
11th Biennial IFC Conference on “Post-pandemic landscape for central bank statistics”

BIS Basel, 25-26 August 2022

Banks' real estate exposures: Risk-based approach to measurement of exposures and concentrations¹

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¹ This presentation was prepared for the conference. The views expressed are those of the authors and do not necessarily reflect the views of the BIS, the IFC or the central banks and other institutions represented at the event.

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Banks' Real Estate Exposures: Risk-Based Approach to Measurement of Exposures and Concentrations

Patrick Slovik and Farah Azman

Abstract

The study develops a holistic risk-based approach to measuring banks' real-estate exposures and real-estate sector concentrations. As banks' real-estate exposures increasingly extend beyond traditional lending, adequate statistics shall cover broader types of on-balance sheet exposures and off-balance sheet exposures. The study describes a novel approach to measuring banks' exposures and concentrations utilising a risk-based approach aligned with the more granular post-crisis reforms of the Basel standards. It outlines a method of integrating the revised Basel standards with statistics on banks' sectoral exposures and concentrations and proposes refined metrics based on credit risk-weighted assets.

Keywords: Basel Accords; Bank credit; Commercial real estate; Concentration risk; Credit risk; Data gaps; Financial crisis; Real estate; Residential real estate; Sector concentration

JEL Classification: G01, G21, G28, G31, G32

Banks' Credit Risk and Sector Concentrations

Historical experience shows that the concentration of credit risk in banks' portfolios has been one of the main causes of bank distress (BCBS, 2006). Sector concentrations in banks' portfolios arise from excessive exposure to a sector or several highly correlated sectors. The Basel Accords' Pillar 1 approach has been portfolio invariant, i.e. appraising the risk of a single exposure without consideration for the portfolio's structure or concentrations. The business sector concentration risk thus warrants a focus on appropriate methodologies for measuring sector concentrations.

Banks' credit risk concentrations, particularly real estate exposures, exert a material impact on the soundness of the financial system. Distress in the real estate sector propelled numerous financial crises globally.^{1,2} Such financial crises either originated directly in real estate sector distress or real estate sector distress aggravated the severity and length of financial crises. Real-estate-linked financial crises were not limited to a particular category of real estate, as their causes stem from exposures to both residential real estate and commercial real estate (relatively equitably).^{1,3}

While banks' real estate financing has been traditionally dominated by loans, other types of on-balance sheet and off-balance sheet exposures have increased in prominence. The share of conventional lending to total banks' assets has declined over time (Slovik, 2012). This is attributable to broadening financial innovation and deepening market-based finance. In response to the impact of financial innovation and market-based finance, authorities should adjust measurements to accommodate changes in financial structures of financial institutions (Lumpkin, 2010).

Extending Measurement Scope of Sector Exposures

Adequate measurement and analysis of banks' real estate exposures require extending their scope to include all types of on-balance sheet and off-balance sheet exposures to the real estate sector. The measurement and disclosure of broadly defined sector exposure categories and their inclusion in sector concentration aggregates remains scant, with most sector-specific research, analysis, and dashboards still predominantly based on loans. Consolidated measurement of sector exposures covering all on-balance sheet and off-balance sheets exposures can be applied to any sector.⁴

Consolidated Sector Exposures

Equation (1)

$$CSE = \sum_{i=1}^n On_SE_i + \sum_{j=1}^m Off_SE_j \times CCF_j$$

Legend: CSE – Consolidated Sector Exposures; On_SE – On-Balance Sheet Sector Exposure; Off_SE – Off-Balance Sheet Sector Exposure; and CCF – Credit Conversion Factor.

¹ Based on a review conducted by the authors of 20 different financial crises globally between 1970 and 2020, covering countries in North America, Europe, and Asia.

² Similarly, the Basel Committee for Banking Supervision's review of bank failures concluded: "Credit concentration risk, usually in real estate, was cited in 9 out of 13 episodes." (BCBS, 2004).

³ The European Systemic Risk Board offers similar conclusions: "Adverse real estate market developments in some member states, both in residential real estate and commercial real estate, resulted in large losses in the past and negatively impacted the real economy." (ESRB, 2017).

⁴ Sectors represent business sectors, although the methodology can also be applied to other segments exhibiting default dependencies, such as geographical regions, several highly correlated sectors, or sub-segments of specific business sectors (for instance, residential real estate or commercial real estate).

Common on-balance sheet sector exposures cover lending and investments but may include other relevant types of on-balance sheet credit exposures. In the case of real estate, common categories include residential real estate loans, commercial real estate loans, loans to real estate companies,⁵ investment in real estate securities, direct investment in real estate or property acquired in settlement of debt, and may also include other types of material exposure categories (while the scope commonly excludes infrastructure projects or socially beneficial real estate projects).

