

# FRTB reloaded:

The need for a fundamental revamp of trading-risk infrastructure

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# FRTB reloaded: The need for a fundamental revamp of trading-risk infrastructure

Investing in infrastructure isn't glamorous. But a thoughtful rebuild will pay dividends for years to come.

The Fundamental Review of the Trading Book (FRTB)<sup>1</sup> introduces many new elements to Basel's market-risk framework. Some of the most important include new methodologies and approaches—such as expected shortfall (ES), a revised standardized approach to calculating capital requirements, and nonmodelable risk factors (NMRF)—as well as new processes and forms of governance (for example, the P&L attribution test and desk-level approvals). Banks are expending enormous effort to add these capabilities.

Less noticed are the implicit demands these changes make on the trading-risk infrastructure—the data and systems that support the enhanced methodologies and processes introduced by FRTB. Indeed, it might seem that FRTB asks banks only for some light housekeeping; the Basel paper barely mentions infrastructure per se. But the implications are actually enormous: at larger banks, what's needed is nothing less than a fundamental overhaul. In a 2017 McKinsey survey of traded risk strategic priorities for the next five years, banks put data quality and enhancements to the technology platform at the top of the list. At smaller banks, the stakes are not as high, but these institutions also have work to do.

Throughout the industry, the trading-risk infrastructure is showing signs of strain in the face of FRTB compliance. In large measure, that's because banks have underinvested in this area since the introduction of Basel 2.5 and haven't always tackled the work strategically. One of the bigger issues at many banks is a pair of parallel yet misaligned risk and finance architectures (including differences in pricing models, market-data sources, and risk-factor granularity), which leads to contradictory and confusing results.

Recent quantitative-impact studies (QIS) by the Basel Committee and many banks' own analyses on the new P&L attribution test show that more than 70 percent of the desks in a bank fail the test; that is, banks cannot adequately explain the P&L and its drivers. Or consider the large number of manual overrides needed to get the trade-population right, the onerous chore of risk-factor mapping, stale market data, missing reference data, and pricing-model breaks resulting from nonstress calibration: all are infrastructure challenges. Even before FRTB takes full effect, these and other challenges have led to poor back-testing results and further supervisory “add-on” capital charges—for example, value-at-risk (VaR) multipliers greater than five—as outlined in a 2013 study by the Basel Committee.<sup>2</sup>

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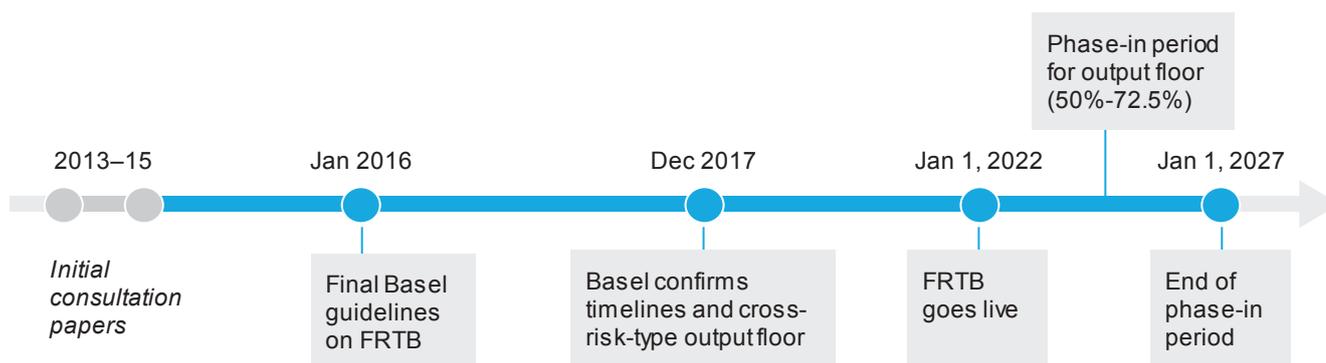
<sup>1</sup> “Minimum capital requirements for market risk” (BCBS 352), Basel Committee on Banking Supervision, Bank for International Settlements, January 2016, [bis.org](http://bis.org).

<sup>2</sup> “Regulatory consistency assessment program (RCAP)—analysis of risk-weighted assets for market risk” (BCBS 240), Basel Committee on Banking Supervision, Bank for International Settlements, January 2013, [bis.org](http://bis.org).

The banks that read between the lines of the original FRTB requirements and started to fix their infrastructure have a strategic advantage now. But the confirmed delay of FRTB implementation to January 1, 2022,<sup>3</sup> has thrown other banks a lifeline (Exhibit 1).

## Exhibit 1

### The confirmed delay of FRTB<sup>1</sup> implementation to January 1, 2022, has thrown many banks a lifeline



<sup>1</sup> Fundamental Review of the Trading Book.

SOURCE: Basel guidelines, McKinsey

In our view, there is just enough time before the deadline to tackle the deeper challenges. Rather than coasting to the finish line, banks should focus on implementing FRTB in a smart way, including the broader strategic goal of upgrading the trading-risk infrastructure from front to back.

Banks that choose this path will capture benefits in capital efficiency, cost savings, and operational simplification. We believe that these benefits can mitigate the full extent of the reduction in banks' ROE resulting from FRTB and other regulations—a reduction we estimate at three percentage points. In this paper, we will examine the business case for an infrastructure overhaul, including the core sources of efficiency and savings; the design principles of a best-in-class infrastructure; and the steps banks can take to implement these ideas.

