80. In recent years, the increasing use of complex financial instruments and the globalisation of financial markets were accompanied by a shift from deposit-based to market-based funding. Due to the increasing dependence on wholesale funding, institutions face higher exposures to market prices and credit volatilities. Furthermore, the extension of interbank market activity brings the risk of contagion effects.

***CRM 12. In order to be able to identify all major kinds of liquidity risk concentrations, institutions need to have a good understanding of their funding and asset structure and be fully aware of all underlying influencing factors over time. When relevant, depending on its business model, an institution should be aware of the vulnerabilities stemming from its funding and asset structure, e.g. from the proportions of retail and wholesale funding on the liability side or large concentrations of single securities in their liquid assets buffer, that should be avoided. Also, when relevant, the identification of liquidity risk concentrations should include an analysis of geographic specificities. Finally, the identification of concentrations in liquidity risk should take into consideration off-balance sheet commitments.***

81. The identification process of liquidity risk concentrations needs to take into consideration both market liquidity risk and funding liquidity risk as well as the possible interaction of the two. Institutions need to manage their stocks of liquid assets to ensure to the maximum extent possible that they will be available in times of stress. Institutions should avoid large concentrations in less liquid asset classes relative to their long-term stable funding. Otherwise in a market downturn this may severely damage the institution's liquidity generation capacity.
82. High concentrations in wholesale funding typically increase liquidity risk as institutional funding providers are more credit-sensitive and susceptible to market rumours about the financial difficulties of institutions than retail funding providers. Inter-bank funding entails contagion-risk and can be a volatile funding source, especially in times of crisis, when confidence among institutions is lost and they become reluctant to lend to each other. When assessing the probability of withdrawal for each concentrated source of funding, both behavioural and contractual considerations should to be taken into account.
83. For institutions active in multiple countries and currencies, access to diverse sources of liquidity in each currency in which the institution holds significant positions is required since credit institutions are not always able to swap liquidity easily from one currency to another.
84. There may be legal or regulatory constraints on the free flow of assets between jurisdictions (e.g. tax issues, regulatory ring-fencing) restricting the ability of groups to allocate assets where they are most needed. Institutions should be able to identify intra-bank (between the head office and the foreign branches) and intra-group (either between the parent company and its subsidiaries or among different subsidiaries) concentrations in liquidity.

85. Another important factor influencing liquidity risk concentration is off-balance sheet items, as appropriate. Off-balance sheet liquidity needs may arise both from contractual and non-contractual commitments. Off-balance sheet contractual obligations may include such items as commitments to provide financing, guarantees, execution of limits within agreed credit lines, etc. Covenants in securitisation contracts should be screened for clauses - e. g. performance or downgrade triggers - that can impose collateral requirements or the obligation to provide liquidity support. The necessity to support entities such as SPVs in order to maintain a good reputation, market share or business relations may come unexpectedly, especially in times when an institution already faces stress, and may severely threaten the institution's liquidity position. Potential liquidity needs relating to the execution of such off-balance sheet commitments should be regularly assessed. Early repayment of debt instruments (instruments callable or with trigger clauses) should also be considered.

***CRM 13. In identifying their exposure to funding concentration risk, institutions should actively monitor their funding sources. A comprehensive analysis of all factors that could trigger a significant sudden withdrawal of funds or deterioration in institutions' access to funding sources (including, for example, in the form of asset encumbrance) should be performed.***

86. There are no fixed thresholds or limits that define a funding concentration which depends on the institution and its balance sheet structure. Amongst other things, funding concentrations can include the following examples:

(i) Concentrations in one particular market/one particular instrument:

- the inter-bank market;
- funding through debt issuance (commercial paper, medium-term notes, hybrid bonds, subordinated bonds, etc.);
- other wholesale funding (deposits from institutional investors and large corporations); and
- structured instruments (FX swaps, asset-backed commercial paper, covered bonds), both due to funding reliance and exposures due to margin and collateral calls.