Measurement and disclosure of off-balance sheet sector exposures are commonly missing even in relatively advanced contemporary frameworks and dashboards. This omission represents a material data gap. Off-balance sheet exposures⁶ to a particular sector (such as real estate) could be sizable, often exceeding more observable types of on-balance sheet sector exposure categories. Off-balance sheet items can be converted into credit-exposure equivalents through the use of harmonised credit conversion factors that were developed as part of the BCBS's Basel Accords.

Enhancing Risk Sensitivity of Sector Exposures

While the consolidated sector approach defines an all-inclusive scope, it might not be sufficiently risk-sensitive. Risk sensitivity recognises that same-sized credit exposures do not necessarily have the same credit risk. The credit risk of real estate exposures relates to factors such as loan-to-value (LTV) ratios, counterparties' external credit ratings, whether the property is income-producing or self-occupied, or exposures' asset quality. Credit risk weights derived from the harmonised BCBS's Basel Accords can be utilised to obtain credit risk-weighted consolidated sector exposures.

Credit Risk-Weighted Consolidated Sector Exposures	Equation (2)
$CRWA(CSE) = \sum_{i=1}^n CRW_i \times On_SE_i + \sum_{j=1}^m CRW_j \times Off_SE_j \times CCF_j$	
<p><i>Legend: CRWA(CSE) – Credit Risk-Weighted Consolidated Sector Exposures; CRW – Credit Risk Weight; On_SE – On-Balance Sheet Sector Exposure; Off_SE – Off-Balance Sheet Sector Exposure; CCF – Credit Conversion Factor.</i></p> <p><i>Note: The equation has been simplified to provide a more intuitive expression of the use of risk weights and credit conversion factors for the measurement of risk-sensitive sector exposures. A more detailed calculation might also recognise the impact of credit risk mitigants as defined in the BCBS's Basel Accords, the role of specific provisions, and other relevant factors.</i></p>	

Revised Risk Sensitivity of Real Estate Exposures

Exposures to residential or commercial real estate with lower LTV ratios have different risk characteristics than exposures with higher LTV ratios. This is based on the equity-maximisation theory that links borrowers' defaults with rational comparisons between costs and returns given contemporaneous LTV ratios. In contrast, the ability-to-pay theory relates borrowers' defaults primarily to cash-flow constraints. The evidence from several studies supports the equity-maximisation model in lieu of the ability-to-pay model (Jackson et al., 1980; Wong et al., 2004).

⁵ Real estate companies can be referred to as corporate entities with a majority share of total turnover derived from real estate activities or financing of real estate activities.

⁶ Off-balance sheet exposures commonly include guarantees, letters of credit, acceptances, commitments, and other types of off-balance sheet exposures of financial institutions.

The revised standardised approach for credit risk (part of finalising post-crisis Basel III reforms) enhances risk-weight granularity subject to varying LTV ratios of residential and commercial properties. It also provides risk-weight granularity subject to risk weights of counterparties, source of repayment cash flows, or issue-specific ratings of covered bonds. The revision enables a greater integration between the measurement of sector exposures and the harmonised Basel Accords' risk sensitivity (along with the use of harmonised credit conversion factors or credit risk mitigants).⁷

Risk Weights for Residential Real Estate Exposures							Table (1)
Repayment is not materially dependent on the cash flow generated by the property							
LTV ratio	≤50%	50% to 60%	60% to 80%	80% to 90%	90% to 100%	> 100%	
Risk weight	20%	25%	30%	40%	50%	70%	
Repayment is materially dependent on the cash flow generated by the property							
LTV ratio	≤50%	50% to 60%	60% to 80%	80% to 90%	90% to 100%	> 100%	
Risk weight	30%	35%	45%	60%	75%	105%	
Source: BCBS (2017)							

Risk Weights for Commercial Real Estate Exposures							Table (2)
Repayment is not materially dependent on the cash flow generated by the property							
LTV ratio	≤60%			>60%			
Risk weight	Min (60%, Risk weight of counterparty)			Risk weight of counterparty			
Repayment is materially dependent on the cash flow generated by the property							
LTV ratio	≤60%		60% to 80%		>80%		
Risk weight	70%		90%		110%		
Source: BCBS (2017)							

Risk Weights for Covered Bond Exposures							Table (3)
Rated covered bond exposures							
Issue-specific rating	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-		
Risk weight	10%	20%	20%	50%	100%		
Unrated covered bond exposures							
Risk weight of issuer	20%	30%	40%	50%	75%	100%	150%
Risk weight	10%	15%	20%	25%	35%	50%	100%
Source: BCBS (2017)							

⁷ The Basel Accords' internal ratings-based (IRB) approach relies upon banks' internal assessments of credit risk weights with a primary objective of further enhancing risk sensitivity (BCBS, 2001). Similar to the revised standardised approach, risk weights modelled based on the IRB approach decline with lower LTV ratios (PRA, 2017). Both revised standardised and IRB approaches can be utilised within risk-sensitive exposure frameworks subject to the compilers' objectives. A post-crisis Basel III reform of the IRB approach introduced an output floor of 72.5% of the total risk-weighted assets, calculated based on the standardised approach (BCBS, 2017), designed to limit inconsistencies in RWAs between banks.

