FRTB: Banks' Regulatory Capital Calculations Just Got More Complicated Again ...

ICE Data Services, Alveo, Baker McKenzie, LLP, and Capital Markets Advisors, LLC.

Introduction

The Coronavirus pandemic has forced regulators worldwide to defer several deadlines and the Fundamental Review of the Trading Book (FRTB) is no exception. The FRTB's implementation date has been delayed by one year till December 31, 2022, the new deadline which global regulators intend to meet. Although the new go-live date of January 1, 2023 may seem far away, banks still need to reach a series of FRTB milestones in 2021 and 2022 to achieve the revised deadlines below:

Standard	Original implementation date	Revised implementation date
Revised leverage ratio framework and G-SIB buffer	1 January 2022	1 January 2023
Revised standardised approach for credit risk	1 January 2022	1 January 2023
Revised IRB approach for credit risk	1 January 2022	1 January 2023
Revised operational risk framework	1 January 2022	1 January 2023
Revised CVA framework	1 January 2022	1 January 2023
Revised market risk framework	1 January 2022	1 January 2023
Output floor	1 January 2022; transitional arrangements to 1 January 2027	1 January 2023; transitional arrangements to 1 January 2028
Revised Pillar 3 disclosure	1 January 2022	1 January 2023

Source: BCBS IRB = internal ratings-based approach; CVA - credit valuation adjustment.

Basel's FRTB regulation has been rolling down the tracks for several years now, but this time the timetable for its implementation appears certain. The new regulation has significant implications for the amount and cost of capital for reporting banks. Making the right choices when implementing the FRTB solution can go a long way towards optimizing the cost of capital while simultaneously providing the business ongoing efficiencies and improved capabilities in other areas such as data, technology, risk management and operations.

FRTB requires significant changes to the data and analytics needed to perform the newly mandated calculations. But the challenge for several banks may lie in the amount and types of data to be tracked over time to ensure compliance. Capturing and tracking that data will require significant changes to systems, technology, processes and operations, as well as attention to touch points and interactions between banking and trading book that are called out by FRTB. To those points, the head of ICE Data Services EMEA, Anthony Belcher, has added that "as banks seek to implement solutions it is critical for them to question data providers and data management platforms on the transparency and auditability of content. In addition, banks must consider how easy a given solution is to integrate with their own data to help minimize non-modellable risk factors with the least cost."

FRTB introduces new elements to the Basel II's market-risk framework, namely four new methodologies:
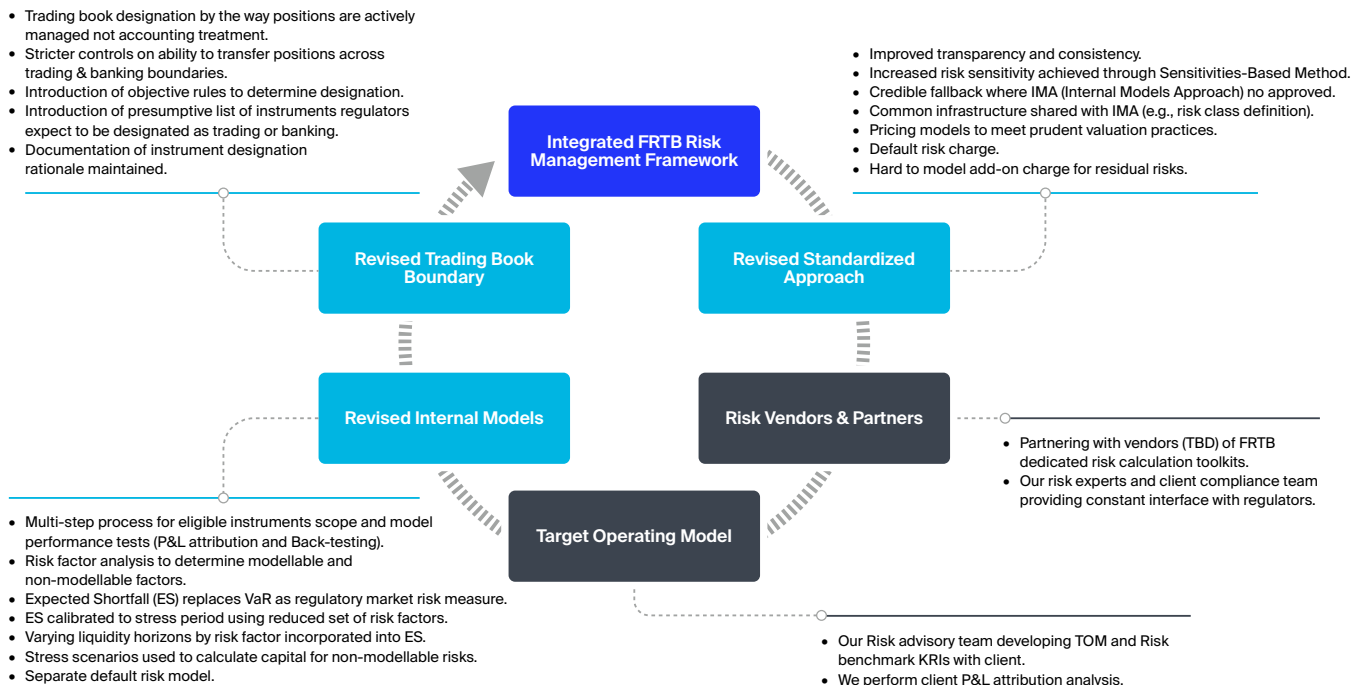
- A revised standardized approach (SA) to calculating capital requirements
- The expected shortfall (ES)
- Non-modellable risk factors (NMRF) which introduce P&L attribution tests
- Desk-level approvals

Although the delayed implementation through the end of 2022 provides some breathing room, the extra time should allow risk staff to address existing and new issues around the data, systems and governance needed to support these new methodologies.

Banks are expected to make changes to their data structures and technology infrastructure, and implement the required processes to begin their reporting based on these new FRTB standards. Now that the new FRTB rules are almost finalized, their complexity requires that banks hit the ground running immediately to avoid delays in the transition from local rules to new systems and processes for full FRTB implementation. This is particularly true for any bank seeking to gain or retain internal model status due to the complex nature of both the P&L attribution requirements and introduction of the Risk Factor Eligibility Test (RFET).

The implementation of the SA approach must be realized by the end of 2022, with potential central bank variations in different jurisdictions. There is still a lot of work to do to achieve alignment of the approach to data between front office, risk and finance; identify reliable data sources on observable prices to minimize NMRFs; review desk structures for the IMA approach; and seek approval from regulators for the Internal Model Approach (IMA) that is expected to occur in 2021 or early 2022 although it will take the bulk of the year to complete the desk level approval process. In addition, banks need to develop proforma FRTB standardized and IMA reporting, variance analysis and budget capital forecasts. They also need to develop the technology blueprint and business requirements to address gaps to FRTB required data classifications and risk factors, and validate P&Ls including realized, risk-theoretical, and hypothetical.