Banks have been given a golden opportunity to get their trading houses in order and to set the stage for all the advanced technologies (robotic process automation, smart workflows, machine learning, and so on) that are so thoroughly remaking the industry.<sup>4</sup>

### The case for investing in infrastructure

Compliance with FRTB is not the only reason to overhaul infrastructure, but it is a powerful one. A coherent front-to-back technical architecture and aligned organizational setup

<sup>3</sup> "Basel III: Finalising post-crisis reforms" and "High-level summary of Basel III reforms" (BCBS 424), Basel Committee on Banking Supervision, Bank for International Settlements, December 2017, [www.bis.org](http://www.bis.org).

<sup>4</sup> *The future of risk management in the digital era*, Institute of International Finance and McKinsey & Company, October 2017, [McKinsey.com](http://McKinsey.com).

eliminate many sources of discrepancy among the business, risk, and finance views. With that, the chances of supervisory approval increase.

Take one example: the better alignment between front office and risk required under FRTB is impossible unless both share an efficient, consistent firm-wide data infrastructure. Without it, banks cannot remediate discrepancies between the risk function's P&L and the front office's—for instance, the differences that arise in sensitivities, back-testing, and P&L attribution.

Just as important, an overhaul of the trading-risk infrastructure makes eminent sense from a business perspective. Key risk metrics, such as sensitivities, VaR or ES, and risk-weighted assets (RWA), are not just technical or regulatory concepts but also the foundation of senior managers' decision making. To produce reliable, fast, high-quality measurements (as specified in BCBS239), an institution needs reliable, high-quality data processed by the cogs of an efficient operating model. Only then can the bank truly know its complete risk profile and profitability, and execute its strategy with assurance.

Underlying both arguments—compliance and business—are the considerable benefits of consistency and efficiency.

### Consistency through unique taxonomies

Consistency is paramount to establish trust and confidence in the metrics. Unique data taxonomies (or dictionaries or libraries) and a clear data model enable provenance and a clear data lineage for the whole front-to-back trading risk-data flow. “Golden sources”—single data sources for a certain data type, used as a reference in all downstream calculations across the bank—inspire confidence and provide accountability by ensuring that only one version of the truth exists for each data type in the bank. (Note that multiple databases can constitute such a golden source if they use the same data taxonomies and structure.) For example, using one source of market data for both risk and P&L calculations directly improves back-testing and P&L attribution results. It can also empower aligned measurements, erase operational risk in data reconciliation, and increase the quality and completeness of data.

Further, there must be a clear ownership and subscription model for specific data types, as well as adequate enforcement around it. In other words, ownership typically lies upstream, where the data are created or sourced, and downstream systems and users subscribe to the upstream golden sources.

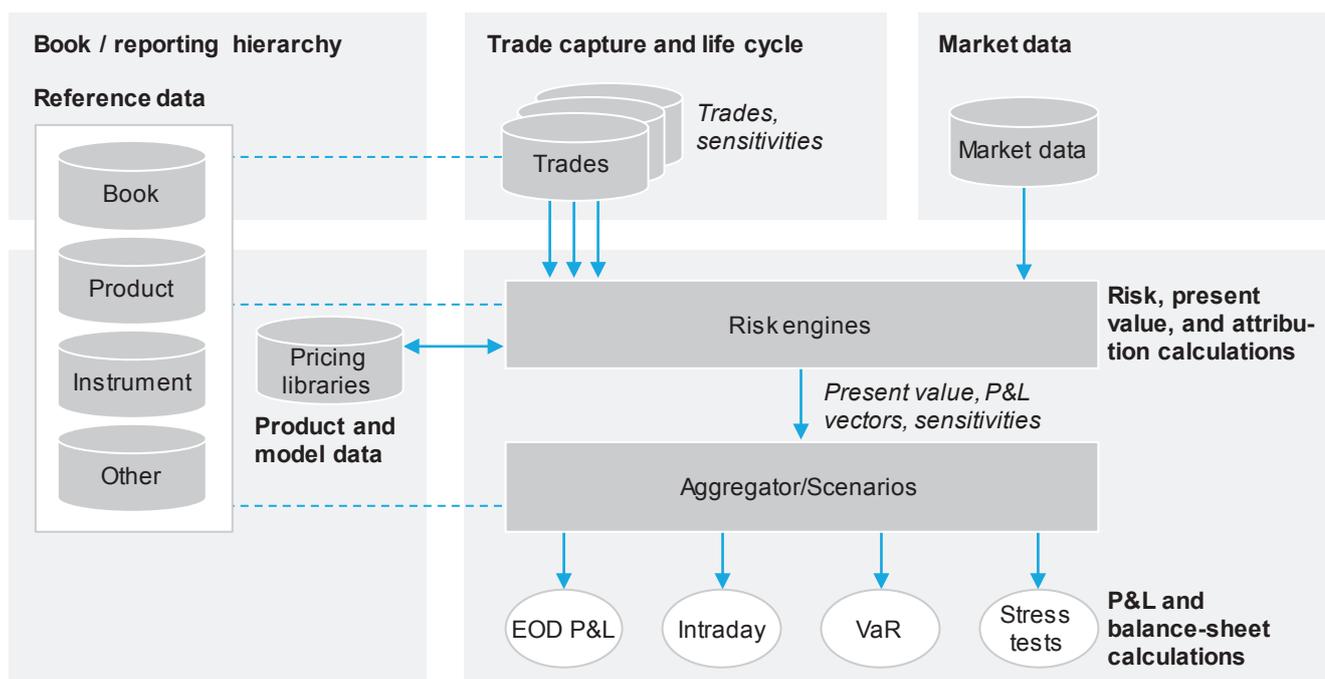
The knock-on effects of unique taxonomies and golden sources extend to the broader organization. By standardizing risk factors and sensitivities throughout a firm, say, or by making universal use of the same pricing-model libraries, banks can move with greater confidence as they design new products or tie together different databases in search of new insights.

