

Interest Rate Risk in the Banking Book

Evolving industry challenges and responses



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1 Executive summary

Interest Rate Risk in the Banking Book (IRRBB) has become a critical challenge for financial institutions following the recent collapse of Silicon Valley Bank (SVB), evolving global regulatory requirements such as those from the Basel Committee, European Banking Authority (EBA) and the volatile interest rate environment. Furthermore, the EBA published a heatmap in February 2024, with key focus areas for banks in the European Union. These changes will require proactive risk management strategies and modelling approaches from banks for IRRBB, to not only comply with regulatory requirements, but also gain a competitive advantage.

This paper presents a comprehensive analysis of IRRBB in the aftermath of SVB's demise and under the EBA regulatory framework emphasising the implications of these changes on bank decision making and risk management practices.

2 Context

In a world of volatile interest rates, the thought of what could happen if there is a sudden interest rate shock is very much at the forefront of bankers' minds. The recent market volatility has created a lot of uncertainty in terms of risk management. For many banks, measuring, managing and hedging their interest rate risk for banking book positions, while maintaining margin targets has become a top priority.

The collapse of Silicon Valley Bank (SVB) in March 2023 has major implications for banks in terms of interest rate risk management. SVB was a prominent lender to some of the biggest names in the technology industry and became the largest bank to fail since the 2008 financial crisis. Lack of interest rate hedging, concentration in Held to Maturity (HTM) assets booked at amortised cost rather than market value, a major run-on uninsured deposits and failings in risk governance were major contributors to SVB's demise. This has led to increased regulatory scrutiny and heightened focus on interest rate risk in the banking book (IRRBB).

In April 2016, the Basel Committee on Banking Supervision (BCBS) issued standards for IRRBB¹. The standards revised the BCBS 2004 principles for the management and supervision of interest rate risk. Those principles set out supervisory expectations for banks' identification, measurement, monitoring, and control of IRRBB, as well as its supervision. BCBS have been going through a consultation phase through to March 2024 covering targeted adjustments to its IRRBB framework. Once finalised, the standards will be implemented in different jurisdictions globally.

In October 2022, the EBA released its implementation standards² for a new IRRBB policy package which included amendments to the implementing technical standards (ITS) on supervisory reporting (valid from 30 June 2023). This new addition to reporting targets to collate the data required for assessing IRRBB risks on an appropriate scale of institutions, including large institutions, small and non-complex institutions (SNCIs) and institutions other than large institutions and SNCIs ('other institutions'), which cannot be left outside the scrutiny of IRRBB risks. Furthermore, the EBA published a heatmap in February 2024, with key focus areas for banks in the European Union.

The key requirements from the EBA standards are summarised below:

- Assessing whether the updated criteria to identify a non-satisfactory IRRBB internal measurement system (IMS) may lead to the mandatory application of the Standardised Approach (SA). This could especially be challenging for banks with an IMS that is fundamentally different from the SA.
- Assessing the economic value of equity (EVE) Supervisory Outlier Test (SOT) outcome against the new threshold (15% of Tier 1 capital). Consequently, banks should reassess their risk appetite in relation to the new threshold and/or implement mitigating steering mechanisms.
- Implementing a net interest income (NII) Supervisory Outlier Test (SOT) in the bank's model landscape and reporting process. Banks are especially challenged to think about consistency in their IRRBB framework (e.g. between internal and regulatory metrics), identifying key drivers that might result in an NII impact, as well as to identify potential steering mechanisms.
- Implementing a five-year cap on the behavioural repricing maturity of certain non-maturing deposits (NMDs) which would require banks to update their tools and systems and assess the expected impact from this cap and the potential consequences this has for hedging practices.
- Creating a consistent definition of Credit Spread Risk in the Banking Book (CSRBB) and integrating this into internal policies and frameworks to initiate risk identification and materiality assessments which requires banks to analyse the credit spread sensitivity of their banking book instruments to define the scope of CSRBB and consequently develop and implement CSRBB models (valid from December 2023).