The road to FRTB implementation is riddled with challenges. For example, with FRTB it is hard to have an intuitive understanding of the drivers of the RWA calculations or use FRTB calculations for business decision making and planning. With Value-at-Risk (VaR) calculations there was a linear relationship between increases in VaR and Basel I regulatory requirements, and then later with stress VaR under Basel 2.5. Under FRTB, banks need to revise the capital calculation process, pricing, and P&L impact of changes in market volatilities, or portfolio correlations and diversification. This is a rich area of convergence to explore and analyze to understand the impact of FRTB at the desk or portfolio level, as well as ensuing liquidity requirements. Banks will need to report FRTB RWA alongside liquidity (LCR/NSFR) and leverage ratio impacts. Increases in RWA capital requirements are expected to be correlated with decreasing LCR and increasing leverage in stress scenarios. Our perspective can add a whole different dimension as illustrated in our component analysis of FRTB outlined in our Points of View (POV) below.

- Trading book designation by the way positions are actively managed not accounting treatment.
- Stricter controls on ability to transfer positions across trading & banking boundaries.
- Introduction of objective rules to determine designation.
- Introduction of presumptive list of instruments regulators expect to be designated as trading or banking.
- Documentation of instrument designation rationale maintained.

- Improved transparency and consistency.
- Increased risk sensitivity achieved through Sensitivities-Based Method.
- Credible fallback where IMA (Internal Models Approach) no approved.
- Common infrastructure shared with IMA (e.g., risk class definition).
- Pricing models to meet prudent valuation practices.
- Default risk charge.
- Hard to model add-on charge for residual risks.

Integrated FRTB Risk Management Framework

Revised Trading Book Boundary

Revised Standardized Approach

Revised Internal Models

Risk Vendors & Partners

- Partnering with vendors (TBD) of FRTB dedicated risk calculation toolkits.
- Our risk experts and client compliance team providing constant interface with regulators.

Target Operating Model

- Multi-step process for eligible instruments scope and model performance tests (P&L attribution and Back-testing).
- Risk factor analysis to determine modellable and non-modellable factors.
- Expected Shortfall (ES) replaces VaR as regulatory market risk measure.
- ES calibrated to stress period using reduced set of risk factors.
- Varying liquidity horizons by risk factor incorporated into ES.
- Stress scenarios used to calculate capital for non-modellable risks.
- Separate default risk model.

- Our Risk advisory team developing TOM and Risk benchmark KRIs with client.
- We perform client P&L attribution analysis.

Source: Capital Markets Advisors, LLC

Current Industry Trend

While it might seem that FRTB standards will affect banks uniformly, the impact and demands of FRTB changes will depend on the maturity of each bank's respective internal risk processes, technology infrastructures and data models. At larger banks, where FRTB-ready market data, reliable risk analytics engine or full end-to-end workflows may be expected, a customized package will be required to address FRTB imperatives. Larger banks harbor idiosyncratic portfolios and products that require a high touch data management process and transparency to gain Bank Supervisor's approval for their models and minimize add-on capital charges. This suggests the need to overhaul their existing risk infrastructures which requires specialized expertise to support the enhanced risk methodologies that FRTB introduces.

Tier One Banks

Tier One[1] banks will need to deploy the analytics and domain expertise to measure risk and calculate capital requirements for the Standardized and the Internal Model approaches. For the Standardized approach, which is required of all entities, they must work on Pricers for delta and Vega sensitivity, Greeks for risk factor sensitivity, Full revaluation VaR, stressed VaR and VaR back testing, and Jump-to-default to calculate Default Risk Charge (DRC). For those using the internal model[2] (subject to approval) they will need to work on Risk Factor Eligibility Tests (RFET), Profit & Loss attribution tests and Expected Shortfall (ES) calculations.

Tier Two Banks

Tier Two[3] banks are spending enormous resources and effort to add FRTB reporting capabilities. Without shedding much light on what data construction, clean up or process re-engineering is required, smaller banks have acknowledged that they have a lot of work to do to avoid the strains of the FRTB transformation on their current risk systems and trading risk infrastructures namely around the convergence of risk, finance and trading desk architectures. One obvious challenge to address is the alignment of the trading desk structures adopted in response to Regulation SHO, OATS, Consolidated Audit Trail (CAT) reporting, Volker and now FRTB, into a consistent approach that also supports finance (product control) concern for P&L by desk and business lines.

A look through of the largest and mid-sized banks in the US indicates that they have not always put data and technology enhancement at the top of their strategic objectives. Faced with FRTB imperatives, some of these banks now realize the extent of their underinvestment and insufficient strategic thinking in their approach to data which has left many of them with redundant data lakes, swamps, and siloed applications.

Their challenge going into FRTB is to work strategically to realign risk, finance and trading data in a manner that enables FRTB to fit seamlessly into their current data (including pricing and market data) and technology ecosystems. Of strategic importance is the designation, re-designation and internal risk transfers of products with embedded derivatives[4] which include any instrument with an embedded prepayment option or that is an

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[1] We are defining Tier One banks as the ones leading the Tier 1 capital ranking where is the primary funding source of the bank consists of shareholders' equity and retained earnings.
[2] The Standardized Approach (SA) is required for all entities regulated under the Basel market risk regime, regardless of whether they also run the Internal Models Approach (IMA).
[3] Define Tier 2 Tier 2 capital is designated as supplementary capital and is composed of items such as revaluation reserves, undisclosed reserves, hybrid instruments, and subordinated term debt.
[4] Any instrument with optionality. A non-exhaustive list of example instruments with optionality includes calls, puts, caps, floors, swaptions, barrier options and exotic options.

option or that includes an embedded option such as convertibility or rate dependent prepayment that is subject to the market risk capital requirement. The embedded option is subject to Vega and curvature risk with respect to interest rate risk and CSR (non-securitization and securitization) risk classes. And when the prepayment option is a behavioral option, the instrument may also be subject to the residual risk add-on (RRAO)]. And finally, data and risk bucketing, factor, and sensitivities definition for FRTB's Standardized Approach (SA) is also a known problem area despite the Basel framework providing prescriptive rules to help banks.

Our Points of View – Impact, Implementation Challenges and Applications

In setting the standards for Minimum Capital Requirements for Market Risk, the Basel Committee on Banking Supervision (BCBS) has revised the Standardized Approach (SA) while also presenting a revised framework for the Internal Models Approach (IMA). Both SA and IMA approaches present their own challenges.