We see several examples of banks setting out to establish golden sources for market data and reference data, as well as a single pricing-model library, with significant cost savings and significant capital savings beyond that (Exhibit 2).

## Exhibit 2

### Banks can design a streamlined infrastructure with golden sources

Front, middle, and back offices all tap into same reliable 'golden' sources of data to avoid errors and inconsistency (eg, discrepancy of positions)



SOURCE: McKinsey

### Efficiency: Standardization, automation, and outsourcing

Efficiencies are always welcome, but especially now in view of the significantly higher computational capacity and storage needs of FRTB (such as a tenfold increase in the number of P&L vector calculations over an entire portfolio, and the demands of desk-level reporting). Further, the benefits of consistency—the “goldenness” of the sources—are quickly lost if the infrastructure is not operating efficiently. Primarily, this creates a powerful bias for standardization and automation wherever possible. For example, banks need to standardize their risk-factor and reference-data taxonomies, so that they can easily use their golden sources without time-consuming mapping exercises. Standardization may also mean that banks need fewer vendor licenses and less maintenance and can free up staff and computational capacity. Automated data cleaning (potentially using advanced analytics and machine-learning methods) and automated report production are further key drivers of efficiency, as they address some of the most resource-intensive activities.

Organizational efficiencies are available, too. For example, processes such as VaR and P&L production and reporting, as well as the development and validation of models, can be moved to shared service centers and centers of excellence.

Efficiency also comes from acknowledging that not everything can be done in-house. Outsourcing relevant business-as-usual processes and using products from vendors add value and help a bank to concentrate on building capabilities from within. Such processes include data sourcing and the cleaning of market and reference data; transaction-data pooling for NMRF; pricing and risk modeling; and the development, production, reporting, and validation of models. Efficiency is not a positive side effect but a design choice.

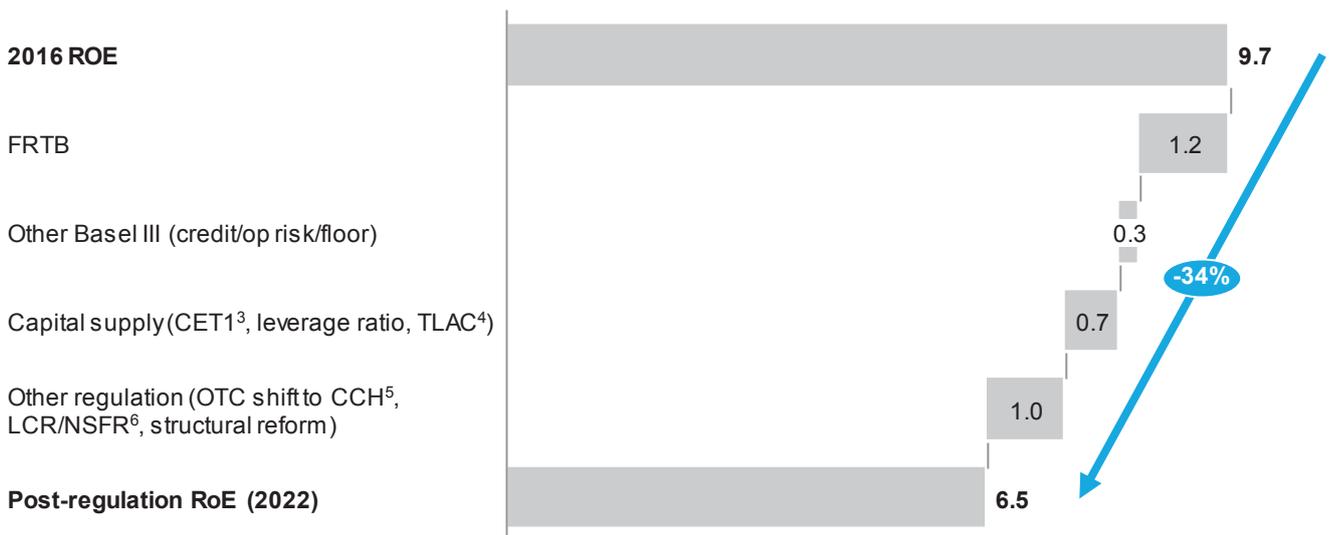
### Sizing the opportunity

On average, the global industry’s ROE remained in the single digits in the last few years (8.6 percent in 2016); so did the ROE of the top-ten global capital-markets players, at 9.7 percent. For the next few years, regulatory-capital constraints, many embodied in FRTB, are likely to keep pressure on profitability. The top-ten capital-markets banks’ average ROE might fall by about 34 percent by 2022, mainly as a result of higher capital requirements (Exhibit 3). We estimate that, on average, the top ten global capital-markets banks will each have to reserve an additional \$9 billion in capital, of which \$4.5 billion results directly from FRTB. Diminished profits lead to strategic complications, not least a limit on the ability of banks to finance future growth. And revenue growth is slowing in many parts of the world.

#### Exhibit 3

#### FRTB<sup>1</sup> and other new rules will dent returns unless banks act

Impact<sup>2</sup> on capital-markets and investment-banking returns on equity (ROE)  
Percent



1 Fundamental Review of the Trading Book.

2 Only direct impact from regulation included (first-order effects), before mitigation actions and business changes. Analysis based on 10 largest capital-markets banks.