¹ <https://www.bis.org/bcbs/publ/d368.pdf>

² https://www.eba.europa.eu/sites/default/files/document_library/Publications/Guidelines/2022/EBA-GL-2022-14%20GL%20on%20IRRBB%20and%20CSRBB/1041754/Guidelines%20on%20IRRBB%20and%20CSRBB.pdf

In the UK, banks are required to manage IRRBB as part of their overall risk management framework, which includes regulatory requirements set by the Prudential Regulation Authority (PRA). These regulations require banks to have robust processes in place to identify, measure, monitor, and control IRRBB. This includes assessing the impact of changes in interest rates on their banking book positions, such as loans, deposits, and other interest rate-sensitive assets and liabilities.

The key IRRBB metrics that banks need to calculate are Economic Value of Equity (EVE) which is the net present value of the firm's assets and liabilities and Net Interest Income (NII) which is the difference between interest income and expenses. The key components of IRRBB are summarised below.

Risk Types	IRRBB Types	Gap Risk	<p>Parallel Gap Risk: Sensitivity to parallel changes in the interest rate yield curve</p> <p>Non-parallel Gap Risk: Sensitivity to the slope and shape of the interest rate yield curve</p>
		Basis Risk	Sensitivity to imperfect correlation between different interest rate yield curves
		Option Risk	Sensitivity to changes in the volatility of the interest rate yield curve where the bank or customer can alter the level and timing of their cash flows.
		Client Behaviour Risk	Sensitivity to changes in expected client behaviour – e.g. mortgage prepayments, pipeline risk and deposit stickiness
	Other Risk Types	Credit Spread Risk	Sensitivity to changes in credit spreads driven by liquidity risk and other characteristics of credit-risky instruments not captured elsewhere

In the following sections, we focus on implications of the new standards for the industry, the key challenges for banks and how the industry should be responding.

3 Implications for the industry

The new IRRBB requirements from the EBA are poised to significantly impact the banking industry. These changes, aimed at enhancing risk management practices and improving alignment with evolving market dynamics, are expected to reshape how banks manage and mitigate interest rate risks. The implications of these norms span across various aspects of banking operations, from capital requirements to business strategy, prompting banks to reassess their risk management frameworks and adapt to a more stringent regulatory environment. The key challenges for banks are summarised below.

3.1 Increased Regulatory Scrutiny

With the addition of the EBA regulatory standards, banks will be required to comply with more stringent rules and guidelines for managing IRRBB. Regulators are likely to closely monitor banks to ensure they are meeting these requirements and scrutinise these practices to ensure they are effective. Furthermore, regulators may require banks to provide more detailed reporting and disclosure on their IRRBB positions (including risk sensitivities such as PV01, duration gap, convexity and hedge effectiveness) and risk management practices. The EBA standards will also require banks to conduct more rigorous stress testing of their IRRBB positions due to the introduction of the Supervisory Outlier Test (SOT) on NII and a new floor in the standards for shorter maturities.

3.2 Stricter Risk Management and Governance Requirements

The EBA standards will require banks to enhance their risk management practices for IRRBB, including more robust measurement and monitoring of risks. This includes implementing a 5-year cap for the behavioural repricing of non-maturity deposits, assessment of Credit Spread Risk in the Banking Book (CSRBB) impacting NII and EVE,

introduction of a SOT for NII and EVE and the introduction of new floors. From these changes, it is evident that EBA expects to impose stricter risk management requirements for banks.

Banks will be required to set stricter risk limits for IRRBB, with a focus on ensuring that their exposure to interest rate risk remains within acceptable levels. Banks will be required to enhance their stress testing practices for IRRBB, with a focus on ensuring that their portfolios can withstand severe and unexpected changes in interest rates. Furthermore, there is an expectation for policies and procedures will to be enhanced to ensure limits and tolerances are well defined and embedded within the organisation.

