

Is Credit Spread Risk Modellable? Understanding CSRBB Modelling in Banks

Zuzanna Wośko

SGH Warsaw School of Economics, Poland

e-mail: zwośko@sgh.waw.pl

ORCID: [0000-0003-2887-6306](http://orcid.org/0000-0003-2887-6306)

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Abstract

Aim: This article offers a theoretical framework for conceptualising and modelling CSRBB (Credit Spread Risk in Banking Book), linking it coherently to the regulatory architecture while maintaining flexibility for diverse banking models.

Methodology: This is a theoretical exposition rather than a full empirical implementation. The simplified numerical case demonstrates how EVE losses may coexist with NII gains under spread-widening, underlining the importance of evaluating both dimensions when setting internal limits and capital buffers.

Findings: As presented in this paper, CSRBB is a multi-dimensional risk, encompassing valuation (EVE) and income (NII) perspectives. The dual approach is essential because spread changes affect both the present value of future cash flows and future interest margins in potentially opposing directions.

Implications: A robust theoretical framework must include all positions in the banking book – unless exclusion can be clearly justified. CSRBB does not operate in isolation, as spread changes often co-move with interest-rate shifts and liquidity conditions. A theoretically consistent model should therefore capture joint dynamics, possibly through multi-factor term-structure frameworks linking interest-rate and spread processes. Model coherence and integration with IRRBB are critical.

Originality/value: The topic of CSRBB is relatively new in literature. From a practical standpoint, the model architecture proposed here can serve as a conceptual blueprint for banks developing or refining internal CSRBB frameworks.

Keywords: CSRBB, credit spread, banking book, banks, risk management

1. Introduction

The banking book of a financial institution, i.e. the portfolio of assets and liabilities that are not held for trading, has for many years been a key focus of prudential risk management. By tradition, much interest has been put into interest rate risk in the banking book (IRRBB) and credit default risk. However, in recent years regulatory authorities and supervisory bodies have increasingly highlighted another dimension of risk: credit spread risk in the banking book (CSRBB). CSRBB focuses on market perception of credit risk since it can change even if the underlying creditworthiness (e.g. default probability) remains unchanged. The credit spreads are said to widen when investors demand a higher yield, i.e. compensation, for holding the instrument, and tighten when investors are willing to accept a lower yield. Credit risk spread has been seen as an important risk because these shifts can affect the economic value of equity (EVE) and the net interest income (NII) of banks, thereby influencing their profitability and capital adequacy and shaping their risk profile.

Why has the importance of CSRBB grown in recent years? There are a few reasons. The most important is that European banks' balance sheets changed their structure over the last few years. Substantial holdings of long-term sovereigns' and financial institutions' debt (EBA, 2024), have exposed banks to potential spread-volatility that historically may have been understated. For example, banks may hold large volumes of non-trading sovereign or financial-institution debt as liquidity or regulatory buffers, and shifts in market spreads of these instruments may generate material exposures.

Moreover, the markets showed in recent years a heightened volatility, and changing investor risk perceptions, and have made spread-movements more frequent and more explicit. Even if all the above mentioned was not noted throughout the financial sector, the regulators have observed and responded: the European Banking Authority (EBA) in its revised guidelines explicitly incorporates CSRBB alongside IRRBB, compelling banks to enhance measurement, monitoring and governance frameworks (EBA/GL/2022/14).

Despite the regulatory interest and rising importance of CSRBB, the academic and practitioner literature on modelling CSRBB remains at an early stage. Whilst many banks have IRRBB frameworks in place, comparatively fewer models comprehensively incorporate spread-risk across the banking-book, especially in a theoretically rigorous manner. There are open questions as to: the scope of instruments subject to CSRBB, the appropriate risk-metrics (sensitivity, shocks, scenario analysis, value-at-risk (VaR)/expected shortfall frameworks), the interaction of CSRBB with other risks (such as IRRBB, credit default risk, market liquidity risk), and the way to calibrate and backtest internal models for CSRBB.

This article contributes to the literature by presenting a conceptual framework for modelling CSRBB in banks' banking-book portfolios. The focus is on a theoretical exposition rather than a full empirical implementation, although a stylised example illustrates the key features.