3 Common equity Tier 1.

4 Total loss-absorbing capacity.

5 Central clearinghouse.

6 Liquidity coverage ratio, Net stable funding ratio.

SOURCE: McKinsey

In a competitive and uncertain environment, capital efficiency and cost savings become significant drivers for boosting ROE. Both are powered by a revamped trading-risk infrastructure. Together, these moves can mitigate the full extent of the expected ROE decline. If a bank can excel at advanced analytics, the gains might be even greater (see Box 1 “A new and vital element of infrastructure”).

**Capital efficiency.** McKinsey’s capital-management survey<sup>6</sup> highlights the fact that banks, especially in Europe, have significant scope to improve the management of their balance sheets. Banks can use three sets of technical levers that, combined, could reduce RWAs by 10 to 15 percent:

- *Improve data quality and infrastructure.* Effective data management can reduce capital charges, even in the standardized approach (STA). For example, banks can develop

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<sup>6</sup> *McKinsey Capital Management Survey 2015*, October 2015, McKinsey.com.

### Box 1. A new and vital element of trading-risk and other infrastructure

Banks are naturally focused on the monumental task of FRTB compliance; in addition, leaders are improving the infrastructure. A select few of these leaders are also developing proofs of concept for applications of advanced analytics and artificial intelligence. These provide ways to capture a higher share of the potential efficiency gains, in a shorter time frame and sometimes at a lower cost (Exhibit A). Advanced analytics offers three benefits to the data infrastructure, in trading businesses and throughout the bank:

- **Better transparency.** Advanced analytics lets banks use much larger data sets—both their own and those from external sources—typically, with minimal cleansing and reconciling. Data lakes can store data in a broad variety of formats: credit support annex (CSA) documents, yield-curve market data, counterparty reference data, value adjustments, product and counterparty limits, and many more. Advanced analytics can pull things from this mishmash and find unexpected insights for better business decisions and risk management.
- **Enhanced risk management.** Natural-language processing and machine learning, two forms of artificial intelligence, provide robust risk-management tools. Some banks are experimenting with them to automate the review of CSA agreements; others are working on targeted trade compressions and dynamic limit management at scale and still others on machine-learning-enabled data-quality controls and outlier management.
- **Greater operational resilience.** Banks using advanced analytics and artificial intelligence are seeing long-term, sustainable benefits in operational resilience, such as faster response times to unexpected events, better trade surveillance, earlier warnings, and more comprehensive stress testing of portfolios.

That said, few if any banks are truly exploiting advanced analytics and artificial intelligence at scale in their infrastructure, though proofs of concept are mushrooming everywhere.

a comprehensive, relevant, and cross-cutting data model that considers issues such as product classification and segmentation and how to allocate positions to the relevant models, approaches, and risk-weight categories. They can identify gaps in the data and mitigate them by, say, checking the availability of historical market-data time series and sourcing all relevant external ratings. In fact, tapping the full range of external data sources (such as emerging trade repositories and industry utilities) is desirable to ensure comprehensive data sets. Finally, banks can enhance and validate their data through backfilling and thoughtful proxies for hard-to-find data.

- *Enhance processes.* Many processes that figure in the calculation of capital requirements—such as hedging, netting, and collateral management—can be enhanced by, for example, ensuring full coverage and the timeliness and rigidity of the process, as well as by allowing only limited deviations. Further, the data process involved can be standardized and automated. Like cost efficiencies (mentioned above), this approach can help capture capital efficiencies.

**Exhibit A**

**Advanced analytics and artificial intelligence can transform activities across the trading-risk infrastructure**



SOURCE: McKinsey

- *Carefully choose and parameterize models and methodologies.* One core lever for capital efficiency (and accuracy in capturing the risk profile) is opting for the internal-model approach (IMA)—in particular, for products that are heavy RWA consumers. Indeed, the standardized approach often leads to more conservative capital charges and is more prescriptive, offering less flexibility for banks to optimize further. Recent QIS and banks’ internal analyses of FRTB’s impact show that use of the IMA adds 50 percent to market-risk RWAs, while STA adds 150 percent. While impressive, this capital-efficiency gain must be weighed against the operational complexity and cost of implementing and maintaining IMA. The potential volatility in capital caused by switching from IMA to STA when certain desks fail P&L attribution tests is also an issue. Smaller banks, in particular, might make decisions about IMA different from those of larger banks. And those larger banks may carefully consider the portfolios or desks to place their bets for initial IMA approval—they should be clear winners.

Banks must build and enhance the models needed for FRTB, such as ES, default risk charge, and NMRFs. As they do, they should carefully consider the model type (for instance, the choice of full revaluation or the sensitivities-based approach), as well as the model’s underlying parameters, such as risk-factor coverage and assumptions about correlation and liquidity.

Risk factors are an area of special concern. FRTB introduces a steep capital charge for holding illiquid, NMRF-linked products, such as exotic currency pairs and small-cap single credit names. Risk factors such as these are defined by their frequency of observation; NMRFs have fewer than 24 observations a year, with no more than a 30-day gap between observations. NMRFs alone will boost market-risk capital by 35 percent, suggesting that there is material value for banks in demonstrating the observability of risk factors. Besides sourcing market data from vendors, exchanges, and trade repositories, banks can meet the observability criterion by pooling transaction data among themselves—for example, through an industry utility. (For more, see Box 2 “About NMRFs and data pooling.”)