(ii) Concentrations in secured funding sources:

- securities financing arrangements such as repurchase/reverse repurchase agreements, stock borrowing/lending and specific assets used in these operations;
- asset-backed commercial paper;

- securitisation of loans, (credit cards, mortgages, autos, etc.);
  - certain types of covered bonds; and
  - dependence on open market operations.
- (iii) Concentrations on a few providers of liquidity stemming from concentrated counterparty credit risk. This dependence on one or a few liquidity providers could even go along with the use of different markets or instruments. Without a specific concentration risk analysis, the concentration on a few providers of liquidity could be less visible and difficult to identify. These concentrations could stem from:
- wholesale market providers (deposits from institutional investors and large corporations);
  - funding from the financial group the institution belongs to;
  - large individual depositors or counterparties;
  - connected counterparties; and
  - geographic and currency concentrations of funding sources.
- (iv) Maturity concentrations, such as over-reliance on short-term funding to finance longer term lending. While acknowledging the fact that maturity transformation is an integral part of banking business, liquidity problems can arise in the event that an institution is unable to roll-over its short-term liabilities. Another type of maturity concentration occurs when similar maturity dates of different funding sources (like debt issuance) require the bank to issue a large number or amount of debt instruments in a short period of time, leading to difficulties in market absorption.

***CRM 14. The qualitative assessments of concentrations in liquidity risk should be complemented by quantitative indicators for determining the level of liquidity risk concentration.***

87. One example of such an indicator is the ratio of wholesale funding to total liabilities. It captures the extent to which an institution relies on - more volatile and vulnerable - market funding sources. In this example, wholesale funding could be defined as the funding provided by deposits from institutional investors and large corporations. Another example is a ratio consisting of the five largest depositors as a percentage of total deposits.



***CRM 15. Institutions should take into account liquidity risk concentrations when setting up contingency funding plans.***

88. When setting up the contingency funding plan, an institution may consider the following:
- early warning indicators capturing any increase in the concentration of liquidity risk and the measures to be taken when a crisis situation/concentration stress strikes; and
  - any increase in concentration stemming from the implementation of contingency measures should be carefully monitored and addressed as quickly as possible.
89. Among the early warnings are those indicators monitoring breaches of concentration limits, as mentioned above (e. g. per individual issuer, sector, liquid facility, asset quality).
90. Among the strategies to be implemented to address a crisis/stress situation when one or more early warning indicators on concentration is triggered are those measures aimed at keeping diversification stable.

**E. SUPERVISORY REVIEW AND ASSESSMENT**

91. The review and assessment of institutions' exposure to concentration risk and concentration risk management, including management's mitigative actions, is a part of the overall assessment of an institutions' risk and business profile, as well as its compliance with the CRD, the Act, Rules and other statutory and/or regulatory requirements. The Authority acknowledges that certain aspects of concentration risk, especially intra-risk concentration, may be embedded in the management of the specific risk areas, and therefore, will apply a flexible approach reflecting the principles of proportionality and relevance to the particular institutions.
92. In particular, if an institution is able to demonstrate to the Authority the degree to which existing risk management arrangements, set up for specific risk areas, adequately capture intra-risk concentrations within that particular risk area, the Authority, in its review, should not expect institutions to set up parallel arrangements solely for the purposes of the intra-risk concentration management.
93. In the assessment of the concentration risk of an institution (both in the context of a cross-border or domestic banking group) the Authority should pay attention to the institution's business model and strategy, including any strategy, which could result in certain entities being concentrated in certain areas, products or markets as a result of the group-wide strategy. Such cases will be closely examined by the Authority and addressed in the context of ICAAP-SREP dialogue between institutions and their respective Authority also taking place in the college framework, where applicable.
94. Since the principles underlying this Rule relate both to obligations of credit institutions and also of the Authority, the Authority has deemed that disclosure of its obligations in the

Rule would provide licence holders and other stakeholders with information as to how the Authority would undertake its SREP.

***CRM 16. The Authority should assess whether concentration risk is adequately captured in the institution's risk management framework. The supervisory review and evaluation process should encompass the quantitative, qualitative and organisational aspects of concentration risk management.***