The paper proceeds as follows. Section 1 reviews the relevant literature on CSRBB, IRRBB and related credit spread modelling. Section 2 outlines the regulatory and supervisory backdrop, emphasising the EBA guidelines and their practical implications. Section 3 proposes a modelling architecture for CSRBB including sensitivity measures, shock scenarios, and an integration into economic-value and earnings-based metrics. Section 4 presents a simple stylised numerical example to illustrate the mechanics of the model. The paper concludes with implications for banks, risk-management practices and future research.

2. Literature Review

2.1. CSRBB Modelling

The idea of credit spread risk in the banking book evolved from the concept of interest rate risk in the banking book (IRRBB). Sensitivity of assets and liabilities which are within scope of banking book to interest rate movements is regularly measured in banks and calculated in terms of impact on net

interest income (NII) and the economic value of equity (EVE) – these are the two main metrics in asset liability management (ALM) (Farahvash, 2020).

The IRRBB framework covers changes in the amount of cash-flows and their timing and the impact of interest-rate changes on discounting. Over time, as regulatory frameworks matured (e.g. via the Basel Committee on Banking Supervision BCBS 2016 standard for IRRBB), banks developed robust systems to measure and manage IRRBB.

Within this backdrop, the notion of credit spread risk in the non-trading or banking book has gradually emerged. The BCBS first introduced CSRBB explicitly in its 2016 paper, albeit without detailed implementation guidance (BCBS, 2016). The key idea is that instruments in the banking book, such as fixed-income securities, may experience changes in market spreads (for credit, liquidity or other components) even if the issuer's default probability remains constant. These changes affect valuation and income metrics similarly to interest-rate shocks.

The formal definition and regulatory inclusion of CSRBB has evolved significantly in recent years. According to the EBA's Guidelines on IRRBB and CSRBB (EBA/GL/2022/14), the CSRBB is defined as (EBA, 2022):

the risk driven by changes in the market perception about the price of credit risk, liquidity premium and potentially other components of credit-risky instruments, which is not explained by IRRBB or by expected credit/(jump-to-) default risk.

The guidelines stress that banks should identify the scope of instruments sensitive to credit-spreads (assets, liabilities, off-balance sheet items) and not exclude ex-ante instruments on the basis of accounting treatment alone. Importantly, the regulators clarify that CSRBB is distinct from IRRBB and from credit default risk, which helps delineate model boundaries. The guidelines also require banks to incorporate CSRBB into their internal measurement and management systems, including stress-testing, scenario analysis and governance.

The definition also addresses two elements which are the drivers of credit spread risk and must be taken into account when modelling (Pahne & Akerlund 2023):

- The changes of the "market credit spread", or "market price of credit risk", which represents the credit risk premium required by market participants for a given credit quality. This can be seen as the additional compensation that investors demand for assuming a greater risk of counterparty default,
- The changes of the "market liquidity spread" which represents the liquidity premium that induces market appetite for investments and presence of willing buyers and sellers. This can be seen as the additional compensation that investors demand for holding an asset that is less liquid, meaning it is more difficult to buy or sell quickly.

Despite this, consulting companies that introduce CSRBB measurement to banks note that implementation challenges remain. For example, the Deloitte report *Ryzyko spreadu kredytowego w księżce bankowej*, indicated that the approach to calibration of credit-spread curves, selection of shocks (e.g. CS01, scenario ± 100 bps), and the treatment of idiosyncratic vs market-wide spread movements differ widely across institutions. Likewise, the McKinsey publication *Confronting new risk management guidelines for credit spread risk in banking* (2025), suggested that many banks remain uncertain about the perimeter of CSRBB, measurement approaches (e.g. sensitivity vs VaR) and integration into internal-capital frameworks.

In the academic and practitioner literature on CSRBB modelling, several themes recur. One challenge is defining which banking-book exposures are materially exposed to credit-spreads versus those that behave like loans/deposits and are less sensitive to market spreads. McKinsey reported that regulators expect banks to justify exclusions and to include any instrument subject to spread-volatility - even if still held in the banking book.

Market practice shows that there are already some common metrics, which include:

- CS01 – the change in present value per basis-point change in credit spread.
- Shock-based scenarios e.g. parallel upward or downward shifts in spread curves (e.g. ± 100 bps) or historical worst spread moves.
- Distribution-based approaches such as spread-value-at-risk (S-VaR), expected shortfall or stress scenarios based on historical spread movements.

Given the novelty of CSRBB frameworks, the literature emphasises the need for strong governance, clear documentation of assumptions (e.g. spread-shock parameters, instrument classification), model validation and audit trails. The EBA guidelines also mandate supervisory review of CSRBB frameworks.