3.3 Improvements to Modelling Capabilities

Banks will be required to improve their measurement of IRRBB, using more sophisticated models (e.g. for behavioural modelling of deposits and prepayment risk) and methodologies to assess their exposure to interest rate risk (e.g. use of dynamic risk sensitivities). This will involve more granular analysis of their banking book positions and the impact of interest rate changes. This in turn will put increased emphasis on data management to ensure completeness, accuracy and timeliness of banking book position, market and reference data.

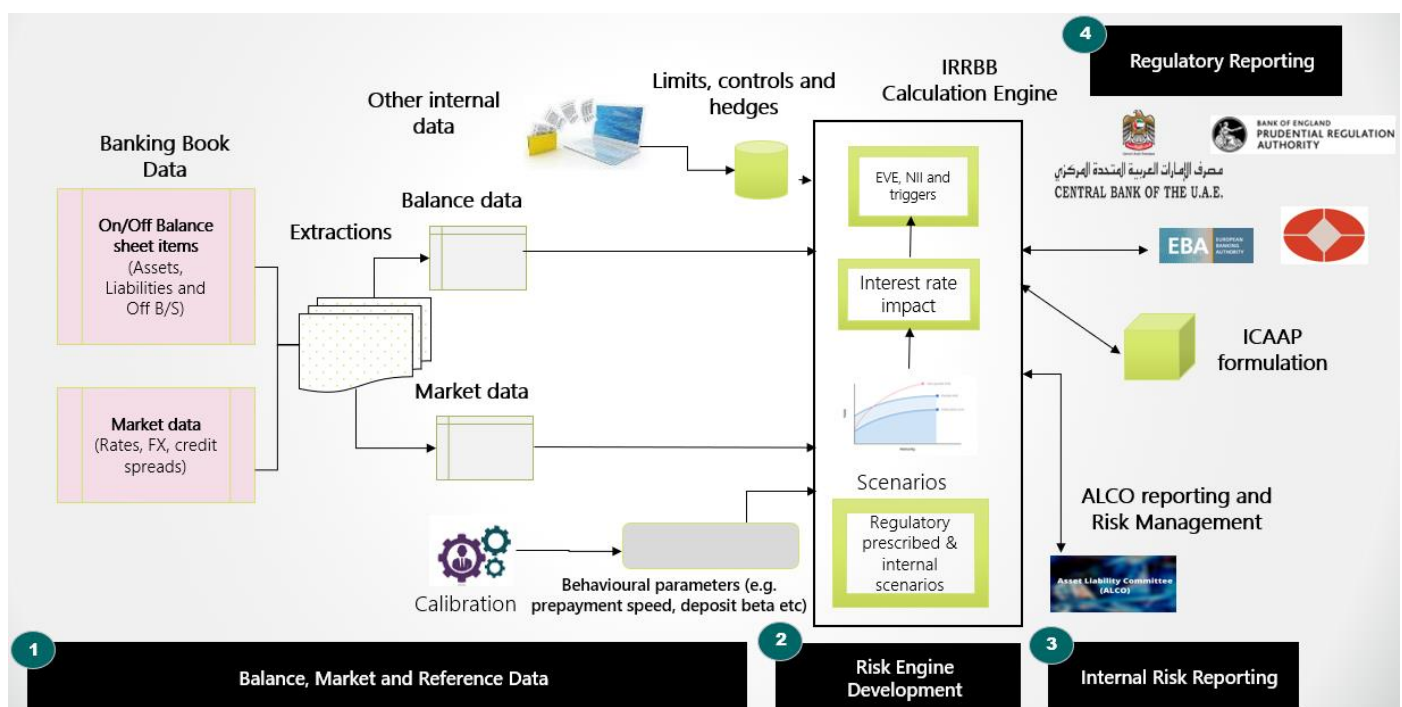
4 Challenges and the way forward for banks

Implementing new standards set by the EBA regarding IRRBB and in the aftermath of the collapse of SVB, there are several challenges for banks. The key challenges and how the industry should respond are discussed below.