**Cost savings.** Reaching double-digit ROEs also depends on the cost savings delivered by a modern infrastructure. Typically, these range between 15 and 20 percent of the current infrastructure cost base, or \$250 million to \$350 million for an average top-ten global capital-markets bank. (Such efficiencies are additions to the significant cost savings already achieved in the past few years.) Moreover, these cost-saving moves have significant synergies with the process optimization and standardization described above.

Cost savings can be achieved in three main ways. Start with the systems infrastructure, which often has duplicative elements, and the data. Banks can centralize unique data warehouses into golden sources, remove duplicative applications, and consolidate front-office risk calculation “engines” (and repurpose the hardware and people supporting them). We have seen examples of banks consolidating their fragmented landscape of about 40 or so front-office risk engines into fewer than five, with an immense impact on savings.

Standardization and automation, with their strong contributions to efficiency, play a role in cost savings. So does a better prioritization of activities, such as a hierarchy of needed reports. Banks can also streamline their outputs. Eliminating “nice to have” information makes reports simpler; consolidating risk reports to different recipients into one saves time

and effort. Automation reduces manual work and improves effectiveness by significantly reducing the number of errors.

Third, banks can mutualize their costs. New platforms and industry utilities provide shared data—most prominently, market data and reference data—and reduce the cost of the common activities that all banks need to undertake but that don't offer a competitive advantage to any.

A large European bank, which was particularly troubled by problems with duplicative applications and confusion among its data sources, recently put most of these capital-efficiency and cost-saving moves in play. It defined five initiatives. On the technology front, the bank reduced the number of applications and transferred production of some services to a shared service. On data, it worked to build golden sources. In risk and finance, it aligned governance and did technical work to bring finance's P&L and risk's exposure reports into alignment. It simplified its processes. Finally, the bank used demand management to lower the cost of new development (for instance, by asking users to prioritize new functionalities in risk applications) and the costs involved in the daily run of systems (reducing daily breaks, for example, and the associated cost of support and maintenance). Costs fell by more than 10 percent, regulatory delivery became faster, and the accuracy of information improved.

### Toward a best-in-class infrastructure

As banks outline a vision of their future infrastructure, their design should reflect the objectives outlined above: consistency through golden sources, as well as efficiency through standardization, automation, and outsourcing. They would also do well to keep the process fluid to ensure that infrastructure is sufficiently flexible to adapt to the final FRTB rules.

But consistency and efficiency are concepts, not guidelines. Accordingly, we developed a set of principles to guide the design of the target architecture (Exhibit 4). These principles lead naturally to a set of actions that will be broadly relevant to most banks and illustrate concretely how to build a best-in-class infrastructure.

### Overarching guidelines

Best-in-class means aligning the front office, risk, and finance through consistent data management. Banks should develop golden sources to store and maintain data, with data mapped to different books and systems. They should also consolidate front-office risk engines and use them for risk and P&L calculations alike. That will enable businesses to conduct tactical "what if" analyses and rapid stress tests on the same data that risk uses, which will aid transparency into capital consumption.

Finally, banks should follow a three-lines-of-defense setup for their data management but also consider synergies in the use of platforms and data across the lines. This approach not only improves data-quality management but, in combination with the single data platform, may also promote efficiencies. For example, rather than generating separate second-line data sets and models, banks can increase their consistency and efficiencies by using first-line data and tools (such as risk factors, sensitivities, and pricing models) in risk, with adequate controls for validating data and models.

## Box 2. About NMRFs and data pooling

FRTB sets out new guidance on nonmodelable risk factors, or NMRFs. (The “modelability” of risk factors is perhaps best described as their observability.) The regulator seeks to ensure that risk models are credible and calibrated using observable market data.<sup>1</sup> If banks cannot meet the standard, they will be subject to additional stressed-capital charges, which may increase market-risk IMA RWA<sup>2</sup> by 35 percent,<sup>3</sup> or about \$10 billion in additional RWA for an average global bank, according to our estimates. The challenge for all banks is that in some asset classes or products, such as those with long maturities or less liquid underlyings, their own trading volume is not high enough to meet the modelability criteria. The usual data vendors, exchanges, and trade repositories often do not have these complex products in their data sets.

The most promising solution is for banks to pool their data to achieve a sufficient number and frequency of transactions. Data pools could receive transactions from several banks and from other sources, such as data vendors, exchanges, and trade repositories. Pool operators could clean the data and remove duplicates and then aggregate transactions in the same instrument into one complete time series. Such a series would give a truer indication of an instrument’s liquidity than an individual bank’s data in isolation. And such an NMRF utility, if set up well, would ensure that contributing banks can maintain ownership and control of their data and have their data in a secure place but still get the benefit of a shared portfolio view.

To establish a proof of concept, we recently built a pool of about 150,000 transactions across asset classes, sourced from and shared with seven banks. A significant operational effort was needed to source the data in each bank’s front-office systems, clean them, and map them to the ISDA<sup>4</sup> product taxonomy to make them ready for aggregation. But the data pool worked. The experiment suggests that avoiding the NMRF add-on will more than compensate for the effort and expense of setting up a utility.

That said, data pools must address some challenges, including the need to preserve anonymity as data are cleansed and pooled. The submission of price information (which may be required by the regulation) has the potential to reveal proprietary and confidential information and will have to be managed carefully. Banks will need to audit the quality and integrity of the data submitted.

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<sup>1</sup> A risk factor is deemed modellable if it is observable as an element of a real trade or a committed quote between arm’s-length parties. Observations need to take place 24 times in the year, and with no more than a one-month gap between observations.