Risk-Weighted Sector Concentration Ratio

Sector concentrations in banks' portfolios represent a key driver of credit risk (Bonti, 2006). Sector concentration risk has been one of the main causes of banks' failures (BCBS, 2004). Based on empirical studies, sector concentrations increase banks' credit risk and, in turn, an optimal level of economic capital by 20% to 40% (BCBS, 2006). Therefore, adequate measurement of sector concentrations remains crucial for risk management and banking supervision. There has been a remarkable diversity in the way different banks and supervisors approach sector concentrations.

Similar-sized sector exposures of different banks or banking systems may have significantly different risk characteristics, rendering concentration risk statistics that are not risk-sensitive inadequate. Varying scopes and lack of risk sensitivity restrict cross-bank or cross-country comparability of sector concentration ratios and their interpretability by stakeholders. A sector concentration ratio defined through credit risk-weighted assets benefits from the Basel Accords' harmonised methods for risk sensitivity (and also, credit conversion factors, risk mitigants, etc.).

Sector Concentration Ratio	Equation (3)
$\text{Sector Concentration Ratio} = \frac{CRWA(CSE)}{CRWA}$	
<i>Legend: CRWA(CSE) – Credit Risk-Weighted Consolidated Sector Exposures; CRWA – Total Credit Risk-Weighted Assets.</i>	

Conclusion

The concentrations of banks' exposures in sectors or segments can substantially increase the credit risk of banks' portfolios. This warrants a greater focus on developing holistic and harmonised approaches for measurement, management, and supervision of sector exposures. Such comprehensive measurement shall include all types of on-balance sheet and off-balance sheet exposures to a sector. Off-balance sheet exposures can be converted into credit-exposures equivalents using harmonised credit conversion factors developed as part of the Basel Accords.

In addition to a holistic and harmonised scope, sector exposure measures need to be adequately risk-sensitive. The BCBS's Basel Accords provide the only globally harmonised methodology for risk sensitivity. The study outlines a method for integrating sector exposure statistics with the revised BCBS's Basel Accords. Banks' sector exposures and concentrations can thus be expressed in terms of credit risk-weighted assets. Defining exposures in terms of credit risk-weighted assets also provides a more comparable and intuitive approach related to credit risk and capital adequacy.

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Abstract

The study develops a holistic risk-based approach to measuring banks' real-estate exposures and real-estate sector concentrations. As banks' real-estate exposures increasingly extend beyond traditional lending, adequate statistics shall cover broader types of on-balance sheet exposures and off-balance sheet exposures. The study describes a novel approach to measuring banks' exposures and concentrations utilising a risk-based approach aligned with the more granular post-crisis reforms of the Basel standards. It outlines a method of integrating the revised Basel standards with statistics on banks' sectoral exposures and concentrations and proposes refined metrics based on credit risk-weighted assets.

Sector Exposures and Concentration Risk

- Historical experience shows that sector concentration risk in banks' portfolios has been one of the main causes of bank distress, which warrants a focus on appropriate statistical methodologies.
- Sector concentrations in banks' portfolios arise from excessive exposures to a sector, several highly correlated sectors, and also apply to other exposures exhibiting high default dependencies.

Sector Exposures and Financial Distress

- Banks' credit risk concentrations, particularly real estate sector exposures, exert material impact on the soundness of the financial system and contributed to numerous financial or bank crises globally.
- Real-estate-linked financial crises were not limited to a particular real estate category, as the causes stem from exposures to both residential real estate and commercial real estate rather equitably.

Sector Exposures and Financial Innovation

- While banks' real estate financing has been traditionally dominated by loans, other types of on-balance sheet and off-balance sheet exposures to the real estate sector increased in prominence.
- This is attributable to broadening financial innovation and deepening market-based finance. In response, authorities should adjust statistics to accommodate changes in financial structures.

Extending Measurement Scope of Sector Exposures

- Adequate measurement and analysis of banks' real estate exposures require extending their scope to include all types of on-balance sheet and off-balance sheet exposures to the real estate sector.
- Measurement and disclosure of off-balance sheet sector exposures are commonly missing even in relatively advanced contemporary frameworks and dashboards, resulting in material data gaps.

Consolidated Sector Exposures

Equation (1)

$$CSE = \sum_{i=1}^n On_SE_i + \sum_{j=1}^m Off_SE_j \times CCF_j$$

Legend: CSE – Consolidated Sector Exposures; On_SE – On-Balance Sheet Sector Exposure; Off_SE – Off-Balance Sheet Sector Exposure; and CCF – Credit Conversion Factor.

