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LEADING THROUGH INNOVATION

Fundamental Review of the
Trading Book

Data -
Key to successful implementation of
FRTB SBA





Although the Fundamental Review of the Trading Book (FRTB), which is part of the Basel III revisions, has been in the making for several years, banks remain concerned about the demands on the quality and volume of Trade Data needed to determine the revised market risk capital charge. In this paper, we will discuss those market data challenges, along with potential means to address them.

The data and computational challenges in implementing the Internal Measurement Approach (IMA) have been well documented, however banks may find it equally difficult in sourcing and aggregating data for capital computation under the Standardised Approach (SA) as well.

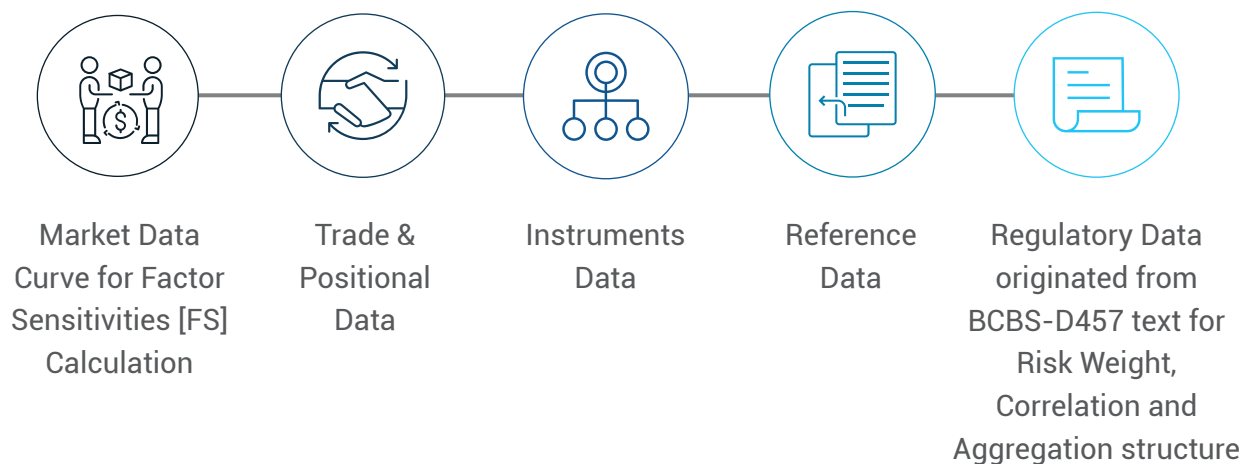
The calculation of market risk capital charge as per the Standardised Approach consists of determining a capital charge per risk class using the Sensitivities Based Approach (SBA) and aggregating them to determine the overall capital charge for market risk. To this are added the Default Risk Capital charge (DRC) for the risk of default, as well as the additional charge for the Residual Risk Add-On (RRAO) to arrive at the minimum capital requirement.

This blog mainly focuses on the data challenges associated with the Sensitivity Based Approach (SBA) of the FRTB to calculate risk capital charge.



Data Challenges in FRTB-SBA

The main data inputs for FRTB-SBA capital charge calculation can be categorized into following:



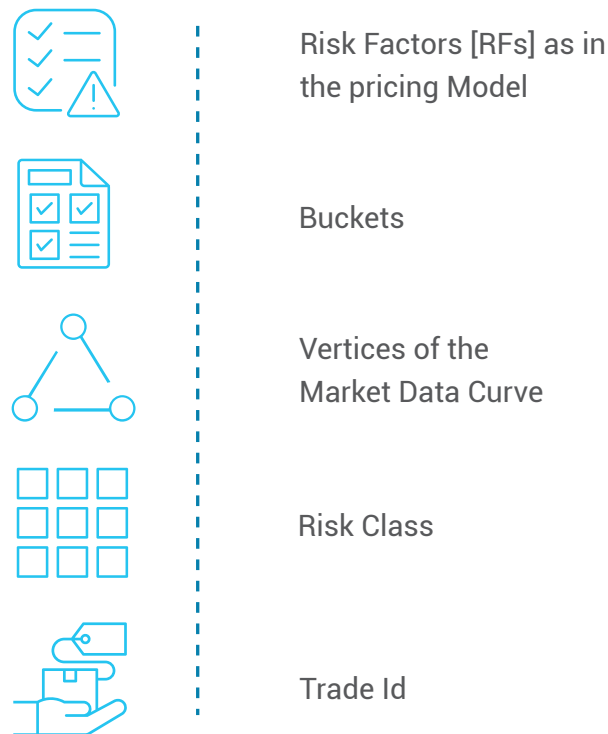
FRTB-SBA data challenges can be bucketed into three major categories:

1. Factor Sensitivities [FS] Sourcing:

SBA under FRTB utilizes the factor sensitivities (FS) for capturing linear as well as non-linear risks, making it a departure from earlier standardized models. The use of FS as well as their calculation consistency are both prescribed by the rules for SA (as well as IMA).

However, requiring these calculations to be the same as those used for pricing models or instrument prices in the P&L statement or market risk management is a first. Thus calculations used for the valuation models for trading purposes by the front office are to be consistent with the sensitivities computation.

Also, granularity of risk factors as well as regulatory prescription are to be captured by the FS. The best practice would be to calculate FS once in the Front Office (FO) System as prescribed by FRTB, and store it in the golden database for downstream risk calculation, and organize and store FS data by the following attributes



Sourcing and aggregating risk factors sensitivities [RFs] data for all risk classes along specified risk buckets and tenors is a critical requirement while performing FRTB-SBA capital assessments.

Documenting the FS data definition, and any gap with FO system with Market Risk System for FS reconciliation is the prime objective during capital assessment exercise.

2. Risk Factors [RFs] Mapping & Metadata Attribution:

The RFs work as basic inputs into Bank Pricing & PnL calculation function. For example, SOFR term structure curve for Rates business, USD Vol Curve with Term Structure for Option products. Banks need to identify and define the set of RFs exposed to trading book for FRTB-SBA Capital calculation requirements, and their association with metadata of those RFs. For example, Sector Industry, Rating, Investment Grade, CCY, Tenor, Market Cap, Indices etc.

To calculate risk charge under SBA, banks need to compute three levels of factors sensitivities matrix per risk factors for each risk class.

Delta is calculated for all the linear products.

Vega is calculated for all the optionality embedded products

Curvature risk measure for instruments /products with optionality /nonlinear structure to capture incremental risk not captured in delta risk. Its revaluation exercise with two stress types [ups/down] scenario is used for FRTB-SBA Capital charge computation.

The challenge arises to identify the right set of risk factors for delta, vega & curvature computation.

Banks and Financial Institutions need to create a risk data taxonomy for attributing right set of RFs for a trade FRTB-SBA Capital compliant. The RFs should reflect the FRTB regulatory guidelines and should be in sync with the FO pricing model and official PnL Calculation model. These RFs would be further used for PnL attribution & FRTB-SBA Capital allocation requirements.

Mapping of Risk Factors to Factor Sensitivities

RISK CLASS	ATTRIBUTES	FACTORS SENSITIVITIES [FS]
General Interest Rate Risk (GIRR)	By Curve (SOFR, LIBOR, OIS) & Tenor [3M, 6M, 1, 2, 3, 5,10,20,30Y]	<ul style="list-style-type: none"> Delta : 1 bps bumps by tenor, sticky delta Curvature : shifting curve
Credit Spread Curve (CSR)	By Curve (Name CDS, Index CDS) & Tenor (1, 2, 3, 5,10Y)	<ul style="list-style-type: none"> Curvature Risk = $(\Delta(+1\text{bps}) - \Delta(-1\text{bps}))$
Equity FX Commodity	By Name , Sector , Cap, Market Currency Pair By Grade and Location	<ul style="list-style-type: none"> Delta : 1% shocks and scale to 100% sticky delta Curvature : shifting curve
Implied Volatility : GIRR , CSR, Commodity	By Curve and the Cube : <ul style="list-style-type: none"> Expiration Residual underlying tenor Moneyness (S/K) 	Vega : relatives change in Imp vol, scale to 100%
Implied Volatility : Equity and FX	By Name/Currency pair and <ul style="list-style-type: none"> Moneyness (S/K) Expiration 	

We have worked out an example on metadata association with RFs. This metadata association /attribution is very important for FRTB-SBA Capital calculation and aggregation schema.