The Standardized Approach (SA)

The SA is a capital charge that consists of:

- **Sensitivities-based Method (SBM)** — a parametric market risk calculation based on standardized risk factor sensitivities, volatilities and correlations specified by the Basel Committee.

- **Default Risk Charge (DRC)** — a jump-to-default measure for individual issuers as well as securitizations based on standard netting rules to capture hedging effects, and

- **Residual Risk Add-On (RRAO)** — an additional charge for non-vanilla instruments whose risk is not captured by either of the two metrics above.
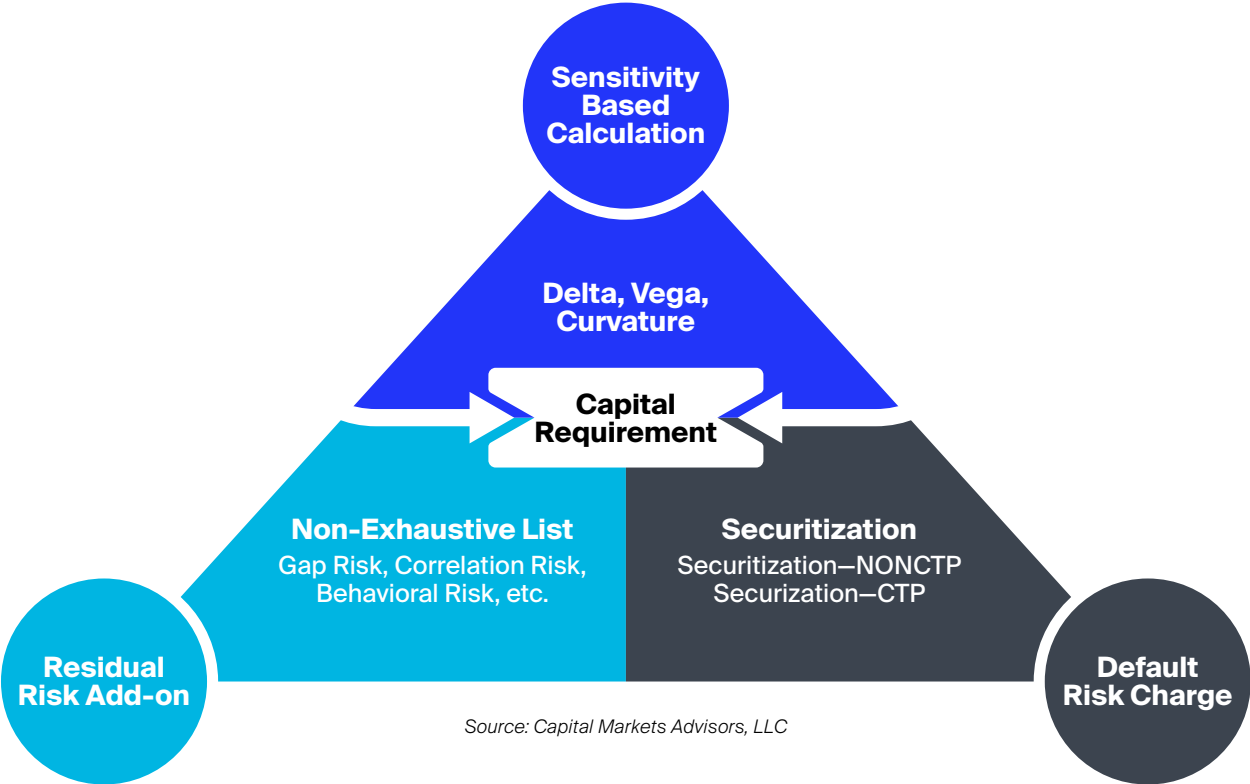
Source: Capital Markets Advisors, LLC

The SA calculation is driven by risk sensitivities, risk weights, and multi-level formulas based on bucketing and netting rules that are specified in detail by the BCBS Committee. Thus, any effective FRTB solution should simplify the mapping to FRTB risk factors, with GIRR, CSR, Equity, FX, and Commodity benefit from the full complement of rates, curves, surfaces, and cubes. However, ICE's Belcher notes that, "the seemingly innocuous exercise of mapping a security to a FRTB Standard Approach numerical bucket has been more complicated than banks originally believed. A similar bucketing schema required for ISDA SIMM found banks with differences of opinion on which bucket was appropriate for margin calculations. ICE Benchmark Administration in collaboration with ISDA has developed a crowdsourcing facility to generate a standard industry agreed upon classification for that case. We believe the industry may want to leverage that infrastructure for FRTB purposes to assist in their FRTB SA analysis."

Greek sensitivities driving the Sensitivities-Based Method (SBM) must be defined and calculated consistently for all asset classes. The Jump-to-Default (JTD) analytics for the Default Risk charge (DRC) should be based on the same settings and data (prices, holdings, terms, and conditions) as the SBM calculations. Residual Risk Add-On (RRAO) instrument classification and notional amount must be based on sound data. The SA's index look through requirement must be based on index constituent data across a broad set of index families and asset classes. Risk bucket classification must adhere to Basel FRTB rules, including both SBM buckets and DRC buckets. And ICE's Belcher adds that given the complexities of the SBM, especially with look-through requirements, ICE Data Services finds banks have an appetite to partner with external providers for sensitivity risk calculations - thus avoiding creating internal analysis for numerous positions that the bank does not directly own. For example, when a bank owns a security there are several requirements in calculating just one risk metric, such as legal, data, and technology infrastructure. These requirements could be taxing and costly for the bank to implement. ICE provides a streamlined approach to responding to banks' risk sensitivities that could be advantageous. Banks must establish Basel risk weights and correlations with configurability to account for different national regulators' rulings on liquidity and applicability of spread and default risk. Banks also need to implement the capital calculation and aggregate charges by the following risk types, total SBM, DRC and RRAO, that will sum to report the total capital charge.

This should be supplemented by instrument and firm-level outputs, including instrument level sensitivities and firm- and node-level capital charges available in outbound files in standard formats. Similarly, pre-trade what-if analysis of impact on the capital charge, in addition to the ability to archive auditable data to comply with regulatory requirements should also be considered. Finally, it is important to note that under FRTB, the SA will act as a floor to the Internal Model Approach (IMA).

Internal Model Approach

The FRTB introduces a more stringent IMA, coupled with a significantly more risk-sensitive Standardized Approach (SA). In terms of the differences with the previous Basel 2.5 approach, the FRTB IMA replaces VaR with expected shortfall (ES) and requires proof that the risk factors used in the model are derived from sufficiently liquid instruments, which is restyled as "modellability."