1. Uplifting data governance practices

Data governance is a very important aspect of IRRBB and has seen increased regulatory scrutiny ever since the formulation of BCBS 239³. Increasingly regulators will evaluate the effectiveness of the firm's data governance framework for IRRBB, as this has a direct impact on the quality of IRRBB outputs (EVE, NII and interest rate risk sensitivities).

Banks should play particular attention to ensure that the interconnectivity between IRRBB source data systems (for assets, liabilities and off balance sheet positions and balances), market data systems (with interest rates, FX rates and credit spreads), calculation engines and regulatory reporting/internal reporting systems are well documented to facilitate review by an independent party. A typical process flow for IRRBB is shown below.



³ <https://www.bis.org/publ/bcbs239.pdf>

For underlying systems, the completeness, accuracy and timeliness of the data that feeds IRRBB models needs to be a top priority, with a clear segregation between input, model and output data. A well-defined data model will ensure traceability from input through to outputs, including explaining changes in IRRBB key metrics such as EVE, NII and risk sensitivities. To facilitate this, banks should implement data lineage for IRRBB models covering metrics, critical data elements (CDEs), transformations and controls. Furthermore, there needs to be a strong control framework to monitor data quality key performance indicators (KPIs). This will enable banks to build scenarios and projections within a single framework, effectively applying calculations at the contract-level.

2. Improving model governance practices and senior management understanding of risks

Regulatory scrutiny of models has increased globally in recent times as evidenced by the PRA (SS 1/23)⁴, ECB guide to internal models (EGIM)⁵ and more recently in the United Arab Emirates (UAE) with the CBUAE Model Management Standards (MMS)⁶. Banks should clearly set out roles and responsibilities in the model management process for IRRBB and put in place robust policies and procedures to mitigate the impact of model error or incorrect model use. Effective model validation processes are very important in this regard to ensure that there is sufficient review and challenge of IRRBB model design, implementation, use and ongoing performance monitoring (e.g. backtesting procedures).

As was seen in the case of SVB, senior management did not have a handle of what was driving the interest rate risk of the firm and whether the hedging strategies were effective over time. This was one of the major drivers of SVB's collapse. The challenge for senior management is often to understand the highly technical nature of the models used for IRRBB. Without the appropriate technical knowledge, some senior managers may fall back on managing the process rather than the outcome, by seeking confirmation that the correct stakeholders have been consulted and that correct procedures have been followed. This will not suffice, as senior management should take explicit responsibility in managing and mitigating IRRBB model risk. From a regulatory and internal audit perspective, banks should evidence that senior management clearly understand the key elements of model design, assumptions, expert judgements applied, key sensitivities, limitations and uncertainties.

A key implication of these expectations is that rigorous training programmes, combined with high quality documentation, metrics and communication throughout the modelling process is vital, to enable senior management to make informed risk management decisions. Banks are increasingly addressing these challenges through the use of technology (for example model inventory capture, natural language processing-based evaluators and interactive risk management dashboards).

3. Enhancing risk appetite, limit monitoring, risk management and oversight

There are increased expectations from regulators globally (e.g. EBA, PRA and CBUAE) for banks to improve their risk appetite formulation, limit monitoring and risk management processes for IRRBB. Banks should define robust IRRBB policies and procedures that clearly articulate risk identification, assessment, mitigation and governance processes for IRRBB, including roles and responsibilities across the three lines of defence. Early warning thresholds should be setup to manage IRRBB risks effectively to ensure that the exposure for EVE and NII stay within regulatory imposed supervisory outlier tests (SOTs). This has a bearing on the regulators assessing a satisfactory internal measurement system (IMS) for IRRBB. If the documentation, governance and controls are deemed not robust enough, banks may be mandated by the regulator to revert to the standardised approach, which will be more punitive for banks.