<sup>2</sup> Internal-models-approach risk-weighted assets

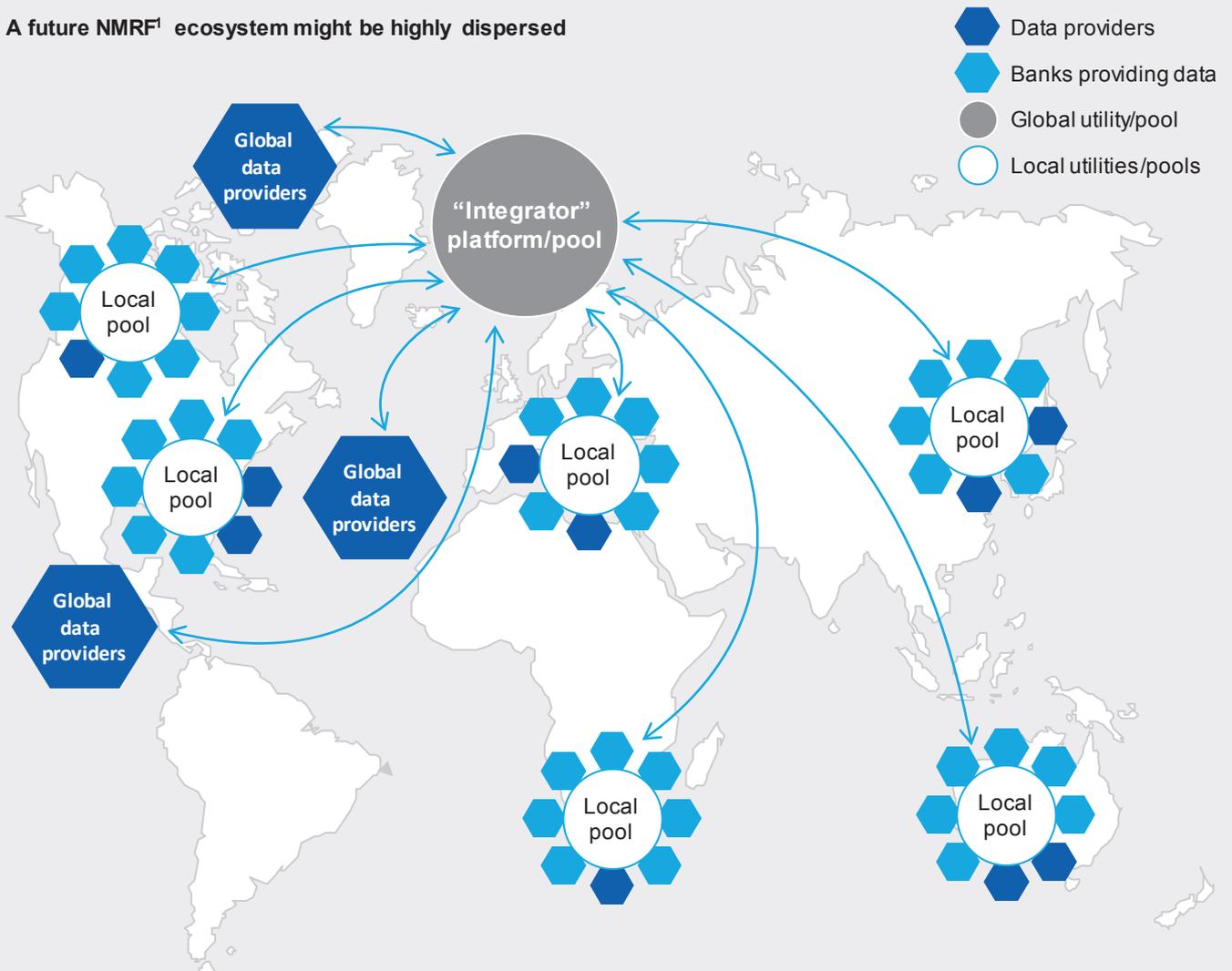
<sup>3</sup> An average of estimates by McKinsey, the Basel Committee on Banking Supervision (BCBS), and the International Swaps and Derivatives Association (ISDA).

<sup>4</sup> International Swaps and Derivatives Association.

What's next for data pools? Regulators seem to be open to the idea, though further clarity is needed on the definition and interpretation of some rules. If regulators agree and the idea takes off, banks are expected to be by far the most valuable data source, as they will have access to the most illiquid, nonexchange-traded, and nonplatform-cleared trades. That said, exchanges, trade repositories, and data vendors may be able to provide some data that banks could then supplement. Eventually, every bank will need to integrate these different data sources to achieve the optimal impact (Exhibit B).

**Exhibit B**

**A future NRMF<sup>1</sup> ecosystem might be highly dispersed**



<sup>1</sup> Fundamental Review of the Trading Book.