2.2. Statistical Approaches Used for CSRBB Modelling

CSRBB remains an underexplored research area regarding statistical approaches suitable for this purpose. There are some papers which suggest the use of principal component analysis (PCA) to model credit spread shocks, allowing for effectively isolating the idiosyncratic credit spread component and ensuring compliance to regulatory guidelines (Van den Oever & Ruwaard, 2023; Boavida, 2022), yet its practical implementation presents challenges. Segal et al. (2025) addressed some of the open questions posed for future research by Van den Oever and Ruwaard (2023), particularly by understanding how credit spread shocks may differ between instrument types, with a specific focus on government versus corporate bonds. The authors concluded that from a risk management perspective, the calibrated shocks, encompassing both market credit spreads and liquidity spreads, offer a practical basis for setting limits and defining stress-testing scenarios. These findings also underline that systemic risk dominates the credit spread fluctuations, with the first principal component explaining most of the total variance and the PC1 highly correlated with all issuer time series. The remaining PCs show varying degrees of correlation with individual issuers, but are not uniformly or strongly aligned with any one instrument, reflecting their role in capturing residual, idiosyncratic variation. Importantly, the principal components are orthogonal, meaning that each captures a distinct source of variation in the data.

Pahne and Akerlund (2023) found the Nelson-Siegel-Svensson model useful for yield curve estimation to further calculation of credit spreads, and suggested it as an effective tool for calculating the NII measure. The Nelson-Siegel-Svensson model is a very wellknown method also used and recommended by central banks.

Commonly in finance banking Value at Risk (VaR) and Expected Shortfall (ES) are used to calculate the impact of stress scenarios on EVE or NII. Often applied as a historical approach, changes in n-day rolling difference are used to form empirical distribution and then the relevant percentile is chosen to calculate value at risk (usually 99% VaR).

As European banks adapt to the EBA's evolving CSRBB guidelines, understanding how shocks propagate across maturities would be very useful. Some companies already deliver solutions based on VAR (vector of autoregression) modelling, revealing how disturbances in CDS spreads ripple through sovereign bond markets.

However, there are still some gaps in the literature and opportunities for theoretical modelling. While initial frameworks and practitioner guidance have emerged, several gaps remain that justify further theoretical work. Many banks apply ad-hoc sensitivity or scenario-based methods without a fully coherent model linking spread changes to both EVE and NII and integrating correlation, maturity-structure and instrument classification. There is a lack of a unified modelling architecture, and this motivates development of a more structured framework. Moreover, CSRBB is inherently linked to IRRBB, credit default risk, and liquidity risk, yet many models treat it in isolation. A theoretical model that incorporates these interactions would be valuable.

Empirical studies on spread-movements (especially for non-trading assets in the banking book) are limited, making calibration of parameters uncertain. There is a research need for the theoretical justification of assumptions (e.g. shock sizes, correlation structures) and sensitivity analyses. Additionally, given the relatively recent regulatory push, the literature offers scant coverage on how CSRBB models are validated, back-tested, incorporated into ICAAP/ILAAP processes and connected to risk appetite.

While practitioner pieces (e.g. McKinsey, Deloitte) discuss challenges and high-level frameworks, few articles provide formal theoretical derivation or stylised examples illustrating model mechanics.

In view of these gaps, this article aimed to propose a theoretical sketch of modelling architecture for CSRBB, designed to be compatible with supervisory expectations and flexible enough to accommodate different bank balance-sheet compositions, risk-tolerances and product mixes.

3. Regulatory and Supervisory Framework

The regulatory framework for modelling Credit Spread Risk in the Banking Book (CSRBB) is shaped by both broad international standards and the detailed guidelines introduced by the European Banking Authority (EBA) in the EU. Understanding this environment is essential for developing a theoretically coherent architecture that aligns with supervisory expectations, even when the focus remains on conceptual modelling rather than full empirical implementation.

The concept of CSRBB originates from the broader framework of interest-rate risk in the banking book (IRRBB) as defined by the Basel Committee on Banking Supervision (BCBS). The Basel 2016 standard for IRRBB explicitly identified credit spread risk in the banking book as a distinct but related risk. Under Basel, this refers to the current or prospective risk to a bank's capital and earnings arising from adverse changes in credit spreads of banking-book instruments not held for trading. While this standard provided high-level guidance, it did not elaborate in depth the modelling techniques, calibration or supervisory review processes for CSRBB. Thus, although CSRBB is conceptually embedded in the BCBS framework, significant implementation and modelling detail remained open for development by banks and supervisors.