95. As part of its assessment, the Authority should review the compliance of institutions with these Principles. The Authority should also evaluate the extent to which concentration risk management is embedded in an institution's risk management framework and whether the institution has considered all possible areas where risk concentrations may arise.
96. The Authority should consider using quantitative indicators in its Risk Assessment Systems (RAS) to assess the level of concentration risk within institutions. These indicators may be built up on the basis of the set of limits, thresholds or similar concepts defined internally by institutions.
97. These indicators should be used within the Authority's RAS to carry out peer comparisons and identify outliers. The Authority recognises that simple concentration risk indicators built on the information provided from supervisory reporting have shortcomings (e.g. they might not fully capture the interdependencies between exposures). Therefore, at least for the largest and most complex institutions, these measures are to be regarded as supplementary only and are not expected to cover the risk profile of an institution completely. In any case, these measures are not expected to serve as a replacement for the internal assessment of an institution itself.
98. As regards inter-risk concentrations, the Authority is aware that the methodological approaches to measure inter-risk concentration in the industry are still under development and anticipates that models which capture a holistic approach will evolve over time. In this regard, the Authority will evaluate any such models on a case-by-case basis, always keeping in mind the concept of proportionality.
99. The Authority recognises that the assessment and management of concentration risk does not only rely on quantitative modelling techniques but also on qualitative factors e.g. the expertise of people with regard to the identification and management of risks in individual sectors, markets and financial instruments and the quality of the risk management, such as expertise and local knowledge, market information, etc. These factors are often relevant for institutions where concentrations are a reflection of their business models and strategies. All relevant information should be considered while conducting the assessment.
100. One of the important aspects of the supervisory review of concentration risk management is the ongoing dialogue with an institution on all levels, both technical and management. In its reviews, the Authority considers all sources of information about institutions' concentration risk management, including institutions' own internal assessments and validation as well as reviews undertaken by internal audit or similar functions. It is

important to note that the Authority also engages in dialogue with the Board of Directors and senior management of institutions in relation to overall diversification strategies, which may have implications for the level of concentration risk in particular business lines and/or entities.

101. The Authority should assess the reliability of proposed or implemented risk-mitigating actions, including their effectiveness in times of stress or illiquid markets and the way any potential shortcomings are addressed.

***CRM 17. In cases where supervisory assessment reveals material deficiencies, the Authority, if deemed necessary, should take appropriate actions and/or measures set out in Article 9 (Restriction and Revocation of a Licence) and Article 16A (Own Funds) of the Act and paragraph 28 of this Rule.***

102. These actions might entail requesting an institution to take additional remedial action such as considering its strategy or future management actions with respect to mitigation of the concentration risk.

103. For example, if the limit structure does not reflect the chosen risk tolerance and no other mitigation approaches towards concentration risk have been established, the Authority could, in dialogue with the institution, ask it to bring its limit structure and mitigation approaches into line with its risk tolerance (i.e. change the limits).

***CRM 18. The Authority should assess whether institutions are adequately capitalised and have appropriate liquidity buffers in relation to their concentration risk profile, focusing on buffers (liquidity and capital) in relation to the unmitigated part of any concentration risk.***

104. The Authority should ensure that the institution holds an adequate amount of capital and liquidity buffers against its concentration risk. In this regard, special consideration should be given to concentrations which are inherent in the business strategy.

105. While it is recognised that the role of capital needs to be assessed within the broader context, the Authority's overall expectation is that the higher the levels of concentration, the greater the onus will be on institutions to demonstrate how they have assessed the implications in terms of capital.

106. In the event that the capital held by an institution does not adequately cover the nature and level of the concentration risks to which it is or might be exposed, the Authority should take appropriate action aimed at reducing risk exposures, possibly including obliging the institution to hold Additional Own Funds as described under the Act article 16A para (2).

107. Finally, obliging institutions to hold Own Funds in excess of the minimum level is one of the measures that can be used by the Authority where institutions do not exhibit to its satisfaction the appropriateness and adequacy of their internal processes for identifying, measuring, monitoring and mitigating concentration risk.

108. The Authority acknowledges that capital may not always be the best way to mitigate liquidity risk. However, capital may have a role to play in protecting institutions against the possibility of having to liquidate assets from the liquidity buffer at fire-sale prices – a likely scenario in a period of banking sector stress. The Authority should further be satisfied with the composition of institutions' liquid asset buffers in accordance to CEBS Guidelines on liquidity buffers and survival periods<sup>(7)</sup>.

***CRM 19. The Authority should assess whether concentration risk is adequately captured in firm-wide stress testing programmes.***

109. The Authority should assess the extent to which concentration risk is adequately captured in firm-wide stress testing programmes<sup>(8)</sup>. In addition, the Authority may perform or request institutions to perform additional stress tests.

***CRM 20. In the case of a cross-border operating institution, appropriate discussions should be held between the Authority and the consolidating or host supervisors, as the case may be, to ensure coordination of supervisory activities, and that concentration risk is adequately captured within the institution's risk management framework. Results of the assessment of the level of concentration risk and concentration risk management should be taken into account in the risk assessment of the institution and discussed in the relevant college of supervisors.***

110. Following the principles of the home-host supervisory cooperation elaborated in the CEBS Guidelines for operational functioning of colleges (GL34)<sup>(9)</sup>, colleges of supervisors play an essential role in the coordination of supervisory activities, including the review of concentration risk management. In the context of its role within a college of supervisors, the Authority together with home or host supervisors, as the case may be, should assess the concentration risk management in order to ensure that all material concentrations are adequately captured, understood and addressed in the context of the risk management framework at the consolidated and individual entities' level. The results of the assessment of concentration risk and its management should be taken into account in the risk assessment of the group and its entities.