SOURCE: McKinsey

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## Exhibit 4

### Best-in-class trading-risk infrastructures reflect basic design principles

Overarching guidelines	<ul style="list-style-type: none"><li>▪ <b>Alignment between front office, risk, and finance</b> through single enterprise-wide platform to store and maintain data</li><li>▪ <b>Alignment between business-as-usual usage and regulatory exercises</b> (eg, enable pretrade mini-stress tests/"what-if" analyses by the business on same data as full regulatory stress tests)</li><li>▪ <b>A three-lines-of-defense setup</b> to ensure strong oversight</li></ul>
Processes	<ul style="list-style-type: none"><li>▪ <b>Clearly defined EOD process</b> by region, creating transparent full data set for bankwide EOD processes</li><li>▪ <b>Standardized workflow</b> for the production of P&amp;L and IPV<sup>1</sup> on daily/monthly basis</li></ul>
Pricing models	<ul style="list-style-type: none"><li>▪ <b>Transparent and aligned risk-data aggregation</b> and second-order calculation (eg, VaR<sup>2</sup> from P&amp;L vectors) for risk/capital measurement</li><li>▪ <b>Universal use of single pricing library</b>, with different parameter settings for EOD and VaR calculation</li></ul>
Trade data	<ul style="list-style-type: none"><li>▪ <b>Standardized booking of all trades</b> at point of transaction</li><li>▪ <b>Single representation of trade</b> in minimal number of repositories, with controlled at-source change process</li></ul>
Market data	<ul style="list-style-type: none"><li>▪ <b>Single repository for market data</b> and derived objects (curves, surfaces, matrices), fully accessible for bankwide use</li><li>▪ <b>Availability of market data back to 2007</b></li></ul>
Reference data	<ul style="list-style-type: none"><li>▪ <b>Full adoption of complete golden source of static data</b>, with full attribute set for front-to-back use cases and aligned/transparent hierarchies</li><li>▪ <b>Unique product definition</b> that meets all regulatory requirements across the organization</li></ul>
Risk factors	<ul style="list-style-type: none"><li>▪ <b>Standardization of risk factors/explains</b> with use of full revaluation wherever practicable—same EOD data set of measures during P&amp;L, IPV risk management</li></ul>

<sup>1</sup> Independent price verification

<sup>2</sup> Value at risk

SOURCE: McKinsey

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A global universal bank has been developing its strategic trading-risk infrastructure over the past few years. As mentioned earlier, it consolidated 40 front-office risk engines into four, expanded the front-office pricing library to cover all products and produce a single set of pricing models for end-of-day P&L and VaR, deployed full revaluation for VaR, and cleaned the reference database; now it is moving toward a golden source of market data. Using the front-office pricing models, the bank produces end-of-day prices and P&L vectors for VaR purposes on the four risk engines. Risk aggregation and reporting are then performed in an aggregation layer of the stack. The impact is lower costs, faster production, and greater alignment of the P&L and VaR.

#### Processes

End-of-day processes need to be well coordinated between regions to generate a full and transparent data set for a bank's end-of-day process. The banks' ambition should be to move from batch to real-time processing, which will allow snapshots of the current portfolio at any moment. While working toward real-time calculations, most banks still have a "follow the sun" batch process for end-of-day P&L and risk calculations, with final consolidation

and aggregation in the corporate center. Many production processes still include a large share of manual steps, such as manual adjustments. A standardized workflow will increase the reliability and traceability of results and capture efficiencies.

### Pricing models

The industry is already trending toward greater use of front-office pricing models for risk purposes, with adjustments made to reduce computational intensity. For many banks, FRTB has triggered this trend. The choice facing banks now is whether to go for full implementation right away or start a staged approach. The main challenge is that risk relies on the front office to make changes.

One US bank has been using a single risk and pricing architecture for the past 15 years. Already, the joint architecture is used by risk and the business to measure and manage risk and performance; it ensures that prices are aligned and that risk and P&L views are consistent. Similarly, a European bank is moving to an integrated market-risk infrastructure with the objective of allowing risk to run front-office pricing models for VaR calculations. It is a major transition to move from running separate risk-pricing models (operated well downstream with a sensitivities-based Monte-Carlo approach) to front-office pricing models in upstream risk engines using a full-revaluation historical-simulation approach. In fact, this can take three to five years to roll out across the whole portfolio. While VaR uses the front-office pricing models, a different parameter setting may be deployed to reduce computational intensity.

### Trade data

Trade data are the beating heart of infrastructure, integral to every important process, such as hedging, risk reporting, capital calculation, and collateral management. Banks are continually finding new uses for trade data; witness the rise of trade surveillance. Several steps can ensure the quality and consistency of trade data, starting with the universal, standardized booking of all trades and collateral at the point of transaction. The default mode should be “no exceptions”; when absolutely necessary, a controlled “solve at source” change process should be well established and widely communicated. Paste it on traders’ desktops if need be, and lock it in the chief data officer’s job descriptions and data-management policies. In reality, banks still suffer from the high cost of—and time wasted on—reconciliations of trade populations among front-office booking systems, finance’s books and records, and risk systems.

### Market data

The availability and quality of market data have a material impact on capital charges—for example, in the calculation of NMRFs, VaR, and stressed VaR, as well as in pricing and hedging activities. Banks can improve market data in several ways, none more crucial than aggregating all their market data and derived objects (such as curves, volatility surfaces, and matrices) into a single golden source. That in turn is integrated into all relevant systems: front office, risk, and finance. Banks should backfill all time series to 2007, using proxies where necessary; if the time series doesn’t include the greatest financial calamity in memory, it is probably worthless. Most banks’ “periods of significant stress” (required for the stressed calibration of ES) came in 2007 and 2008.

The future market-data environment will see contributions from several large vendors, trade repositories, and industry utilities. The new Markets in Financial Instruments Directive (MiFID II), which calls for greater transparency into market data, is leading many banks to evolve their approach to collecting, storing, and using market data.

### Reference data

Comprehensive, sound reference data are essential to enriching trade data sets for more accurate trade categorization, processing, and risk management. Banks should have a single reference database used by all relevant processes, upstream and downstream. They need to define consistent book hierarchies (between risk and finance) and unique product taxonomies, and introduce unique instrument identifiers, especially for instruments that are not exchange traded or otherwise standardized. Industry utilities can help make reference data more comprehensive.