In addition, banks must demonstrate that their risk models are sufficiently aligned with their front office models by passing a set of P&L attribution tests that the BCBS Committee is finalizing. Firms that cannot meet the IMA criteria must calculate their FRTB capital based on the Standardized Approach alone. However, the capital requirements are expected to be much higher for desks that rely on SA, rather than IMA. Therefore, a comparative analysis and evaluation of the pros and cons of each approach are critical for each desk and bank. Also banks that plan to use the IMA for determining market risk capital requirements must have a rigorous and comprehensive stress testing program at the trading desk and at the bank-wide level.
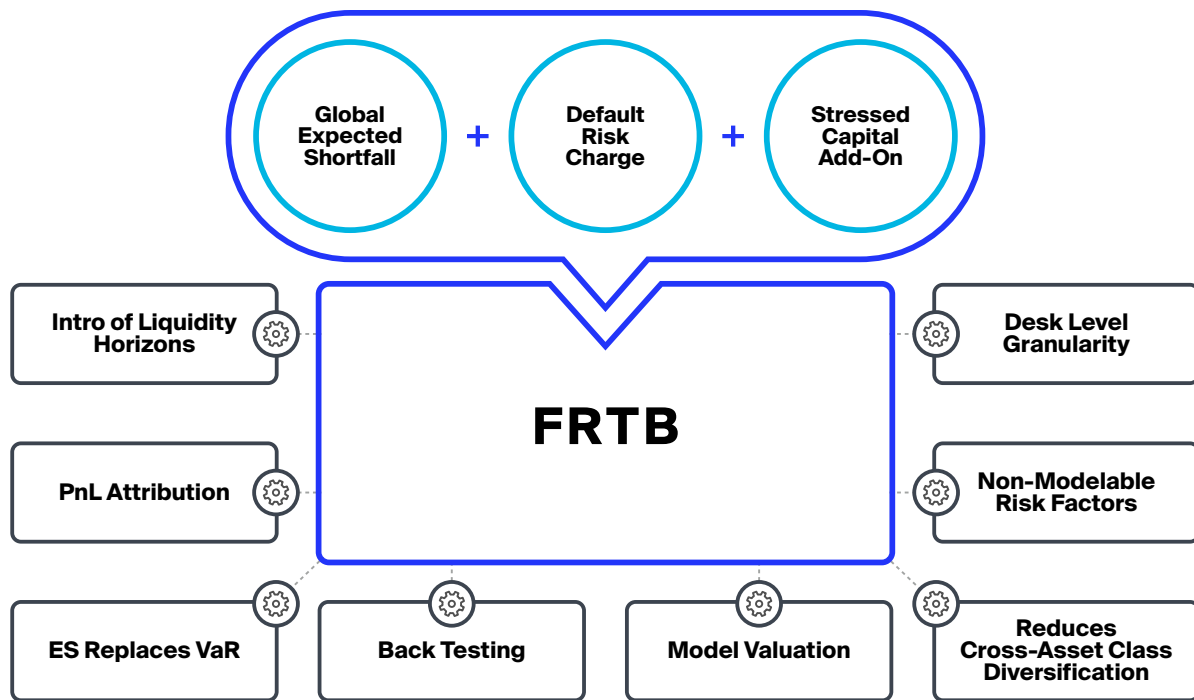
Source: Capital Markets Advisors, LLC

Meeting IMA requirements presents correlated challenges and maintaining IMA approval is difficult especially for firms with fixed income desks. The modellability of the underlying risk factors can be difficult to prove for fixed income, especially where a significant number of underlying risk factors require additional data. Fixed income is one of the most difficult asset classes to model for IMA capital calculation because each bond price for example needs to be mapped to a significant number of risk factors (FX, risk-free curves, risky curves, etc.) and there may be additional inputs (OAS or Z-spreads) required. Credit Default Swap (CDS) curves have had reduced availability and liquidity since the 2008 crisis, which may significantly impact the modellability of fixed income and credit trading. Furthermore, different systems and/or methodologies between the front office and the middle office may also cause variations in results. ICE's Belcher also added that "across our issuer name universe, 80% will have observations on the 5-Year CDS point, the risk factor most traded in the CDS market. But observations on other tenors are rare. We look forward to providing an FRTB product that combines CDS and corporate bond observations to improve the modellability across the full curve for less liquid issuers."

One consideration banks have, that may improve their ability to model the risk of their portfolio and better ensure they stay in the blue and light blue zones[5], is to examine the level of granularity with which they break down things such as yield and other curves. Firms are required, at a minimum to use at least the granularity that is prescribed by the regulators in the regulation itself, but they are allowed to use a finer level of granularity for both risk modelling and P&L attribution. The challenge is that the finer you slice it, the more challenging it is to obtain the necessary data to model those factors and ensure compliance from a data completeness and quality standpoint. On the other hand, by using finer levels of granularity, firms improve their ability to model their portfolios more accurately and thus are more likely to stay in the blue and light blue zones, barring unmodelled
market moves.

A reduction in the granularity of risk factor sets can help with modellability, however it may also lead to a failure of IMA P&L attribution tests. These tests require a comparison between the Actual P&L, Theoretical P&L, and

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[5] The framework for the supervisory interpretation of back testing results for the bank-wide capital model:
(1) Blue and light blue zones corresponds to results that do not themselves suggest a problem with the quality or accuracy of a bank's model.
(2) Dark blue zone encompasses results that do raise questions and for which such a conclusion is not definitive.
(3) Orange zone indicates a result that almost certainly indicates a problem with a bank's risk model.

the Hypothetical P&L. The P&L attribution tests should ensure that there is consistency between the way each instrument is represented in the capital calculation, and the trading desk and mark-to-market calculation.

Actual P&L (APL) is derived from the daily P&L process, time effects and new and modified deals. It excludes fees and commissions as well as valuation adjustments for which separate regulatory capital approaches have been otherwise specified or which are deducted from Common Equity Tier 1. However, it must include FX and commodity risks from positions held in the banking book.

Risk Theoretical P&L (RTPL) is similar to realized P&L and should be based on: (i) the market model implemented for the IMA risk calculation, and (ii) the risk factors variability used in the model (using middle office risk system data). It is the daily desk-level P&L that is predicted by the valuation engines in the trading desk risk management model using all risk factors in the trading desk risk management model (i.e. including the NMRFs).

Hypothetical P&L (HPL) is defined as the P&L that might be realized under certain conditions. These conditions may include various stress scenarios, or cases where possible hedges or additional positions are added to the actual positions. One required variant of Hypothetical P&L requires the bank to value their positions from yesterday, as if they hadn't changed through today's trading, using today's prices[6]. The P&L tests that compare actual P&L versus projected must be calculated at least monthly and reported prior to the end of the following month. If a desk falls in the red zone, it will be required to move from the IMA to the SA, which may result in a significant increase in capital requirements. The precise methodology used to compare the two P&L measures is still being finalized by the BCBS who is apparently leaning toward a preference for measures of correlational and distributional similarity.