RISK CLASS	FRTB-SBA METADATA SCHEMA
GIRR	<ul style="list-style-type: none"> CurveType :SOFR/ OIS /EONIA/SONIA/FED Curve (RiskFree Curve) , Inflation , Basis Tenor : Vertex for RFs Sensitivity (3M, 6M ,1Y, 3Y, 5Y, 10Y, 15Y, 20Y, 25Y, 30Y) Currency for Bucket allocation
CSR-NSzn	<ul style="list-style-type: none"> Credit Quality : Investment Grade , HighYield Sector : Industry Sector (Financial/Energy/Pharma/IT & Communication/INFRA)
CSR-Sec_CTP	<ul style="list-style-type: none"> Sector : Industry Sector Risk Weights & Corr risk are modified to reflect longer LH and Larger basis risk.
CSR_Sec_NCTP	<ul style="list-style-type: none"> Credit Quality & Seniority : Senior & Non-Senior Investment Grade Investment Grade , High Yield , Not Rated Sector : RMBS, CMBS, ABS, CLO
EQUITY	<ul style="list-style-type: none"> Market Capitalization : Large , Small Economy : Advanced , Emerging Sector : Industry Sector
Commodity	<ul style="list-style-type: none"> Type of Commodity : Energy , Metal , Gas , Agri etc Commodity Curve Tenor (3M, 6M ,1Y, 3Y, 5Y, 10Y, 15Y, 20Y, 25Y, 30Y) Physical / Derivatives/Cash + Delivery Location

*** [CSR-NSzn = Credit Spread Risk –Non Securitization], [CSR-Sec_CTP =Credit Spread Risk Securitization –Correlation Trading Portfolio], [CSR-Sec_NCTP =Credit Spread Risk Securitization –Non Correlation Trading Portfolio]

For building metadata, Bank can take help from third party vendors like Markit/ Bloomberg/ Reuters/ Golden Sources or internally they can build instruments level static data and reference data for metadata mapping with trading book risk factors exposure.

3. FRTB-SBA Calculation Gap

The modified risk charge calculation methodology under SBA as per FRTB has necessitated an understanding of the gaps in data requirement between the existing models and calculators versus those required under the new rules.



Maturity Mismatch

As sensitivity-calculation drives the definition of the risk factors and vertices under the FRTB framework, differences may arise due to maturity misalignment of the risk factor and vertices versus with those of the banks' computation systems.



Assumptions

Incorrect capital charge computation under SBA may also be due to the result of assumptions made by the risk management teams, to fill the gaps caused by the prevailing data challenges in the risk model development process in the banks. An example could be the linear extrapolation done to calculate the risk sensitivities, where lack of underlying data may necessitate that banks make certain assumptions.



Data Sourcing Gaps

The desired data for capital charge computation under SBA may not be obtainable under the banks' current risk infrastructure. Internal ratings management for both equity and credit issuers, break-up of underlying products, decomposition of equity baskets and indices as well as sourcing of equity ratings data for default risk charge computation all may suffer from data sourcing challenges.



Data Taxonomy

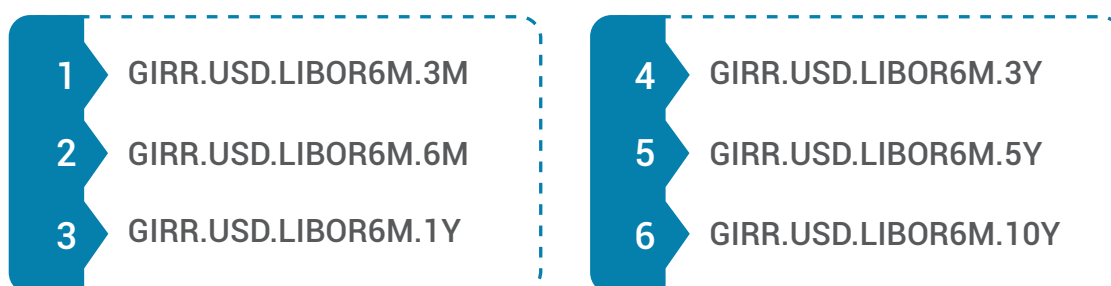
Maintaining calculation consistency and interpretational homogeneity of asset classes across the bank in order to classify different products as per FRTB rules may become challenging owing to the disparities in the front offices and risk management systems. Asset class to instrument mapping may thus become difficult.