Off-balance sheet items can be converted into credit-exposure equivalents through the use of harmonised credit conversion factors that were developed as part of the BCBS's Basel Accords.

Enhancing Risk Sensitivity of Sector Exposures

- While the consolidated sector approach defines an all-inclusive scope, it might not be sufficiently risk-sensitive. Risk sensitivity recognises that credit risk of same-sized credit exposures differs.
- The credit risk of real estate exposures relates to factors such as loan-to-value ratios, counterparties' external credit ratings, source of repayment cash flows, exposures' asset quality, or others.

Credit Risk-Weighted Consolidated Sector Exposures

Equation (2)

$$CRWA(CSE) = \sum_{i=1}^n CRW_i \times On_SE_i + \sum_{j=1}^m CRW_j \times Off_SE_j \times CCF_j$$

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Note: The equation has been simplified to provide a more intuitive expression of the use of risk weights and credit conversion factors for the measurement of risk-sensitive sector exposures. A more detailed calculation might also recognise the impact of credit risk mitigants as defined in the BCBS's Basel Accords, the role of specific provisions, and other relevant factors.

Credit risk weights derived from the harmonised BCBS's Basel Accords can be utilised to obtain credit risk-weighted consolidated sector exposures.

Revised Risk Sensitivity of Real Estate Exposures

- The revised standardised approach for credit risk (part of finalising post-crisis Basel III reforms) enhances risk-weight granularity of bank real estate exposures to residential and commercial properties.
- Revised risk-weight granularity varies based on loan-to-value ratios, risk weights of counterparties, sources of repayment cash flows, issue-specific ratings of covered bonds, and other relevant factors.

Risk Weights for Residential Real Estate Exposures

Repayment is not materially dependent on the cash flow generated by the property						Table (1)
LTV ratio	≤50%	50% to 60%	60% to 80%	80% to 90%	90% to 100%	> 100%
Risk weight	20%	25%	30%	40%	50%	70%
Repayment is materially dependent on the cash flow generated by the property						
LTV ratio	≤50%	50% to 60%	60% to 80%	80% to 90%	90% to 100%	> 100%
Risk weight	30%	35%	45%	60%	75%	105%

Source: BCBS (2017)

The revised standardised approach enables a greater integration between the measurement of sector exposures and the harmonised Basel Accords' risk sensitivity (also applicable in the IRB approach).

Revised Risk Sensitivity of Real Estate Exposures (continued)

Risk Weights for Commercial Real Estate Exposures

Repayment is not materially dependent on the cash flow generated by the property				Table (2)
LTV ratio	≤60%		>60%	
Risk weight	Min (60%, Risk weight of counterparty)		Risk weight of counterparty	
Repayment is materially dependent on the cash flow generated by the property				
LTV ratio	≤60%	60% to 80%		>80%
Risk weight	70%	90%		110%
Source: BCBS (2017)				

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Rated covered bond exposures							Table (3)
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Risk weight	10%		20%	20%	50%		100%
Unrated covered bond exposures							
Risk weight of issuer	20%	30%	40%	50%	75%	100%	150%
Risk weight	10%	15%	20%	25%	35%	50%	100%
Source: BCBS (2017)							

Risk-Weighted Sector Concentration Ratio

- Sector concentrations in banks' portfolios represent a key driver of credit risk. For this reason, adequate measurement of concentrations remains crucial for risk management and banking supervision.
- Similar-sized sector exposures of different banks or banking systems may have significantly different credit risk characteristics, rendering concentration risk statistics that are not risk-sensitive inadequate.

Sector Concentration Ratio

Equation (3)

$$\text{Sector Concentration Ratio} = \frac{CRWA(CSE)}{CRWA}$$

Legend: CRWA(CSE) – Credit Risk-Weighted Consolidated Sector Exposures; CRWA – Total Credit Risk-Weighted Assets.

A sector concentration ratio defined through credit risk-weighted assets benefits from the Basel Accords' harmonised methods for risk sensitivity (and also, credit conversion factors, risk mitigants, etc.).

Extending Measurement Scope of Sector Exposures

- Holistic and harmonised approaches for measurement of sector exposures shall include all types of on-balance sheet and off-balance sheet exposures to a sector.
- Off-balance sheet exposures can be converted into credit-exposures equivalents using harmonised credit conversion factors developed as part of the Basel Accords.

Risk-Based Measurement of Sector Exposures

- Sector exposure and concentration measures need to be adequately risk-sensitive. The BCBS's Basel Accords provide the only globally harmonised methodology for risk sensitivity.
- Sector exposures and concentrations expressed in terms of credit risk-weighted assets provide a more comparable and intuitive approach related to credit risk and capital adequacy.