Regardless of the precise form the P&L attribution tests eventually take, a high degree of alignment between front and middle office data and analytics will be required. If there are significant differences or inconsistency between front office and middle office analytics, there is a high probability of failing one or both tests.

Back testing requirements is another challenge for IMA. It compares the value-at-risk (VaR) measure calibrated to a one-day holding period against each of the actual P&L (APL) and hypothetical P&L (HPL) over the prior 12 months. Specific requirements to be applied at the bank-wide level and trading desk level are set out by the BCBS and back testing of the bank-wide risk model must be based on a VaR measure calibrated at a 99th percentile confidence level. Finally, the scope of the portfolio subject to bank-wide back testing should be updated quarterly based on the results of the latest trading desk-level back testing, risk factor eligibility test and PLA tests.

Legal Perspective – *Jennifer Connors, Baker McKenzie, LLP*

Boundary Between Banking and Trading Books — A critical aspect of the revised capital requirements are issues related to the regulatory boundary between the banking book, which is subject to credit risk capital requirements, and the trading book, which is subject to market risk capital requirements. The changes reflected in the FRTB regulations reflect the view of the Basel Committee on Banking Supervision ("Basel Committee") that the prior versions of the capital requirement regime had a number of shortcomings that became evident as a result of the financial crisis of 2007-2009. Because the rules, pending the latest iteration to come into effect in 2022, continue to determine whether an instrument is to be assigned to the banking book or the trading book based on the bank's intent to trade the instrument, the rules have, as a practical matter, permitted banks to engage in regulatory arbitrage between the capital requirements of the banking book and the trading book where the bank decision could determine that lower capital requirements would apply on one side or the other of the boundary. Proposed Regulations 25.14, 25.15 and 25.16 specifically prohibit and govern this process, subject only to specified extraordinary circumstances approved by a bank regulator.

[6]MAR 99.6

While under the revised risk framework the basis for the boundary is still trading intent, the Basel Committee believed that the changes would bolster the framework in several respects:

- **Additional specifications regarding the trading book** — To reflect the fact that the market risk and credit risk capital requirements address different kinds of risk, the revised boundary sets out a list of instruments that must be allocated to the trading book and a list of instruments that must be allocated to the banking book under Regulations 25.2 through 25.13 subject to banking book assignment under Regulations 25.7 and 25.8. Banks are not permitted to deviate from these lists. In addition, the revised rules create a list of instruments "presumed" to be in the trading book, and a bank must receive supervisory approval to deviate from these presumptions.

- **Enhanced supervisory oversight** — Banks must make available to supervisors the reports that describe the rationale for including instruments in the trading book (*See* Regulations 25.11 and 25.12).

- **Restrictions on the ability to arbitrage the boundary** — Under the revised framework, there is a strict limit on the movement of instruments between the banking book and the trading book. If the capital requirement for an instrument is reduced because of moving an instrument between the banking book and the trading book, the difference is imposed as an additional capital requirement (*See* Regulations 25.17-25.24).

While the framework generally adds a much higher degree of specificity to the determination of which side of the boundary a particular instrument should fall, the framework will generate a number of interpretive questions that should be addressed by regulators in order for banks to properly calculate their capital requirements under the revised framework. A prime example of an area where interpretive guidance is essential is the requirement in Regulation 25.9 to account for embedded derivatives and reflect them in the trading book. It is not always clear what is an embedded derivative, and it is also not clear how they should be reflected in the trading book, where they would be subject to a requirement to mark to the market. Where the derivatives involved do not trade separately and therefore do not have an independently generated market price, registrants may have significant difficulty in computing how those items should be priced and reflected in the capital calculations. Considering this, it may well be beneficial to approach the supervisory regulators for clear interpretive guidance regarding the handing of these instruments.

Supervision Under the Revised Framework — In addition to the heavy technology lift required to accommodate the significant increase in calculations under the models for market risk (Standardized Approach and Internal Model Approach) needed to comply with the revised capital requirements, the adoption of these changes will also generate substantial compliance and supervisory challenges for banks and their affiliates.

There will be a need to establish ongoing surveillance and supervisory checks per Regulation 25.17 under the revised framework to be able to demonstrate a robust compliance effort. Various areas within the bank , such as Legal, Operations and Information Technology will need to coordinate to develop a process to confirm to senior management and regulators that the required systems are in place to properly calculate the capital requirements for the banking and trading books both in connection with the initial processes and procedures to ensure compliance under the ongoing and annual surveillance and supervisions in Regulation 25.17. There must be a procedure and process to identify significant events and clarity as to what such an event would involve.

In addition, because of the scope of calculations required under the proposal, it is difficult for registrants to fully assess the compliance risks. For example, how are the regulators going to assess compliance for purposes of possible penalties? Regulation 25.9 requires exactitude in calculating hedge values. If a bank makes a small mistake in the required capital and market risk calculations, but is otherwise in compliance with its capital requirements, will the bank be subject to penalties or other enforcement action? It would be extremely useful, therefore, for regulators to provide guidance with respect to how compliance will be assessed, and enforcement conducted.

Effect on Securities Affiliates — To the extent a bank subject to the revised framework has a securities affiliate, whose holdings are included in the overall bank's capital calculations, the bank will also need to consider the affiliates compliance with its own separate capital calculation. For example, to the extent the bank has an affiliate that is a registered broker-dealer in the United States, that affiliate will need to separately comply with the net capital rule of the Securities and Exchange Commission ("SEC") independent of the Basel Committee framework. The SEC net capital rule differs from bank capital requirements and is generally based on the liquidation value of the broker-dealer. Compliance will have to consider the need to comply with a range of specific U.S. Securities Acts requirements, in the context of building in the required standard and related risk models.

Outsourcing — To the extent any of the calculation or other compliance activities related to the revised Basel framework is outsourced by the bank or any of its securities affiliate to a third party, the bank or affiliate will need to consider any applicable outsourcing rule and regulations. For example, U.S. broker-dealers registered with the SEC and subject to oversight by the Financial Industry Regulatory Authority, are required to be responsible for activities outsourced to third parties, particularly where the service outsourced relates to a regulatory requirement and must be included with respect to annual surveillance under Regulation 25.19.

Market Data Integration – *Martijn Groot, Alveo*

FRTB raises the bar on many aspects of market data management. These areas include the increasing volume and diversity of market data, the need for consistency of data across different departments and an increasing scrutiny on data collection, aggregation, derivation, verification, and warehousing processes. Overall, the data management challenges speak to several industry trends.