Let's take an example of 5Yx10Y USD LIBOR6M Rate Swaption trade to understand the complexity of FRTB-SBA Calculation and Data Challenges:

There are two broad risk factors [RFs] with this trade

1. USD LIBOR6M Yield Curve with Term structure [3M,6M,1Y,3Y,5Y,10Y]
2. USD Vol Curve with Three level of Moneyness [ATM, ITM, OTM], Option Maturity 5Y and Underlying Tenor 10Y.

There are six risk factors attached with USD LIBOR6M Yield Curve that is Interest rate [GIRR] as risk class:



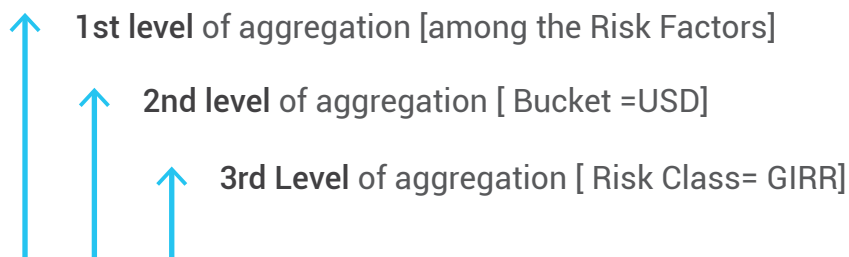
The USD Vol Curve risk factor dimension would be 3D

- ♦ Level of Moneyness [ATM, ITM, OTM]
- ♦ Option Maturity [6M,1Y,3Y,5Y,10Y]
- ♦ Underlying Tenor [3M, 6M, 1Y, 3Y, 5Y, 10Y]

The Total RFs required to perform vega capital charge calculation would be =
3 Moneyness x 6 underlying Tenor x 5 Option Maturity = 90 RFs

■ This example reflects that we need to perform 6 delta risk sensitivities calculation, 90 vega risk calculation and at least one curvature risk calculation with one base scenario & two stress scenarios [3], therefore we need to perform atleast **99 = [6 delta RFs + 90 vega RFs +3 Curvature RFs]** factor sensitivities calculation.

These risks emanating from 5Yx10Y USD LIBOR6M Rate Swaption trade need to aggregated into three level aggregation hierarchy.



Now assume that we have 1000 trades in our trading booking portfolio for a small /medium sized bank with different attributes

- ♦ Risk Class [GIRR, COMMD, FX, Traded Credit]
- ♦ Currency Level [USD, JPY, EUR, HKD, SAR, AED etc.]
- ♦ Average Trade Maturity [10Y]
- ♦ 20 Option embedded products
- ♦ 25 Traded Credit Instruments
- ♦ Products [EQ Option, IR Swaption, CDS Index, EQ Basket etc.]

The calculation and data requirements would grow in exponential/linear fashion for FRTB-SBA capital charge for the given trading desk/portfolio.

Calculations per trade by Banks/FI may jump up significantly from the existing 250 to 500 calculations under Basel 2.5 regulations to a massive 12,000 calculations under the FRTB-SBA capital calculation due to the new prescribed risk factors and liquidity computation. This is due to the estimation of at least 79 different calculation inputs required under FRTB-SBA for each factor sensitivity class, excluding FX Risk and GIRR, assuming the trading book has assets across buckets.