In the European context, the EBA issued its updated set of guidelines on interest rate risk in the banking book (IRRBB) and credit spread risk arising from non-trading book activities (CSRBB) under reference EBA/GL/2022/14. These guidelines replace the earlier EBA Guidelines of 2018 on IRRBB and expand the mandate to explicitly include CSRBB, with the following application deadlines: parts relating to IRRBB applied from 30 June 2023; the CSRBB-specific elements applied from 31 December 2023. The guidelines emphasise not only the measurement but also the assessment, monitoring and governance of CSRBB. They require banks to establish internal measurement systems (whether internal-model or standardised), and supervisors to assess whether those systems are 'satisfactory'. In cases where the internal system is deemed unsatisfactory, the standardised approach may be required.

For CSRBB in particular, the scope is broad: it includes all instruments in the banking book (assets, liabilities, derivatives, off-balance sheet) except non-performing exposures, unless a robust justification is documented for any exclusion.

The guidelines require that the bank's measurement and reporting of CSRBB cover impacts on both the economic value of equity (EVE) and net interest income (NII), and that the model validation, back-testing and challenge functions be in place.

The regulatory architecture also provides for supervisory outlier tests (SOTs) and standardised approaches which supervisors may invoke if internal models are not acceptable. For CSRBB, although specific standardised methodologies are less mature compared to IRRBB, the same supervisory expectations apply: internal systems must be documented, tested and capable of capturing spread-risk in the banking book.

Owing to this regulatory and supervisory framework, theoretical modelling of CSRBB must address the following design implications:

- The model must clearly link to supervisory metrics: EVE change and NII change under spread shocks or scenarios.
- The model must cover the full banking book scope (assets, liabilities, derivatives, off-balance sheet) unless justified.
- Behavioural assumptions (e.g. non-maturity deposits, prepayments) remain relevant because spread risk may interact with interest-rate risk and behavioural risk.
- Governance, validation, back-testing and documentation must be considered, even in a theoretical model, as these are highlighted by the regulators.
- The model should allow the possibility of standardised fallback approaches if internal modelling is not appropriate, so aligning the architecture with both internal-model and standardised-method possibilities strengthens theoretical robustness.

4. Methodology of Modelling Architecture for CSRBB

This section proposes a conceptual framework for modelling credit spread risk in the banking book. The goal was not to provide a full implementation with bank-specific data, but to lay out the architecture of a model consistent with supervisory expectations and also sufficiently flexible to be adapted to different banking business models. The next section provides a stylised numerical example to illustrate the key mechanics.

4.1. Model Scope and Instrument Classification

The first step in any CSRBB modelling architecture is to define the scope as to which positions in the banking book are subject to CSRBB modelling, and how they are classified.

The banking book generally consists of assets and liabilities not held for trading. Within this, the model must identify instruments whose valuation or income is sensitive to credit-spread movements (rather than pure interest-rate movements or default risk). Exclusions in the one bank may not be accepted by the regulator in another. A bank's balance sheet decomposition plays an important role. If the share of some instruments affected by credit spread is small, such positions can probably be omitted with sufficient reasoning. In cases where the instrument has an important share, this is not accepted by the regulator.

A typical instrument classification might include:

- Fixed-income debt securities (sovereign, financial institutions, corporates) held in the banking book.
- Loans and advances held at fair value where credit spreads are embedded in valuation (if applicable).
- Banking-book derivatives linked to credit spreads (e.g. credit default swap hedges, embedded options).
- Banking-book liabilities whose cost is sensitive to credit spreads (e.g. subordinated debt, hybrid instruments).
- Off-balance sheet items with embedded credit-spread sensitivity (e.g. loan commitments, guarantee lines where credit spreads may shift).

Any instrument excluded from CSRBB should be justified in line with supervisory expectations, for example non-performing exposures may be excluded as they may be subject to default risk rather than spread risk.

The regulator's requirement claims that no banking book instrument should be excluded from the scope ex-ante, and any exclusion must be documented and justified, therefore the European Banking Federation recommends a decision tree for evaluating credit spread-sensitive positions (European Banking Federation, 2023).

In 2024, as part of their medium to long-term objectives listed in the IRRBB heatmap, the EBA indicated its intent to monitor CSRBB exclusions and provide guidance where needed (EBA, 2024).