Current Trend

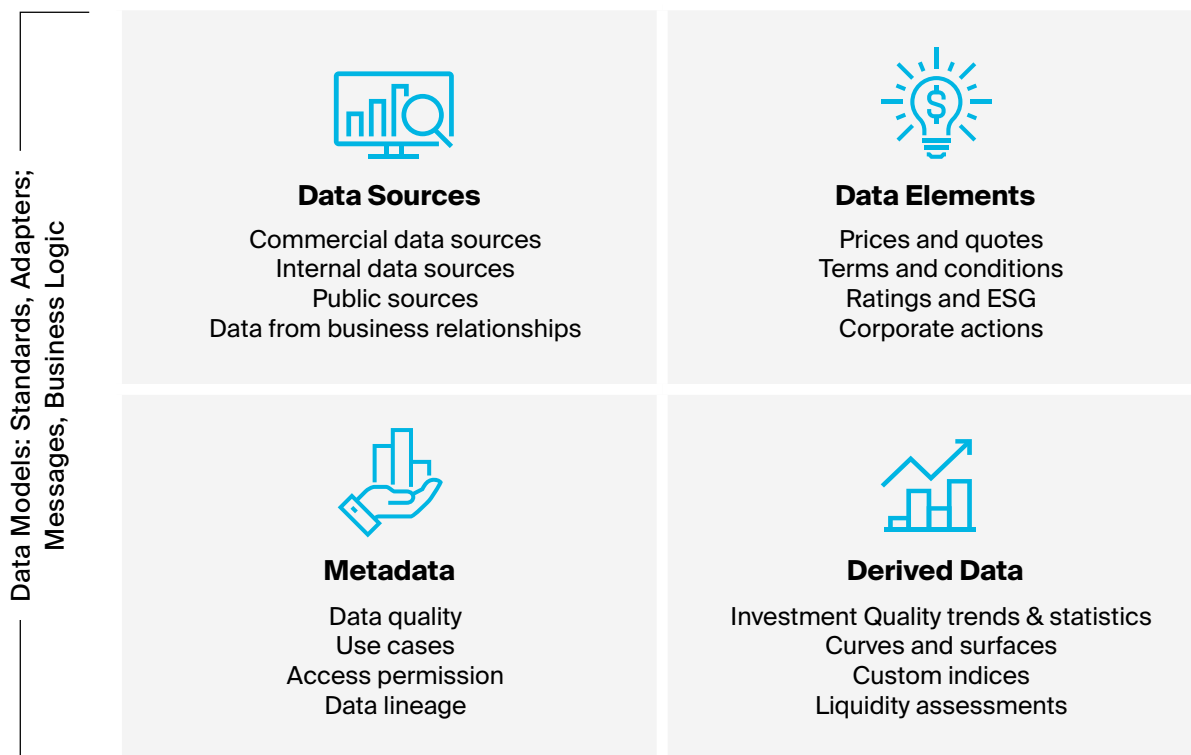| Shift to Cloud	New Technologies	Extended Use Cases	Machine Learning	Internal Data Integration
Industry shift to cloud and to sourcing data management via managed services models	Adoption of open source technology to help cope with volumes and provide a trusted foundation for analytics (Cassandra/Spark) to support quants and business users	Some firms using FRTB as a catalyst, recognizing links between market data requirements stemming from IPV and traded risk	Early adoption of machine learning techniques for operational improvements (advantaged data cleansing automation, intelligent proxying)	Clients look to use their own data sets and combine with third-party products

Source: Alveo

And we also see the following developments when it comes to FRTB and market data management:

- **Data volumes:** Banks will need to keep longer time series going back to 2007 to support the new ES metrics and potentially store different histories per market. Other than quotes, banks need to keep additional fields such as risk class, risk factor, risk sensitivity type, risk weights, liquidity horizon and Reduced Set flag. Also, IMA banks need to perform the RFET requiring trade level data for the last year.

- **Data sources:** Banks may look to combine additional internal sources including their own trade data with additional external sources that offer real price evidentiary support. These could include the main providers of FRTB data offerings such as DTCC, ICE Data Services, IHS Markit, Bloomberg and Refinitiv as well as broker data sets and data from public trade repositories or pooling consortia.

- **Data aggregation:** These additional data sets need to be mapped appropriately to the right risk factors. The FRTB text contains various principles on sound market data management reflecting some of the earlier BCBS239 "principles for effective risk data aggregation and risk reporting".

- **Data derivation:** Data derivation includes the checking of market data sets for completeness and outliers through sets of business rules, the mapping of price data to risk factors, the shocking of risk factors for stress scenarios and the creation of risk factors through analytical models including the calculation of curves and implied volatilities. Through this process, it is important to keep track of changes to business rules, input data sets and calculation parameters.

- **Process scrutiny:** As the repercussions of inconsistent and erroneous data have gone up, banks take a closer look at their data management processes and the metadata they track. Metadata includes permissions, changes and especially lineage: i.e. the ability to trace back and reconstruct what data sources and/or business rules led to a certain outcome or decision. An example of process scrutiny from FRTB is the periodic check of validity of proxies.[JS1]

When it comes to FRTB's data management challenges – all four main categories of more data sources, more data fields, more metadata, and more derived data come together. We summarize these four categories below:

Channels for Sourcing Financial Information

Data Models: Standards, Adapters; Messages, Business Logic

Data Sources
Commercial data sources
Internal data sources
Public sources
Data from business relationships

Data Elements
Prices and quotes
Terms and conditions
Ratings and ESG
Corporate actions

Metadata
Data quality
Use cases
Access permission
Data lineage

Derived Data
Investment Quality trends & statistics
Curves and surfaces
Custom indices
Liquidity assessments

Source: Alveo

FRTB has been long in the making and - like all Basel regulations - went through various cycles and some delays. However, the next 12 months are critical for banks in keeping to the (delayed) timeline. Banks need to look at their data collection, their data warehousing, their back testing, their data quality management processes and, in general, upgrade their data management. FRTB has acted as a catalyst in causing many banks to conclude they need to upgrade their market data capabilities when it comes to ease of access, integration of data warehousing and analytics, data cost management and overall sourcing and aggregation. Not only FRTB but also other business requirements as well as other internal, investor, client and regulatory reporting requirements benefit from an easily accessible source of consistent and verified market data.

FRTB requires a general uplift in market data management capabilities. Through its innovation, scalable technology, and managed services, off the shelf integration with all main data providers and large sell-side install base, Alveo is the partner of choice of banks around the world.