111. In the assessment of the concentration risk of a cross-border group and its entities, the Authority should pay attention to the group business model and strategy, including diversification strategy, which could result in certain entities being concentrated in certain areas, products or markets as a result of the group-wide diversification strategy. Such cases should be closely examined and discussed by the colleges of supervisors.

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<sup>(7)</sup> See: <http://www.eba.europa.eu/documents/10180/16094/Guidelines-on-Liquidity-Buffers.pdf>.

<sup>(8)</sup> More details on stress testing, including concentration risk stress testing, are available in Annex 2D to this Rule.

<sup>(9)</sup> See: <http://www.eba.europa.eu/documents/10180/16094/GL34.pdf>.

112. The results of such assessments may be taken into account when deciding on the adequacy of the level of own funds held by the group with respect to its financial situation and risk profile and the required level of own funds for the application of Article 16A(2) (1) of the Act to each entity within the banking group and on a consolidated basis, as required by Appendix 4 to this Rule.

***CRM 21. The Authority, in its reviews, should pay particular attention to those institutions which are highly concentrated, e.g. by geographical region of operation, customer type and specialised nature of product or funding source (specialised institutions).***

113. Generally, the Authority expects a positive relationship between the degree of concentration and the level of capital. However, other relevant factors linked to the business model of an institution and quality of risk management, such as expertise and local knowledge, should also be considered. Those factors are often relevant for institutions where concentrations are a reflection of their business models and strategies.

114. In those institutions, focusing on selected products, certain categories of borrowers or certain geographic regions may generate a specialised expertise (or, conversely, a specialised expertise may lead to focus on specific activities) that may result in portfolios of relatively higher quality despite the degree of concentration.

115. A balanced view has thus to be taken when assessing the focused activity that may inherently lead to concentrated exposures, generally requiring a higher level of capital, though potentially reflecting a relatively better portfolio quality given the greater local knowledge. In assessing specialised institutions, the Authority should be cautious with respect to the risk mitigation techniques undertaken by the institutions and not encourage an institution to enter a new line of business, customer segment or geographic location to obtain diversification, if the institution might have little experience or capability in such areas.

## **F. CONCENTRATION RISK TO THE ‘REAL ESTATE SECTOR’**

Credit institutions which are considered by the Authority as core domestic credit institutions (those which have strong links with the Maltese domestic economy, have a widespread local branch network and provide a full spectrum of banking services and are core providers of credit and deposit services in Malta) could, under normal circumstances, be substantially exposed to the real estate sector insofar as their credit portfolio is concerned either directly to specific economic sectors (vide paragraph 2 below) or through exposure to collateral covering most credit exposures. In fact, the most common form of asset class used as security, takes the form of hypothecs on property, be it domestic or commercial in nature.

For the purposes of this Rule, exposures to the Real Estate Sector shall be deemed to include those to the *Construction* sector (with *Construction and development of buildings* being the main sub-sector), *Real Estate activities* (with *Buying and selling of own real estate, Renting and operating of own or leased real estate* being the main sub-sectors) and *Households and*

*individuals* (with *Acquisition of land/dwellings for own use* and *Construction, extension or completion of self-owned dwellings* being the main sub-sectors).

In view of the idiosyncratic risks arising from credit institutions' exposures to the Real Estate Sector, even indirectly through collateral securing an exposure/facility, institutions shall consider such risks as having additionally a Pillar II element.

In this context, credit institutions shall ensure that they regularly and adequately assess the risks to the Sector and take all the necessary measures to mitigate risks inherent in such exposures. Other than on an individual exposure basis and the creation of impairments based on IFRS where these are required, credit institutions shall also take into account the fact that total exposures to the Real Estate Sector may constitute a concentration risk for a credit institution. For this reason, credit institutions shall ensure that:

- (i) there is more rigorous and comprehensive analysis of proposals for lending to this Sector;
- (ii) there is regular review of both the large exposures and other material exposures to this Sector;
- (iii) collateral values are periodically monitored and valued regularly based on the principles laid down in Banking Rule BR/09, especially in case of *non-performing* facilities, in order to ensure the adequacy of consequent provisioning;
- (iv) there is an adequate monitoring process over the conduct of facilities to this sector; and
- (v) general measures are adopted to further mitigate residual risk if necessary, such as amendments to the institutions' relevant policies (e.g. amendments to set sector limits).