While often associated with IRRBB modelling, behavioural assumptions (such as prepayment, early redemption, deposit run-off) can also affect spread sensitivity – for example, if a liability's spread resets at a behaviourally assumed date rather than contractual. The model architecture should allow for these assumptions.

4.2. Risk Metrics

Once the scope is defined, the next step is to select risk metrics and analytical techniques. The architecture should encompass multiple layers.

- Sensitivity analysis. The example is CS01metric (change in present value per basis-point change in credit spread) for each instrument or bucket. This provides a first-order approximation of spread-risk.
- Shock scenarios. One must develop upward/downward spread shock scenarios (for example ± 100 bps) across issuer/sector/maturity curves and apply them to the banking-book portfolio to produce changes in EVE and NII. This aligns with supervisory expectation of stress testing for CSRBB.
- Distribution-based approaches. For more advanced modelling, a full distributional approach (value-at-risk or expected shortfall for spread-movements) may be used. The architecture should allow modelling of correlation across issuers/sectors/maturities, jump risk (e.g. large spread widening events) and tail risk.
- Combined metrics. Institutions should link each of the above to EVE impact (change in economic value of equity) and NII impact (change in net interest income over a horizon) to ensure both value and earnings perspectives are captured.

Linking interest rate and spread risk. It must be recognized that spread risk does not operate in isolation – for example, a rise in interest rates may trigger spread-widening, or funding spread may impact the cost of liabilities. The model architecture should allow co-movements of interest rates and credit spreads (a so-called two-factor or multi-factor framework).

4.3. Model Mechanics – Cash-flow and Valuation Linkage

The architecture needs to show clearly how cash-flows and valuations respond to spread-movements. A typical modelling process would project expected cash-flows under contractual and behavioural assumptions for each instrument (prepayments, call options, deposit run-off).

For a baseline scenario, future cashflows must be discounted at appropriate discount rates to derive present values and economic value of the portfolio. For a shock scenario, spread shifts should be applied or scenario adjustments to the relevant credit-spread curves (issuer, sector, maturity) and adjust the discounting/valuation accordingly. For example, for a +100 bps shock in spreads, discount rates increase leading to a lower present value.

For banking-book instruments where spread-movements affect yield/ margin (e.g. floating rate securities or liabilities whose cost spreads change), one must simulate the impact on future interest income/costs over a specified horizon, then the change in NII can be derived. Next, the instrument-level results should be aggregated to the portfolio level to compute overall Δ EVE and Δ NII due to the spread shock/distributional movements. Optionally it can be decomposed by issuer, sector, maturity, instrument type, region depending on the needs. Correlation between issuers/sectors/maturities should also be incorporated. The architecture should allow sensitivity to different correlation assumptions.

Finally, regarding scenarios, extreme but plausible scenarios, such as large sovereign spread widening, and sectoral crisis, should be performed and worst-case EVE/NII impacts computed, as well as expected shortfall metrics.

4.4. Calibration, Validation and Governance

The model architecture must also embed calibration, validation and governance features to be consistent with supervisory expectations.

Calibration is based on spread-curve shocks, historical volatilities of spreads by sector/maturity, correlation matrices and behavioural assumptions. For this purpose internal and external data are used, and it must be ensured that the parameter estimates are reasonably conservative.

The choice of statistical techniques used for different steps is not defined by the regulator. More sophisticated statistical techniques already used and described in the literature (see Section 2) for CSRBB modelling are PCA (principal component analysis), the Nelson-Siegel-Svensson model and VaR (Value at Risk) and ES (Expected Shortfall).

PCA is a widely known statistical technique used to reduce the dimensionality of a dataset while retaining trends and patterns. When analysing the variability of credit spreads, its sources can be separated into a few components. It can be assumed that the first principal component captures the systemic component of credit spreads – common to all issuers – while subsequent components reflect idiosyncratic movements that the EBA excludes from the CSRBB scope. In that sense credit spread risk is captured as a market sentiment.