There is an expectation from regulators for banks to perform regular stress testing using mandated interest rate scenarios for EVE and NII. Both Basel and EBA will be performing a recalibration of the interest rate shocks to ensure these are fit for purpose for the current economic environment. Banks should perform impact analysis and assess whether any changes are required to their risk appetite and limit monitoring to ensure compliance with the standards. Furthermore, banks should develop and implement an effective internal stress testing framework for interest rate shock scenarios that form part of the Internal Capital Adequacy Assessment Process (ICAAP) that is:

⁴ <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/supervisory-statement/2023/ss123.pdf>

⁵ https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.supervisory_guides202402_internalmodels.en.pdf

⁶ <https://www.centralbank.ae/media/00aarr3a/model-management-standards-attach-to-notice-5052-2022.pdf>

- Commensurate with the bank's nature, size and complexity as well as its business activities and overall risk profile.
- Performed regularly, at least annually and more frequently in times of increased interest rate volatility and IRRBB levels.

Furthermore, interactive dashboards should be setup to report IRRBB metrics including EVE, NII and risk sensitivities. These should be used to drive strategic decisions including portfolio management (i.e. balance sheet composition in terms of the mix of assets and liabilities) and hedging decisions across the maturity spectrum (e.g. duration gap, convexity and hedge effectiveness). Care and attention should be taken in hedging both linear and non-linear risks. The risks also need to be reported through appropriate committees with escalation procedures in place when limits and tolerances are breached. It is also important for banks to perform impact analysis to understand the 5-year behavioural repricing maturity assumptions (as per the EBA guidelines) for non-maturity deposits (NMDs). Application of the cap on NMDs will impact a bank's EVE measurement and interest rate hedging strategy and banks should adopt strategies to ensure deposit stickiness to ward off migration to term deposits or to other banks.

4. Revamping behavioural modelling for IRRBB

There is still considerable variation in banks approaches to modelling IRRBB behavioural risks, especially risks arising from embedded optionality linked to customer behaviour such as prepayment risk, early withdrawal of term/non-maturity deposits, pipeline risk and margin compression and basis risk. More often than not, firms employ static interest rate shocks such as those prescribed by BCBS and the EBA (e.g. parallel shifts, steepeners/flatteners and short rate changes). However, regulators globally are increasingly expecting firms to supplement this with more dynamic simulation-based approaches.

Banks should invest in developing more robust simulation models for interest rates capturing the dynamics of low/high and rising /falling interest rate environments and also generating a range of possible outcomes.

Examples for different risk types are provided in the table below, covering the nature of the risks, calculation approach and key strategic levers.

Risk Type	Nature of the Risk	Calculation Approach	Key Strategic Levers
Prepayment risk	<p>The risk of loss due to the early settlement of fixed rate products.</p> <p>Prepayment risk generally arises on the following products: fixed rate mortgages, personal and commercial loans</p>	<p>To calculate the bank's prepayment risk capital requirement, a scenario-based approach can be used to generate a distribution of net gains and losses over the forecast horizon.</p> <p>Market interest rate scenarios drive customer prepayment behaviour. This, in turn, drives the mismatch between actual and expected prepayment profiles and the hedge size, thereby determining the cost of adjusting hedges. In each scenario, hedge adjustment costs are at least partially offset by early repayment penalties.</p>	<p>The key levers of the capital requirement are:</p> <ol style="list-style-type: none"> 1. Customer channel /mix in terms of customers that are less likely to prepay than others 2. The bank's policies on early repayment penalties