With regard to collateral monitoring and valuation mentioned in the third bullet point above, credit institutions shall pay particular attention to those exposures that rely on the value of collateral in assessing whether an impairment provision is required or otherwise. Accordingly, it is the credit institution management's responsibility to review the assumptions made within the context of the requirements of Banking Rule BR/09.

Accordingly, the Authority expects credit institutions to implement an appropriate governance framework with the requisite assessment and internal control structures (as explained above, in line with the relevant requirements laid down in Banking Rule BR/09), which enables a credit institution's Board of Directors to assess the risk to its internal capital and monitor this on a regular basis. Mindful of the implications that this would entail, the Authority expects that a credit institution's Board consequently provides policy direction to executive management which could take the form of increasing allocation of the credit institution's internal capital in respect of the said risk area, capping the risk by introducing thresholds as to the level of lending to the Real Estate Sector or where possible, reduce exposure through diversification and growth in other areas.

## **G. EXAMPLES OF RISK CONCENTRATION**

### **I. Examples of inter-risk concentration – description of events of the sub-prime crisis of 2007-2008**

The financial crisis has clearly shown how inter-risk concentrations may arise within financial institutions as risks and losses steeply increased because of single or interacting risk drivers. The interactions between the risk exposures and the difficulty of measuring and managing risks under these conditions can give rise to the rapid growth of unexpected risk positions and losses. What follows is a short abstract of some of these experiences:

Severe doubts about the credit quality of US sub-prime mortgages, coupled with valuation difficulties and uncertainties about the adequacy of credit rating agency ratings led to a severe drop in investor demand. This left originators and structures with the inability to transfer assets to the securitisation markets and unexpectedly concentrated exposures to assets whose values were sensitive to market variables, credit quality and asset liquidity changes. Due to the uncertainties about the underlying quality of the collateral, the ABCP markets also seized up. The freezing of the ABCP markets led to some funding difficulties for certain financial institutions, forcing some to draw on their liquidity lines and/or to shorten the maturity of their debt. These concentrated funding exposures to short-term horizons increased the fragility of the liquidity position. Large (sponsoring) institutions were faced with a build-up of exposures to structured credit assets and further pressure on liquidity positions. The increase in risk aversion, the steep rises in some reference interest rates and credit and liquidity hoarding led to forced asset sales and subsequently to severe price decreases in multiple asset classes (equity, traded credit, corporate bonds, etc.). These falls in asset values often provoked additional collateral requirements leading to further deterioration in the liquidity situation of the credit institutions. This general liquidity squeeze, the uncertainties about the institutions' own contingent exposures and heightened counterparty risk concerns, brought the inter-bank market to a standstill. Hedging the credit and market risks proved extremely hard under these conditions and often less effective than expected, rendering the exposures to those risks much higher (basis risk). Through the losses and downgrading of the monoline insurance companies, the issue of (indirect) counterparty risk suddenly attracted much more attention, again, as hedges proved ineffective. Given the generally declining markets, the number of litigation cases rose strongly. In addition institutions faced with, for instance, rogue trades found it much harder to close those positions without incurring severe losses.

### **II. Examples of inter-risk concentration**

Credit - liquidity risk: failure of material counterparties impairs an institution's cash flow and its ability to meet commitments.

Credit – market risk: where counterparties may be closely related, or the same, or where unsystematic or undiversifiable risk (i.e. the part of the market risk which derives not from general price movements but from specific ones due to, for example, changes in the perception of the inherent credit risk of an issuer) is considered. Furthermore, the worsening credit quality of an issuer can be the source of inter-risk concentration between market risk and credit risk.

This, for example, would be the case where an institution has given a loan or granted a credit facility in addition to investing in the equity of the same company. All these positions will be adversely affected by a deteriorating credit quality. Therefore, the different types of risks cannot be measured independently and the risks cannot be seen as uncorrelated. This confirms the necessity for the adequate management of inter-risk concentrations.

Credit - operational risk: exposure to credit risk may be related to potential operational risk drivers, or the credit quality of risk mitigants (e.g. insurance purchased) may affect the adequacy of operational risk buffers.