The Nelson-Siegel-Svensson model (Nelson & Siegel, 1987; Svensson, 1994) is an extension of the Nelson-Siegel model for describing the term structure of interest rates. This model, widely used by central banks, uses three components (parameters) to describe the shape of the yield curve: the level (long-term interest rates), the slope (the step change in rates), and the curvature (an additional turning point, which is key to the Svensson model, which extends the Nelson-Siegel model). This is a factor-based model that represents the yield curve as a set of several components describing different aspects of its behaviour. The model is widely used in practice because it provides a good fit to actual market data, especially long-term interest rates. Academic studies have provided evidence that the model can also be a valuable tool for forecasting the term structure (Diebold & Li, 2006).

$$y(\tau) = \beta_1 + \beta_2 \left[\frac{1 - \exp(-\frac{\tau}{\lambda})}{\tau/\lambda} \right] + \beta_3 \left[\frac{1 - \exp(-\frac{\tau}{\lambda})}{\tau/\lambda} - \exp(-\frac{\tau}{\lambda}) \right], \quad (1)$$

where $y(\tau)$ is the zero rate to maturity τ , $\beta_1, \beta_2, \beta_3$ and λ parameters to be estimated. More on the estimation and some empirical examples can be found in (Gilli et al., 2010). From an econometric point of view, this approach is similar to adjusting some specific nonlinear trend to the time series data. This model is used to yield curves' estimations which constitute an important input to EVE calculation: to compute duration of instruments and to evaluate EVE sensitivity to parallel or non-parallel shocks. Although the Nelson-Siegel-Svensson method is a well-suited option when extrapolating for longer maturities, it is considered weak in extrapolating for shorter maturities (Pahne & Akerlund, 2023).

Value at Risk and Expected Shortfall are calculated for stress scenarios. Value at Risk (VaR) measures the potential loss in value of a portfolio over a defined period for a given confidence interval, while Expected Shortfall (ES) quantifies the average loss in the worst-case scenarios beyond the VaR threshold. The commonly-used approach is historical VaR calculated on rolling windows.

For credit spread risk measurement the use of credit default swap (CDS) contracts seems to be very intuitive. CDS are the most important instruments in the credit derivative market, essentially providing insurance against the default of an issuer (the reference credit) or on a specific underlying bond (the reference security) (Lando, 2004). Market variability of CDS quotations could be used as some reflection of this risk, however leveraging on such instruments has not yet become common in the market and literature.

Backtesting of the CSRBB model can be very challenging. If internal data are limited, benchmark to peer data or market indices can be used, yet ideally, retrospective comparison of model outputs should be established (e.g. forecast changes in EVE under spread shocks) to actual outcomes. The independent validation function should also review model logic, parameterisation, assumptions and

sensitivity of results. The architecture should include periodic reporting to senior management and Board on CSRBB exposures, limits, and risk appetite. The model should be integrated into the bank's internal capital adequacy process (ICAAP) and internal liquidity adequacy process (ILAAP) as appropriate. It is also recommended to explicitly document how CSRBB interacts with IRRBB, credit default risk, liquidity risk and market risk. For example, spread-risk may amplify default-risk under stress, or liability cost spread increases may affect funding risk.

4.5. Model Output and Supervisory Metrics

Finally, the architecture should map the model's output onto supervisory and internal risk management metrics. Supervisory metrics are presented in Table 1.

Table 1. The supervisory metrics as an output from the CSRBB model

Metric	Description
Δ EVE due to spread shocks	The model should report the change in economic value of equity under one or more predefined spread-shock scenarios
Δ NII over time horizon	The model should report the change in net interest income (or extended NII) over a year or multiple years due to spread movements
Sensitivities by bucket	Present CS01s or spread sensitivities by instrument type, maturity bucket, issuer/sector, which supports limit-setting and risk-appetite monitoring
Stress test outputs	Provide scenario outcomes and optionally distributional tail metrics (e.g. 99th percentile of spread-loss distribution or expected shortfall)
Limit and threshold framework:	The bank should define limits/thresholds on Δ EVE and Δ NII for CSRBB, e.g. "maximum allowable EVE loss from a +100 bps spread shock is X% of tier 1 capital".

Source: own summary based on regulatory documentation.

It must be added that model outputs should be linked to internal capital requirements, stress-testing frameworks, and management actions (e.g. hedging, limit adjustments, portfolio rebalancing).

5. Stylised Numerical Example

To illustrate the conceptual architecture of the CSRBB model proposed above, this section presents a simplified, stylised numerical example. The objective is to demonstrate how changes in credit spreads can affect both the economic value of equity (EVE) and net interest income (NII) of a representative banking-book portfolio, even in the absence of changes in default probabilities or interest rates.

The example is intentionally simplified to highlight model mechanics rather than empirical calibration. It assumes deterministic cashflows, parallel spread shocks and linear sensitivity to spread movements.

