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FRTB MARKET DATA DEMANDS

The need for better quality and more centralised market data

OVERVIEW

Although the Fundamental Review of the Trading Book (FRTB), which is part of the Basel III revisions, has been in the making for several years, banks remain concerned about the implications of implementing its onerous requirements for their wholesale trading activities.

The Basel Committee on Banking Supervision (BCBS) has taken some industry feedback into consideration, clarifying its position or refining the requirements in more recent versions of the FRTB rules,[1] but the regulation still presents banks with significant challenges.

One of those concerns the demands on the quality and volume of market data needed to determine the revised market risk capital charge. In this paper we will discuss those market data challenges, along with potential means to address them.

Before doing so, it is important to highlight other regulations that have a bearing on FRTB compliance:

The BCBS 239 framework ("Principles for effective risk data aggregation and risk reporting") was issued in 2013 and focuses on the guidelines for risk data aggregation and reporting.[2] The overarching requirements of timeliness, quality and accuracy will also apply to the calculation of the revised market risk capital charge. It is worth noting that G-SIBs were the first banks to start on this compliance journey, and studies show that none is yet fully compliant, despite years of effort. These guidelines have not yet been adopted in all Asian jurisdictions. Where they have, banks should weave them into their FRTB compliance journey; where they have not, it would be prudent to adhere to their spirit.

The Bilateral Margin regime (BCBS-IOSCO) for non-centrally cleared OTC derivatives requires initial margin (IM) or Vega margin (VM) calculations for bilateral margining.[3] Given the complexity of IM calculations, the industry has agreed on the ISDA Standard Initial Margin Model (SIMM) sensitivity model, which is similar to the FRTB's sensitivity requirements (although there are some differences).

The 2012 LIBOR-rigging scandal precipitated the demise of the LIBOR reference rate, which is expected to be gradually decommissioned from 2021. Liquidity across the term structure of the alternative rates will take some time to grow, while that of LIBOR currencies will continue to diminish. This creates new challenges for the FRTB's modelling requirements.

It is therefore prudent that banks consider a cross-regulatory view and build efficient compliance programs that help to reduce the impact on their overall franchise value.

DATA CHALLENGES

There are a number of data challenges in adopting the FRTB. These can be categorised in the following eight areas:[4]

1. Modellability of Risk Factors

The most obvious market data demand comes from testing the modellability of risk factors for those desks that intend to apply to use the internal models approach (IMA). The final standard clarifies the eligibility criteria for real price observations, which should encourage more trading desks to apply for the IMA without facing a disproportionate capital impact when risk factors fall under the category of non-modellable risk factor (NMRF).

The latest guideline confirms the final Risk Factor Eligibility Test (RFET) as follows:

To pass the RFET, a risk factor that a bank uses in an internal model must meet either of the following criteria on a quarterly basis ...

1. The bank must identify for the risk factor at least 24 real price observations per year (measured over the period used to calibrate the current ES model, with no more than one real price observation per day to be included in this count). Moreover, over the previous 12 months there must be no 90-day period in which fewer than four real price observations are identified for the risk factor (with no more than one real price observation per day to be included in this count). The above criteria must be monitored on a monthly basis; or
2. The bank must identify for the risk factor at least 100 "real" price observations over the previous 12 months (with no more than one "real" price observation per day to be included in this count).[5]

What qualifies as a "real" price? The BCBS has also provided a clear definition: it states that the price must be derived from an actual transaction or a committed quote or, if provided by a third-party vendor, then that vendor should provide evidence of the transaction or committed quote. Collateral reconciliations or valuations cannot be considered real prices.

The completeness and quality of data directly affects the passing rate of RFET, which in turn has a consequence on the NMRF capital charges calculated under stressed scenarios. Data-pooling infrastructure could help to tackle this challenge. This concept has been proven in Europe and the US, but is currently a blank area in the ASEAN region.

2. Risk Sensitivity

As the Standardised Approach (SA) is the default fallback for the IMA, the data and calculation engine required should be in place for all of the trading desks. The main component of the SA capital is the capital requirement calculated under the sensitivity-based method (SBM). This method aggregates three risk measures—Delta, Vega and Curvature—for seven risk classes.

While Delta and Vega are well-understood, Curvature is a new component introduced in the FRTB to measure the incremental risk that is not captured by the delta risk measure for large price movements in an option. It requires bumping all the rates (up and down) by the Risk Weights prescribed by the FRTB and revaluing all of the instruments subject to curvature risk. This process also requires making sure that there is no double-counting on delta risk.

One challenge here—as with ISDA SIMM calculations—is that correlations between risk factors must be factored in correctly in order to aggregate the effect of individual sensitivities into each risk factor. Lastly, the bank must run three correlation scenarios—high, medium and low; this is done by scaling the correlation parameters. Curvature risk, then, is similar to stress-testing an option portfolio, and this poses significant challenges in terms of data availability, infrastructure and IT capacity.