Market - liquidity risk: interruptions, increased volatility, rapid changes in value or the drying up of markets for certain instruments may negatively affect the liquidity of a given institution.

### **III. Market risk concentration and inter-risk concentration based on the credit quality of the issuer as risk driver**

The credit quality of an issuer is an example of a single risk driver which affects different types of risks and leads to market risk concentration. Deterioration of an issuer's creditworthiness has a negative impact on its share price as well as on the prices of its bonds and it influences the prices of corresponding derivatives. The equity trading desk of an institution could have bought equity, the fixed-income desk bonds and the derivatives desk could have sold credit protection on the same issuer. Since the prices of all instruments are dependent on the same risk driver, the correlations between these different instrument types are very high. This risk concentration should be taken into account because otherwise the risk situation would not be reflected correctly.

### **IV. Market risk concentration and inter-risk concentration based on the risk aversion of market participants**

Another cause of a market risk concentration is a change in the risk preference of market participants. Greater uncertainty about the economic outlook could lead to reluctance to buy risky positions. Risk premiums on all risky products will rise and their prices will fall. This increases the correlations between different asset classes. Some markets will possibly even dry up completely because market participants are no longer willing to buy those products. An institution, although holding a diversified portfolio, will suffer losses on all types of instruments. This risk concentration caused by a change in the risk premium and the accompanying change in correlations ("correlation breakdown") should be included in the risk management of an institution.

The rise in the risk premium could also be the source of an inter-risk concentration between market risk and liquidity risk. An institution can generate less liquidity by selling assets because of the lower prices. It is possible that some assets cannot be sold at acceptable prices if the markets are illiquid as a consequence of market participants' risk aversion. In addition, the issuance of debt or equity is more expensive because the institution has to pay a higher risk premium itself. Here again the connection between different risk types demands appropriate management of risk concentrations.



## **V. Inter-risk concentration between market risk and credit risk based on the foreign exchange rate**

Lending in foreign currency to domestic borrowers is exposed to both market (FX rate) and credit risk. When the domestic currency depreciates, the value of the loan in the domestic currency increases which (by increasing the cost of instalments) may reduce the ability of borrowers to repay. This effect becomes fairly non-linear at higher depreciation rates.

## **VI. Examples of inter-relationships between liquidity and other risk factors**

The institution's overall exposure to other risks and their possible influence on the level of liquidity risk should be analysed in conjunction with the institution's funding profile.

Interrelationships between liquidity risk and other risks driven by the same factors can occur especially in times of stressed market conditions. Such dependencies can strengthen the effect of concentrations that exist in liquidity risk. Examples of such interrelationships may comprise:

- own-credit – liquidity risk: a deterioration in market prices or a downgrade of a counterparty could trigger a margin call or lead to the obligation to deliver additional collateral;
- reputational – liquidity risk: reputational difficulties may lead to a loss of trust in the institution on the part of counterparties and as a consequence to a reduction in funds available to the institution as well as to the withdrawal of funds;
- reputational – liquidity risk: in order to maintain a good reputation and to avoid adverse market perceptions, institutions may wish to provide funding support to associated parties, even if not contractually obliged to, which leads to a deterioration in their liquidity position;
- operational – liquidity risk: interruptions in the payment or settlement process may result in liquidity problems; and
- legal – liquidity risk: potential errors or inaccuracies existing in legal arrangements may make it impossible to enforce the fulfilment of counterparty contracts to provide financing. It may particularly threaten the liquidity of an institution if shortcomings exist in arrangements regarding contingency financing for times of market stress.

## **H. EXAMPLES OF INDICATORS USED FOR CONCENTRATION RISK MANAGEMENT**

The following are examples of simple indicators of concentrations. When used and where applicable, concentration indicators should be based upon a risk sensitive measure (such as internal capital, risk-weighted assets or expected loss) rather than simply upon the size of an exposure:

- Commonly related to a relevant numeraire (e.g. size of the balance sheet, own funds, net profit):
  - Size of a certain number of large exposures (e. g. the ten largest exposures),
  - Size of a fixed number of large connected exposures,
  - Size of key sectoral/geographical concentrations,
  - Exposure to a specific financial instrument;
- Diversity scores, such as the Herfindahl Hirschmann index (HHI), Simpson's equitability Index, Shannon-Wiener index, Pielou's evenness index, Moody's Diversity Score, etc;
- Concentration curves;
- Gini coefficients;
- Portfolio correlations; and
- Variance/ covariance measures.