Risk Type	Nature of the Risk	Calculation Approach	Key Strategic Levers
Early deposit withdrawal risk	The risk of loss due to the early withdrawal of term or non-maturity deposits	<p>To calculate the bank's capital requirement due to early deposit withdrawals, a scenario-based approach can be used to forecast balances / level of deposit stickiness and generate a distribution of net gains and losses over the forecast horizons.</p> <p>Market interest rate scenarios drive customer deposit withdrawal behaviour / stickiness and migration between current accounts, term deposits and non-maturity deposits, thereby impacting hedge adjustment costs. In each scenario, hedge adjustment costs are at least partially offset by early withdrawal penalties.</p>	<p>The key levers of the capital requirement are:</p> <ol style="list-style-type: none"> 1. Customer channel /mix in terms of customers that exhibit higher levels of "stickiness" than others 2. The bank's policies on early withdrawal penalties

Risk Type	Nature of the Risk	Calculation Approach	Key Strategic Levers
Pipeline risk	The risk of loss occurring due to mismatches between forecasted sales (i.e. when products are launched) and actual sales on fixed rate products. Pipeline risk generally arises on the following products: fixed rate mortgages, savings products, personal and commercial loans.	To calculate the bank's pipeline risk capital requirement, a scenario-based approach can be used to generate a distribution of hedge adjustment costs for the bank, over the forecast horizon.	<p>The key levers of the capital requirement are:</p> <ol style="list-style-type: none"> 1. Volumes of new business on fixed rate products 2. Tranche sizes of new business written for fixed rate products

Risk Type	Nature of the Risk	Calculation Approach	Key Strategic Levers
Margin compression and basis risk	Margin compression and basis risk are different components of the same risk. Specifically, the fact that the interest rates on some of the bank's assets and liabilities do not move perfectly in line with the bank's funding costs generates uncertainty in the bank's net interest income (NII).	<p>To calculate the bank's margin compression and basis risk capital requirement, a scenario-based approach can be used to generate a distribution of the bank's potential NII over the forecast horizon.</p> <p>Based upon an understanding of the behaviour of market interest rates (i.e. the relationship between administered rates and reference rates – or the deposit “beta”), future interest rate scenarios are generated. These changes in market interest rates drive changes in NII for the bank.</p>	<p>The key levers of the capital requirement are:</p> <ol style="list-style-type: none"> 1. Volumes of business written on products subject to basis risk 2. The balance between offsetting exposures (i.e. administered assets vs. liabilities) 3. The bank's policies and processes for setting administered rates 4. The extent to which the bank hedges its margin compression

Increasingly, in addition to Monte Carlo Simulation, machine learning techniques such as Principal Components Analysis (PCA), Support Vector Machines (SVMs), Artificial Neural Networks (ANNs) and Multi-Layer Perceptrons (MLPs) are increasingly being used to model dynamic changes in customer behavioural patterns across short, medium and long term horizons. The danger with these models is that they are often “black boxes”, which compromise transparency, interpretability and explainability. Banks should ensure these models are validated appropriately by an independent party, documented effectively and that performance is evaluated using model agnostic evaluation metrics such as Local Interpretable Model-Agnostic Explanations (LIME).

Furthermore, steps should be taken to clearly understand the drivers of IRRBB model outputs, while ensuring that controls in place are designed appropriately and working effectively. Senior management understanding of risks and strategic levers for IRRBB are key to ensure there isn't a repeat of the circumstances that led to SVB's collapse.