### Risk factors

Most banks often do not have a clear risk-factor hierarchy or taxonomy; they also often use different risk factors in their P&L and risk calculations. For example, one large bank uses about one million risk factors for its P&L but only 20,000 for its VaR calculation (a ratio of 50:1), mainly because each trader created his or her own LIBOR curve, while risk used only one curve with a lot of mapped data and proxies. For a target end state, banks should consolidate risk factors in a single “management curve” and use consistent hierarchies among the front office, risk, and finance.

### Building the new infrastructure

Taking these steps is of course challenging—and made harder by the scarcity of implementation budget and other resources at banks that are having trouble generating profits. Nonetheless, having seen several banks successfully develop and execute programs to revamp the infrastructure, we identified five actions critical to their success.

#### Prioritize well

At a large bank, implementation expenses that include significant parts of these infrastructure changes will probably cost \$100 million to \$200 million. At the same time, banks will quickly start saving on capital and operational costs. Carefully weighing these benefits and expenses for each asset class, geography, and group of trading desks is a core lever to manage the scope, complexity, and cost of implementation.

#### Establish senior oversight

Leading banks have put in place a governance committee specifically for the front-to-back capital-markets infrastructure. This committee executes its core oversight responsibility by designing the strategic infrastructure, outlining and monitoring the transformation road map, overseeing progress made across infrastructure-transformation projects, and resolving any issues that might arise from conflicting requirements. Typically, such a committee

includes the chief operating officers for capital markets, market/traded credit risk, and finance; senior managers of risk-data aggregation and risk reporting; and others as needed.

### Exploit synergies with ongoing programs

Business and regulatory programs already under way might have different goals but often touch upon the same infrastructure. An example could be the program to develop Global Market Shock (GMS) loss forecasts, as required under the Comprehensive Capital Analysis and Review (CCAR). Other regulatory programs include 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), and IFRS 9.

Banks usually try to manage these overlaps by putting in place alignment and feedback loops or by staffing programs with the same colleagues. In large organizations, this gets exceedingly difficult, particularly when programs are commissioned by different departments or located in different geographies. Banks should be on the lookout for synergies between FRTB and other ongoing regulatory programs and exploit these synergies in moving towards a more centralized infrastructure (including golden data sources, APIs to key calculation engines, and so on). In our experience, a productive approach towards a more centralized platform for traded risk starts with programs where significant overlap can be expected, such as FRTB and CCAR GMS (Exhibit 5). By closely connecting infrastructures to comply with big regulatory programs, banks can derive significant efficiency benefits.

### Reconsider build or buy options

In response to FRTB, platform and data vendors have begun to offer infrastructure solutions, as well as components such as front-office risk engines, aggregation and reporting systems, and data-management platforms. With a broad range of solutions now commercially available, banks are in a comfortable position to investigate their buy-or-build trade-offs. They can then focus their implementation efforts on areas where in-house solutions are required to ensure flexibility or other desired characteristics. Many banks still think that certain parts of the infrastructure give them a competitive advantage. But as risk IT gets increasingly standardized, this argument makes less sense, and the option to buy becomes more attractive.

### Secure talent

Given the extensive regulatory book of work at many banks, people with relevant capabilities are in high demand: everyone is looking for skilled analytics experts, data engineers, IT developers, and knowledgeable program managers. One solution is to rotate such people frequently across the bank. Another is to provide an inspiring atmosphere to attract and retain that talent. But there are more innovative approaches to talent management: collaboration with fintechs and other vendors may be one; another could be collaboration within the bank (for instance, by building joint advanced analytics or data analytics centers of competence). Banks should scout things out—for example, by joining communities where digital talent resides, such as conferences and online developer forums. In this way, banks put themselves right in front of the talent pool and can attract people to compelling jobs in banking-risk technology.

Exhibit 5

**Banks can exploit synergies between FRTB and CCAR GMS**

	<b>FRTB<sup>1</sup></b>	<b>CCAR GMS<sup>2</sup></b>	<b>Potential synergies</b>
<b>Parameters</b>	Regulatory assigned liquidity horizons by broad product category	Different liquidity horizons for product-specific shocks	Leverage P&L vectors from FRTB ES <sup>3</sup> calculation for GMS scenario design
<b>Measures</b>	Standardized approach based on sensitivities (sensitivities-based approach, SBA)	Full set of sensitivities to be reported in 14Q template	Build single process and data model for sensitivities
<b>Reporting and controls</b>	Increased complexity of market-risk processes/ reporting (eg, desk level)	Increasing set of controls on stress input and output (eg, CFO attestation)	Enhance data lineage and build single data-control infrastructure for both GMS and FRTB
<b>Scenario generation and computation</b>	Increased computational burden from regulatory requirements (eg, repricing, higher liquidity horizon granularity)		Make pricing data centrally accessible to provide for pricing optimization (eg, machine learning)
<b>Results aggregation</b>	P&L attribution test for Internal-model approach approval	Drivers of P&L loss to be evaluated on granular level	Leverage FRTB P&L attribution test to help explain portfolio vulnerabilities and validate GMS results
<b>Processes</b>	Identification of nonmodelable risk factors	Comprehensive risk-identification framework, also quantifying “risks not in GMS”	Develop common single risk-factor taxonomy and data model

1 Fundamental Review of the Trading Book.

2 Comprehensive Capital Analysis and Review global market shock.

3 Expected shortfall.

SOURCE: McKinsey



Time has a way of sneaking up on us. As one risk leader said recently, “FRTB forces us to do the housekeeping that we should have done years ago.” Every bank should take the message to heart and not wait until the next deadline rolls around.

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