This example considers a stylised mid-size European bank with the following positions in its banking book (see Table 2). Only instruments A–D are directly sensitive to credit-spread changes. Deposits (E) are assumed to be insensitive.

Table 2. Example composition of a banking book

Instrument Type	Exposure (nominal, EUR m)	Average maturity (years)	Coupon / Margin	Current spread (bps)	Duration (years)
A. Sovereign bonds (AA)	2,000	5	2.5 %	80	4.5
B. Financial institution bonds (A)	1,500	7	3.2 %	130	5.5
C. Corporate bonds (BBB)	1,000	6	4.0 %	200	4.8
D. Subordinated bank debt issued (liability)	-800	8	4.5 %	250	6.0
E. Retail deposits (behavioural duration = 2 yrs)	-2,700	2	0.8 %	–	1.5

Note: *Positive values denote assets; negative values denote liabilities.

Source: own calculations.

Two parallel credit-spread shock scenarios are applied:

- upward spread shock (+100 bps) applied to all credit-sensitive instruments,
- downward spread shock (-100 bps) applied analogously.

Interest rates are held constant; default probabilities and credit quality are assumed unchanged. Duration-based approximations are used to estimate valuation effects:

$$\Delta PV_i = -\text{Duration}_i \times \Delta s \times PV_i, \quad (2)$$

where Δs is the spread change in decimal terms.

Baseline portfolio economic value can be calculated with the formula

$$EVE_0 = \sum_i PV_i. \quad (3)$$

Assume the present value (PV) of each instrument equals its nominal value for simplicity (par pricing).

Under a +100 bps spread shock, the change in value for each instrument is presented in Table 3.

Table 3. Change in economic value of equity due to +100 bps spread shock.

Instrument	Nominal (EUR m)	Duration	Spread shock (bps)	ΔEVE (EUR m)
A. Sovereign bonds	2,000	4.5	+100	-90.0
B. Financial bonds	1,500	5.5	+100	-82.5
C. Corporate bonds	1,000	4.8	+100	-48.0
D. Subordinated debt (liability)	-800	6.0	+100	+48.0
Total ΔEVE				-172.5

Source: own calculations.

Thus, a 100 bps parallel widening of credit spreads results in an economic value loss of EUR 172.5m, approximately 3.8 % of Tier 1 capital (assuming Tier 1 = 4.5bn EUR).

Under the -100 bps scenario (spread-tightening), the effect is symmetric: $\Delta EVE = +172.5$ m.

Next, the impact on projected net interest income over a one-year horizon is considered. For fixed-rate assets, NII impact arises only if they are repriced or reinvested. For liabilities whose funding spread adjusts immediately (e.g. subordinated debt), changes in spread affect cost of funds.

Assume that 20% of the fixed-income portfolio (by nominal value) matures and is reinvested each year at prevailing market spreads. The change in NII (annualised) can then be approximated as

$$\Delta NII \approx 0.20 \times \sum_i \text{Nominal}_i \times \Delta s_i. \quad (4)$$

For the +100 bps shock

$$\Delta NII = 0.20 \times (2,000 + 1,500 + 1,000 - 800) \times 0.01 = 0.20 \times 3,700 \times 0.01 = 7.4\text{m EUR}.$$

Thus, the bank's one-year NII increases by EUR 7.4m when spreads widen (assuming reinvestment at higher spreads), even though the immediate EVE declines by EUR 172.5m. This highlights the typical trade-off between value and earnings perspectives in CSRBB modelling: EVE and NII can move in opposite directions depending on balance-sheet composition and repricing structure.

5.1. Scenario Analysis and Diversification

In practice, credit-spread shocks are rarely uniform. Sovereign, financial and corporate spreads may widen by different magnitudes, and correlations between them matter.

Assume correlation coefficients:

$$\rho(\text{Sovereign, Financial}) = 0.8; \rho(\text{Sovereign, Corporate}) = 0.6; \rho(\text{Financial, Corporate}) = 0.7.$$

The portfolio standard deviation of ΔEVE under these correlations can be used to derive a distribution-based risk measure (Spread VaR or Expected Shortfall). Portfolio variance is presented with the formula

$$\sigma_p^2 = Var(\Delta EVE) = \sum_i \sum_j w_i w_j \sigma_i \sigma_j \rho_{ij}. \quad (5)$$

To illustrate this, if the standard deviation of portfolio ΔEVE is estimated at 60 m EUR, a 99 % one-year Spread-VaR might be approximated as

$$CSRBB VaR_{99\%} = z_{0.99} \times \sigma_p = 2.33 \times 60 = 140m \text{ EUR}$$

which is comparable in magnitude to the deterministic shock result, with $z_{0.99} = 2.33$ for a normal distribution.