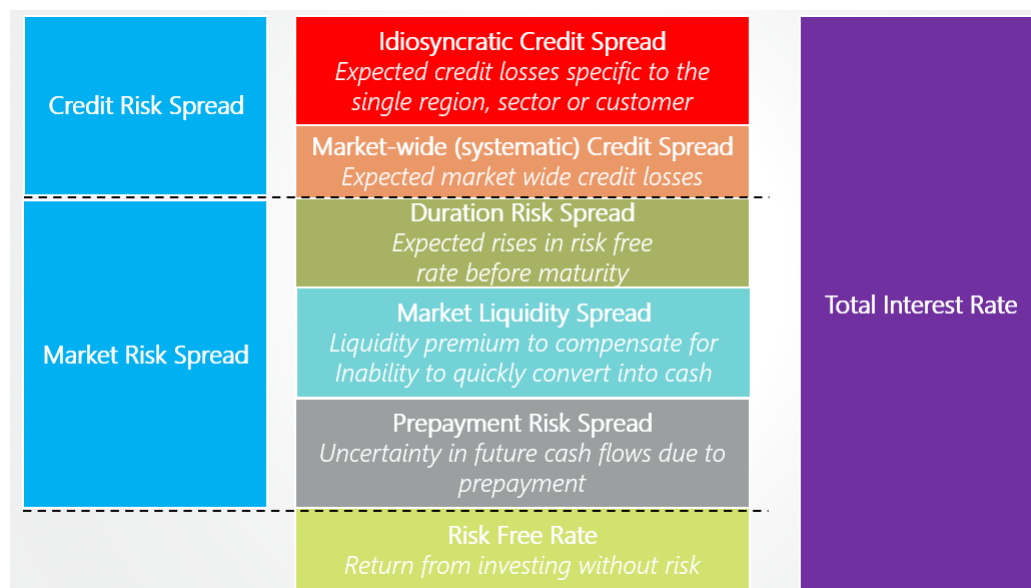
5. Refining the measurement and monitoring of CSRBB

There is a heightened focus from regulators on the inclusion of credit spread risk in the banking book (CSRBB). This captures the credit spread sensitivity of banking book instruments and banks are expected to compute EVE and NII based on these risks. As things stand, banks are expected to incorporate the risks arising from market credit spreads and market liquidity spreads for a given credit quality, in the CSRBB calculations. This poses challenges for asset liability management departments in banks in terms of data acquisition, model development, model validation, risk governance and pricing strategy formulation.

Banks will need to take the following actions regarding CSRBB:

- Develop and use their own methodologies for the identification, assessment and monitoring of CSRBB, which should be commensurate with complexity of the bank.
- Refine their IRRBB policies and procedures to incorporate CSRBB, including embedding these into the bank's processes.
- Continually evaluate the breakdown of the client rate the bank pays or earns on its products. The diagram below provides a breakdown of the client rate. At the moment, only market credit spreads and liquidity spreads are incorporated into the CSRBB framework, but regulators are considering including other

components. Banks should conduct impact analysis for the inclusion of other components into CSRBB on EVE and NII, as well as thinking carefully about their commercial margins.



5 Summary

Interest Rate Risk in the Banking Book (IRRBB) has become a critical challenge for financial institutions following the recent collapse of Silicon Valley Bank (SVB) and regulatory developments in different jurisdictions (e.g. Europe, UK and the UAE). There is increased regulatory scrutiny on banks with regard to IRRBB covering data acquisition, model development, model validation, processes/controls, governance and documentation. It is important that banks address the challenges to not only comply with regulatory requirements but also gain a competitive advantage. To address these challenges, banks should:

- Uplift IRRBB data governance practices.
- Improve IRRBB model governance practices and senior management understanding.
- Enhance risk appetite, limit monitoring, risk management and oversight.
- Revamp behavioural modelling for IRRBB.
- Refine the measurement and monitoring of CSRBB.

By taking these actions, banks can significantly mitigate IRRBB risks and enhance their overall risk management, thereby strengthening their financial resilience, enabling them to navigate market disruptions more effectively and protect the overall stability of the financial system.

6 How 4most can help?

Founded in 2011, 4most have grown to become one of the leading independent credit risk, market risk, data and actuarial consultancies in the UK, Europe and the Middle East. 4most's team of risk experts can help banks with model validation, model development, documentation enhancement, regulatory gap assessment, risk governance, regulatory reporting and delivering customised risk training.

For further questions regarding new standards for IRRBB, please don't hesitate to contact us – info@4-most.co.uk.