3. Adding a New Instrument

Another challenge in IMA is, once a new instrument is added, real price observations), it has to be proxied using a transparent, auditable process. For a newly traded securities/rates, a price history does not reflect its risk factor(s). For instance, a newly traded bond translates its price history should be backfilled, and when this history is not available or not "modellable" (e.g. new issue/IPO or insufficient in an interest and credit risk. These risk factors are thus to be derived historically.

Finally, most risk systems require historical scenarios taking into account trading calendars and day count conventions rather than historical prices to be fed. These transformations on large data sets should be automated as much as possible to avoid operational inefficiencies and risk.

This data challenge could also arise even if the trading desk takes the SA approach, because adding or updating a new instrument requires adding and mapping the applicable risk factor to the appropriate risk buckets and sensitivity shocks. This data should be fed into the risk system before the bank starts trading the new instrument.

4. Liquidity Horizon

The liquidity horizon (LH) is the time assumed necessary to exit or hedge a risk position without materially affecting the market price in stressed market conditions. The LH is determined per risk-factor bucket and could thus change if a risk factor is reclassified. The LH is also affected if a risk factor becomes non-modellable. The applicable historical simulation (HS) is reflected by scaling the expected shortfall (ES) calculated on the 10-day base-horizon for the IMA and the adjusted risk weights for the SA.

5. Consistent Data Taxonomy

Under the sensitivity-based method, the bank must determine each sensitivity and curvature scenario based on the instrument prices or pricing models that an independent risk-control unit uses to report market risks or actual P&L. This requires aligning the front-office pricing models with the FRTB sensitivity models used by risk. Implementing a consistent data taxonomy across the organisation is critical in order to comply with both the FRTB and BCBS 239. This consistency is not only crucial for the SA but is also critical should the bank decide to apply for the IMA, since it sets the stage for alignment on the P&L Attribution tests (see point 7, below).

6. Default Risk Charge

Calculating the default risk charge (DRC) brings a number of data challenges:

- The DRC requires recognising correlations between defaults among obligors. Default correlations must be calibrated over a period of at least 10 years and must include a stress period—typically 2007 or 2008. The DRC should be measured over a one-year liquidity horizon.
- To calibrate the correlation matrix, it is more desirable to use single-name bond curves (bond price curves, CDS timeseries or equity price curves) than indices. However, doing so means much more work is needed to source the data for the additional curves required for each bond, and to have a sufficiently long history.

  Where possible, the bank must use an internal ratings-based (IRB) approach to estimate the probability of default (PD). Where such estimates do not exist, PDs must be computed using a methodology consistent with the IRB methodology, and must satisfy the following conditions:

  – This data should be based on publicly traded securities over a complete economic cycle and over a minimum of five years.

  – A bank may also use PDs provided by external sources (S&P, Moody's, Fitch, etc), provided these can be shown to be relevant for its portfolio.

7. P&L Attribution

Trading desks using the IMA must demonstrate every quarter that they satisfy the P&L attribution ("PLA") test. Banks may align the daily risk-theoretical P&L (RTPL) input data with the data used in the hypothetical P&L (HPL) as long as they provide proper justification and documentation. They can do this when the differences in inputs are due to different providers of market data sources or to the time-fixing of market data sources, and may do so only for the purpose of calculating their PLA.

HPL and RTPL may use the same market data as a basis only, but must use their respective methods (which can differ) to calculate the respective valuation engine parameters. Banks may align the market data between RTPL and HPL pre-transformation, but may not do so not post-transformation.

8. Stress Testing

Banks must undertake a routine and rigorous program of stress-testing. This covers supervisory scenarios, simulation scenarios based on the current portfolio against previous stress periods, and self-developed hypothetical scenarios. The hypothetical scenarios should reflect shocks based on the characteristics of the bank's portfolio—or example, factoring in problems in a key region of the world along with a sharp move in oil prices. To derive the return over this period, these historical stress scenarios require a risk-factor value for the stress period start date and end date.

CURRENT STATE OF THE MARKET DATA MANAGEMENT LANDSCAPE

The FRTB challenges go beyond the issues outlined above and are exacerbated by the state of the market data management infrastructure that is found in most banks today.

The diagram below shows an example of this landscape that covers two distinct data functions: the first, in dark purple, illustrates the daily delivery of the end-of-day market data for trade valuations and independent price verification; the second, in light purple, is a proxy that backfills historic market data and generates historical and stress scenarios for market risk purposes.

Because trade and risk systems are largely unable to extract, transform and load (ETL) data, and lack derivation and quality control services, many of these processes are semi-manual and often rely on a combination of Microsoft Excel-based and in-house solutions.