Number of Buckets for Sensitivities Calculation

FRTB-SBA Bucketing/Classification Challenges

	GIRR	CSR-NSzn	CSR-CTP	CSR-NCTP	EQ	COMMD	FX
Delta	Individual CCY	16	16	25	11	11	Individual CCY pair
Vega	Individual CCY	16	16	25	11	11	Individual CCY pair
Curvature	Individual CCY	16	16	25	11	11	Individual CCY pair



Corrective Measures for Addressing Data Challenges

A successful implementation of FRTB SBA rules merits effective data sourcing and management framework. The following measures provide recommendations which the banks can adopt for improvement in their data strategies and to harmonize them with the FRTB SBA rules -

Measure	Evaluation Aspect		Advantages
SENSITIVITY CONSISTENCY	Approach	Taxonomy	Intra-organization data treatment consistency due to consistent calculations and data sensitivities between the front office and risk management teams
	To ensure calculation techniques are uniform across the bank, a systematic methodology of bucketing risk exposures or sensitivities for each risk class should be adopted. A one-time calculation of sensitivities which are then utilized by different units across of the bank would be the optimum approach.	Consistent definitions of sensitivities across the risk management teams and front office should be maintained. Standard data taxonomies ensure calculation consistency and interpretational homogeneity of asset classes across the bank.	
PLAN FOR P&L ATTRIBUTION	Infrastructure	Data Quality	Improved management of data quality Communication efficiency for better reporting
	To ensure proactive action and timely resolution of issues, the IT processes should be integrated so as to alert users of data issues. This should be done in correspondence with the Risk Technology function.	Users as well as impacted functions to be warned in case of data issues and corresponding delays for better management.	
CENTRALIZED DATA REPOSITORY	Sourcing of Data	Data Quality	Centralized source of intra-bank risk data Data quality management efficiency Support supervisory auditing and approval process
	A central repository containing all risk sensitivities should be set up, where data would flow in from different golden sources and would be stored and organized by risk class, bucket, tenor and risk factor. <ul style="list-style-type: none"> Inventory of sensitivities to be included in the repository for each bucket across risk classes should be finalized. Golden sources of sensitivities to be identified. Data sourcing standards should be set up. Input formats for obtaining data for each sensitivity should be specified. Ideally, a uniform input format should be set up which can be used for data procurement from multiple sources, to ensure consistent data processing for storage in repository. Service level agreements (SLAs) should be established for data feed where data frequency and source systems should be defined. Ideally, daily data feeds should be obtained with pre-specified cutoff time, especially for international operations. 	To ensure internal and external audit approvals, benchmarks for data quality need to be set up for high quality risk sensitivities data management.	
RISK SENSITIVITIES MANAGEMENT	Governance	Data Quality	Consistent risk sensitivity calculation across front office applications. Sensitivity gap identification and correction. Updated SA calculators
	Data from front office systems beneficial for sensitivity management to be documented.	Regular dataset review to verify prevailing risk factors and to discover new risk factors which may influence the models.	

Measure	Evaluation Aspect	Advantages
RISK SENSITIVITIES MANAGEMENT	Infrastructure	Synergy identification due to avoidance of duplication. Economical approach due to identification of strategic tools and process/infrastructure collaboration Regulatory regime compliance
	Technology synergies with other regulatory initiatives like BCBS 239 should be sought. Prevailing infrastructure should be utilized for supporting FRTB or the existing technology solutions for various regulatory requirements should be leveraged for FRTB.	

Conclusion

- ◆ The FRTB-SBA Capital Charge model requires a golden source of Factor Sensitivities data along with its attributes, mapping rule, data enrichment as per regulatory text for capital charge computation and aggregation at Trading desk level.
- ◆ Data Sourcing and its lineage is becoming critical to effectively manage pricing data and market data. The ability to trace the data inputs to FRTB-SBA Capital models back to source and with a full audit trail of the various transformations that have been applied (Pricing, Market Data, RFs definition, derivations, calibrations, golden price rules, etc.), is seen as critical by auditors and regulators alike.
- ◆ The banks need to take numerous data centric considerations to be factored into the design of FRTB data gap program. The FS data between existing system, Pricing and process capabilities, particularly related to the handling of deeply granular data with mapping requirement as per regulatory text BCBS-D457 will determine the effort required to reach a smoothly operating FRTB-SBA data repository within the bank.

■ *Therefor banks would require Golden Data Centric view to comply with FRTB-SBA Capital charge computation and its audit back to Golden Data Sources.* ■

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