Capital Optimization and Data Modellability – *David Scalzetti, ICE Data Services*

Figure 1: Comparison of Modellability for 2Q20 vs. 2Q19

July 1, 2020 RPE Risk Factors									
IR SWAP	Regulatory Bucket Approach								
FIXED FLOAT	0 <= t< 0.75	<= t< 1.5	1.5 <= t< 4	4 <= t< 7	7 <= t< 12	12 <= t< 18	18 <= t< 25	25 <= t< 35	35 <= t< ∞
CURRENCY	1	2	3	4	5	6	7	8	9
EUR									
USD									
GBP									
JPY									
CAD									
AUD									
MXN									
KRW									
CLP									
ZAR									
NZD									
BRL									
SEK									
SGD									
CZK									
HKD									
PLN									
THB									
MYR									
NOK									
HUF									
CHF									
ILS									
RUB									
TWD									
CNY									
INR									
COP									
SAR									
DKK									
AED									
TRY									
PHP									

Source: ICE Data Services

LEGEND:
Easily Modellable, Passing both the "100-Day Test" and the "4-in-90 Test"
Modellable, Passing either the "100-Day Test" or the "4-in-90 Test"
Non-Modellable, Significant data available
Non-Modellable, Limited or no data available

July 1, 2019 RPE Risk Factors								
IR SWAP Regulatory Bucket Approach								
FIXED FLOAT	0 < = t< 0.75	< = t< 1.5	1.5 < = t< 4	4 < = t< 7	7 < = t< 12	12 < = t< 18	18 < = t< 25	25 < = t< 35	35 < = t< ∞
CURRENCY	1	2	3	4	5	6	7	8	9
EUR									
USD									
GBP									
JPY									
CAD									
AUD									
MXN									
KRW									
CLP									
ZAR									
NZD									
BRL									
SEK									
SGD									
CZK									
HKD									
PLN									
THB									
MYR									
NOK									
HUF									
CHF									
ILS									
RUB									
TWD									
CNY									
INR									
COP									
SAR									
DKK									
AED									
TRY									
PHP									

Source: ICE Data Services

2020 has been an extraordinary year on many levels - why would FRTB implementation plans be any different? Although there has been a further implementation delay as discussed above, IMA ("Internal Model Approach") banks continue to perform capital optimization analysis to prepare for the pending deadline. And what a difference a year makes. In Figure 1 above, we look at a comparison of modellability for more than 30 currencies in fixed-float interest rate swaps between those RFET ("Risk Factor Eligibility Test") calculations as-of 2Q19 and as-of 2Q20.

Some observations are immediately transparent. Firstly, it is no surprise that it is difficult to demonstrate modellability for most long-dated swaps, and certain periphery currencies across the entire tenor spectrum. We would expect that bank exposures to many long-dated swaps are quite low and therefore there are minimal consequences for the lack of modellability at the far right on the heat maps in Figure 1. One can also observe significant modellability improvements in shorter dated LATAM swaps, very notably, the Brazilian Real (BRL) and Columbian Peso (COP) observing 5 and 4 of the regulatory tenor buckets becoming modellable in 2Q20, respectively. With most blue, Non-Modellable, Significant data available fields across the heat maps, where

sufficient modellability data is not available with a data provider, we expect data pooling among the banks and data providers to play a meaningful role in minimizing non-modellable risk factors across the industry. However, data pooling is an extensive conversation unto itself and outside the scope of this white paper.

There are also some less obvious observations when juxtaposing these two heat maps. Modellability is conclusively better in 2Q20 than just a year earlier. We believe there are number of causes that are likely contributing to this improvement, including COVID-19. ICE Data Services has observed significant increases in trading throughout the pandemic (namely, the latter half of March 2020) across virtually all asset classes. Many sectors saw a 20-30+% increase in observed trading volumes in this period compared to early in 1Q20, and Fix-Float interest rate swaps were no exception. Based on data published by the CFTC[7], average weekly dollar trading volumes were ~40% higher in the period of mid-March throughout April as compared to the averages calculated using January and February data. We conclude that at least some of the improvement in modellability is a result of pandemic-related trading.

As we stated above, IMA banks are in the process of performing statistical capital optimization analysis and preparing which desks should be the focus of their IMA applications. If some of the modellability improvements are COVID-19- related, it would be prudent for banks to consider this as part of their capital analyses. In other words, it is feasible that longer term modellability will revert to looking more like 2019 than 2020, which may impact several bank's FRTB-related decisions. In the meantime, banks should consider looking at a time series of modellability when making critical capital decisions based on those data.

Data is an essential consideration for FRTB to manage complex risk calculations and establish the right governance and controls on market data and charge computations. FRTB banks must also reconsider how they acquire, align, and use their reference and market data if they are to satisfy some of the more stringent FRTB requirements relating to data. Solving for data dependency will require addressing lineage along with the FRTB data cycle.

Data solutions should also assist banks with FRTB implementation including comprehensive reference and pricing data along with recently released FRTB observability data to assist with the new Risk Factor Eligibility Test (RFET) across asset classes. These include Reference data - Terms and conditions, industry classifications, corporate structure; Market data - Listed instruments, bond prices, credit curves, derivatives data and Historical data; and - At least 10 years depending on asset class FRTB "RFET" transparency data namely specific transparency data , enabling banks to apply the Risk Factor Eligibility Test according to FRTB rules. These rules include eligible trade and committed quote counts, seasonality, other information, and RFET pass/fail flags.

The other critical approach to data for the IMA is the bucketing approach for the RFET where a risk factor is a point on a curve or a surface (and cubes). And to count real price observations for the RFET, banks may choose from the bucketing approaches that must not be overlapping.

Boundary Between the Banking and Trading books: Embedded Derivatives in Banking book & Assets and Risk Transfer Between Books Tracking External Hedges *– Paul Michaud, Capital Markets Advisors, LLC*

RBC 25.9 defines a set of assets which are presumed to be held in the Trading book and are, for the most part, straight forward. On the other hand, Section 25.9 (6) specifically states that options and embedded derivatives which are part of instruments held in the Banking book must be bifurcated and the derivative must be held in the Trading book. The challenge is that the definition of the kind of embedded derivative subject to this treatment is left vague, leaving the bank potentially subject to the whims of the regulator. On the face of it, something as simple as a commercial loan which gives the Bank's client the right to switch from a floating to a fixed rate at some point in the future, in theory contains an embedded derivative. According to the regulation,

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[7] Source of raw data = https://cftc.gov/MarketReports/SwapsReports/Archive/index.htm
[8] RFET is only based on one years' data and the 10-year+ history is required for the historical ES models.

this option should be bifurcated and held on the balance sheet separately and the option held and treated as part of the Trading book. The implications of this directive are significant:

- Banks would need to identify every asset held on the Banking book which contains an embedded derivative. In the strictest interpretation, this would require going through the terms of every asset to identify any embedded derivatives. This effort alone would be analogous to trying to find all assets which are subject to LIBOR, except without the obvious keywords to search for.