From a supervisory standpoint, the bank would report (see Table 4):

Table 4. Reporting figures

Metric	Value (EUR m)	% of Tier 1 Capital
ΔEVE (+100 bps spread shock)	-172.5	-3.8 %
ΔNII (+100 bps)	+7.4	+0.16 %
Spread VaR (99 %)	-140	-3.1 %

Source: own calculations.

If the bank's internal limit for CSRBB losses were set at 5 % of Tier 1 capital, the exposure would be within risk appetite. Nevertheless, the negative ΔEVE underlines the potential capital volatility under spread-widening, even when default risk remains stable.

This stylised illustration demonstrates the key principles of CSRBB modelling:

- EVE and NII may react in opposite directions – value losses can coincide with income gains, highlighting the need for dual-perspective measurement.
- Duration structure and liability composition critically influence spread sensitivity. Longer-duration assets and short-duration liabilities amplify EVE sensitivity.
- Spread correlation and diversification materially affect portfolio results, neglecting these can overstate or understate risk.
- Calibration of shocks (± 100 bps here) is arbitrary, in practice, banks must use historical, stress or supervisory calibration consistent with regulatory expectations.
- Governance and documentation remain essential even in theoretical modelling – each assumption (spread shocks, maturities, behavioural factors) must be explicit and defensible.

6. Conclusions and Implications for Practice and Research

The modelling of Credit Spread Risk in the Banking Book (CSRBB) has emerged as a distinct and increasingly important component of banks' risk management and regulatory frameworks. As supervisory expectations evolve under the EBA's Guidelines on IRRBB and CSRBB (EBA/GL/2022/14), banks are required to demonstrate a clear understanding, quantification, and governance of spread-related risks beyond traditional interest rate or default risk.

This article offers a simple theoretical framework for conceptualising and modelling CSRBB, linking it coherently to the regulatory architecture while maintaining flexibility for diverse banking models. Several conclusions arise from the analysis. As presented in this paper, CSRBB is a multi-dimensional risk, encompassing both valuation (EVE) and income (NII) perspectives. The dual approach is essential because spread changes affect both the present value of future cash flows and future interest margins in potentially opposing directions.

One of the most basic but also not unequivocal aspects of CSRBB modelling is the identification of which instruments are materially exposed to credit-spread movements. A robust theoretical framework must include all positions in the banking book – assets, liabilities, and off-balance sheet items – unless exclusion can be clearly justified.

CSRBB does not operate in isolation, as spread changes often co-move with interest-rate shifts and liquidity conditions. A theoretically consistent model should therefore capture joint dynamics, possibly through multi-factor term-structure frameworks linking interest-rate and spread processes, therefore model coherence and integration with IRRBB are critical. Dynamic multi-factor modelling of joint interest-rate and credit-spread movements capturing term-structure and correlation effects, would be an interesting research avenue to follow.

From a practical standpoint, the model architecture proposed here can serve as a conceptual blueprint for banks developing or refining internal CSRBB frameworks. Its modular design I – spanning perimeter definition, metric selection, valuation logic, and governance – aligns with supervisory expectations and can be calibrated to institution-specific risk profiles. The stylised examples presented in this paper illustrate the trade-off between economic value and earnings perspectives. The simplified numerical case in Section 4 demonstrates how EVE losses may coexist with NII gains under spread-widening, stressing the importance of evaluating both dimensions when setting internal limits and capital buffers.

Further research should investigate macro-financial linkages, connecting CSRBB exposures to broader systemic risk and stress-testing frameworks or integration into ICAAP/ILAAP and climate-related risk models, where credit-spread movements may interact with physical and transition risk channels.

Finally, CSRBB represents a conceptual bridge between market and credit risk within the banking book – a risk that is neither purely structural nor purely transitory. The challenge for both academia and practice is to develop modelling approaches that are theoretically sound, empirically tractable, and operationally robust. By laying out a clear theoretical architecture, this paper contributes to that dialogue and provides a foundation for subsequent empirical validation, supervisory benchmarking, and future methodological advances.

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