- Options must be bifurcated out, which requires changing the position descriptions on the Banking book to ensure that the derivative is not double counted. This may lead to potentially significant changes to systems and processes which track these assets.

- The derivative needs to be held on the Trading book, and linkages need to be maintained back to the original asset on the Banking book. Again, this requires new systems capabilities to maintain this data and the linkages over the entire lifecycle of the Banking book asset.

- Lifecycle events need to be tracked on both sides of the boundary, implying care and attention to detail for operations.

- The embedded derivative needs to be modelled for both pricing and risk purposes on the Banking and Trading book.

- Finally, the derivative needs to be fed through the appropriate risk calculations as part of the Trading book. Overall, this seemingly innocuous requirement, that many may gloss over in their drive to handle the new calculation requirements, may in fact be a potential iceberg looming ahead in the dark.

RBC25.21 outlines when a Bank may transfer risk from the Banking book to the Trading book as part of hedging activities. For the most part, it outlines standard activities that most banks already perform daily. One change is that a specific internal risk transfer desk must now be used as the primary interface between the Banking book and the Trading book which should not pose much of a problem for most firms. What may be potentially problematic is the level of documentation and tracking that is now required to ensure compliance. One key requirement is that to be eligible for this risk transfer, the hedge must be an external hedge and that the hedge must "exactly" match the internal risk transfer. This poses several potential issues:

- What does "exactly" mean? No hedge is perfect and thus obtaining an exact match is practically impossible, except for simple instruments. Even then the degree to which we can obtain an exact replicating hedge is only valid at a specific point in time, at a specific price level, and fails to be exact the instant the market moves. Documenting the degree of hedge effectiveness and how exact the hedge is over time may be an issue.

- Regardless of the degree to which this exact hedge may or may not be obtainable, the Bank is required to capture and track data which maps the various legs of the hedge, not only to the position in the internal risk transfer desk, but also to the original position in the Banking book. This, by necessity, will require additional data be captured and tracked in the various trading systems on the Trading book side as well as on the Banking book side. Modifying the existing systems, processes, and operations to ensure that this data gets captured, tracked, and updated, on an ongoing basis, in a manner which ensures continued compliance, will require significant effort and care for most banks.

Impact on the CVA counterparty credit risk calculation and market risk trading book RWA *– Jonathan Greenman, Capital Markets Advisors, LLC*

FRTB impacts both the trading book market risk RWA and counterparty credit CVA risk calculations. For the CVA, there are also standardized, and internal model approaches applied. Credit spreads are approximated for illiquid counterparties. Hedges are included in the CVA methodology for single-name CDS, and market risk hedges booked by the CVA desk, (though excludes tranched or basket CDS). The implications for CVA capital calculations are like the trading book in terms of the complexity of data, systems, product mappings, and reporting requirements. Elements of the CVA are also defined for the components of debt value added, and additional funding, capital, and initial margin volatility.

Enhanced Governance Process *– Steven Goune, Capital Markets Advisors, LLC*

Leading banks have put in place Steering Committees that oversee and monitor the transformation roadmap across regulatory and technology infrastructure projects and provide solutions to issues arising from conflicts between the business, compliance, and technology. The need to reinvent trading-risk infrastructure for FRTB should lead to the expansion of this stakeholder group to include capital markets operations, market/traded credit risk, Risk IT, and finance. A successful FRTB must capture the synergies between these stakeholder groups to foster the convergence of business and regulatory programs for example since many have different goals but often use the same data infrastructure. FRTB should leverage the effort already completed or underway for programs like the Comprehensive Capital Analysis and Review (CCAR), the targeted review of internal models (TRIM), the European Banking Authority (EBA) Stress Test, the Markets in Financial Instruments Directive 2 (MiFID 2) for European banks, Interest Rate Risk in the Banking book (IRRBB), the standardized approach for measuring counterparty credit-risk exposures (SA-CCR), IBOR, IRROC, SFTR and IFRS 9.

Banks can expect to incur large cost (more than $250M per current estimates) over 18 to 24 months for FRTB implementation including a 6 to 12 months parallel run period. The governance process impact on products and markets is undeniable, but it will be more significant on the restructuring of business, markets, treasury, and banking book, as well as transfer pricing and inter-desk transfers because banks now need to perform standardized calculations using the revised approach at the trading desk level as if they were a standalone regulatory portfolios. In response to this, banks must perform readiness assessment consisting of a gap analysis between Current State and Target Operating Model (TOM), analyze the integration with other regulatory initiatives, and revise current policies and procedures. Banks will also need to consider upgrading and/or consolidating trading platforms, implement new Risk Engines and enhance P&L validation processes.

Establishing better alignment with other regulatory initiatives may be difficult in Tier 1 banks due to different geographies or interest groups. However, a centralized infrastructure (including golden data sources, APIs to key calculation engines, etc.) can foster those synergies. A more productive approach towards a centralized platform for traded risk starts with programs where significant overlap can be expected, such as FRTB and CCAR. By intricately connecting infrastructures to comply with these big regulatory programs, banks can derive significant efficiency benefits.

Finally, data vendors offer solutions such as front-office risk engines, aggregation, risk calculations and reporting systems, and data-management platforms. Some of them are focusing on FRTB and banks should be better equipped to examine their build versus buy trade-offs and only consider in-house solutions where

flexibility or cost efficiency are required. Many banks still think that certain parts of their infrastructure give them a competitive advantage. But as risk IT gets increasingly ubiquitous, this argument is less compelling, and the option to buy or acquire a shared service model is becoming more attractive.

How We Can Help

FRTB will have an impact on most banks' operating and trading models and 2021 is a critical year to make plans to deal with the complex set of requirements it introduces. Addressing them will require the expertise of practitioners with training in risk analytics, mathematical finance, and regulatory rule interpretation. Our team is prepared to assist with the delivery of historical archives of real-time pricing data, including OTC and exchange-traded instruments from various trading venues and third-party contributors; the origination, consolidation and distribution of reference data; the interpretation of rule requirements; and conduct your readiness assessment and support your implementation team.
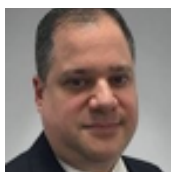
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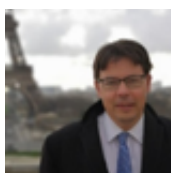
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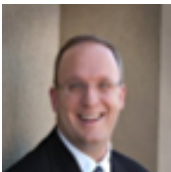
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