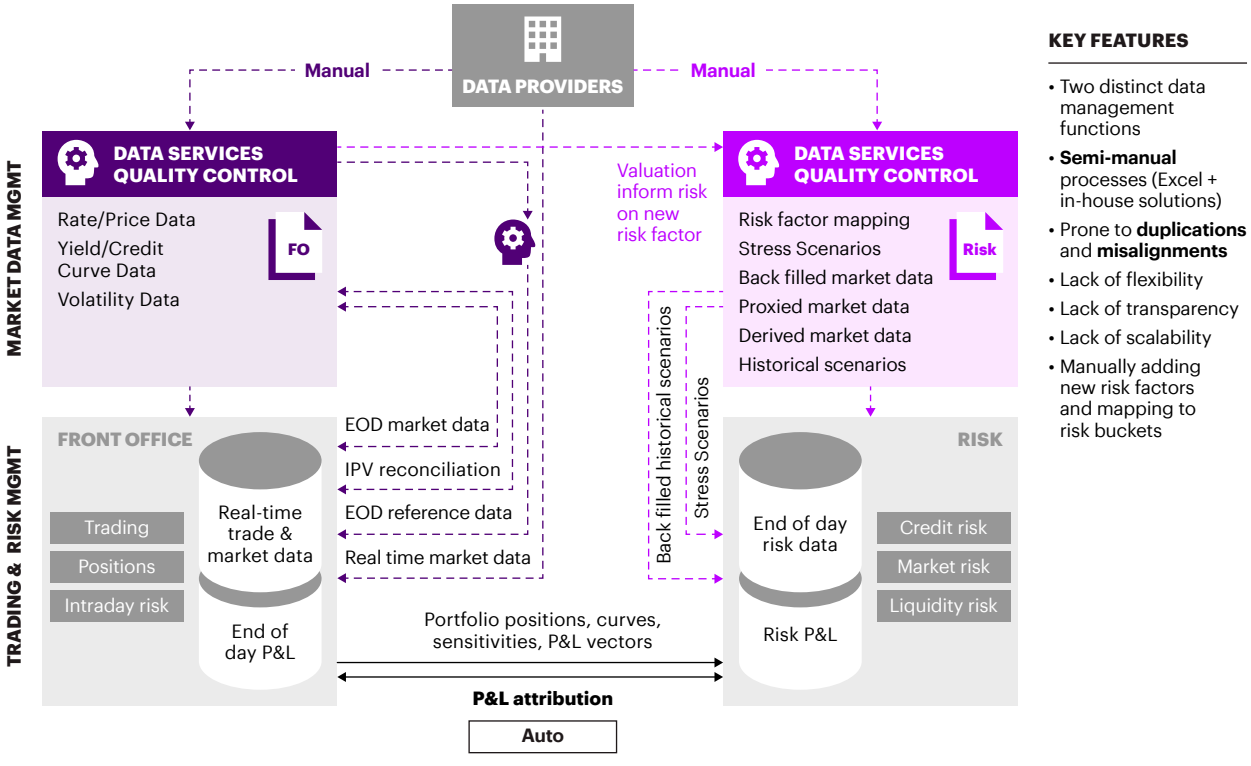
This lack of automation brings a number of drawbacks, including:

- Acquisition, validation and mapping processes are often redundant;
- Processes lack standardisation;
- Manual steps introduce operational risk.

Furthermore, the purpose-built nature of an in-house dedicated solution typically means:

- A lack of flexibility to adjust flows, models and rules to cope with new (regulatory) requirements;
- Their black-box nature lacks data flow and configuration transparency;
- There is a lack of scalability, because these are typically not designed for vast amounts of additional data.

Figure 1: Current Market Data Landscape Infrastructure



KEY FEATURES

- Two distinct data management functions
- **Semi-manual** processes (Excel + in-house solutions)
- Prone to **duplications** and **misalignments**
- Lack of flexibility
- Lack of transparency
- Lack of scalability
- Manually adding new risk factors and mapping to risk buckets

Source: NeoXam

BEST PRACTICES FOR MARKET DATA MANAGEMENT

Design Principles

What each of these challenges has in common is the need for market data, a factor acknowledged by the BCBS. The diagram below illustrates several examples of market data design principles culled from the latest Basel Committee FRTB publication[6] and shows what banks need in place to ensure that their market data infrastructure functions properly.

The principle is that banks must define what this market data infrastructure looks like, must base it on standards, and must see to it that this serves as the single source for valuation and market risk. This is done by ensuring that data flows are automated where possible, with proof of compliance provided by lineage and auditable access to its configuration.

The automated data flows should be implemented in a way that enables timely acquisition, cross-referencing and integration of datasets from external providers and internal sources. This is underpinned by a common data taxonomy and dictionary for security terms and conditions, various price and risk factors, business rules for appropriate risk-factor bucketing, mapping and classifications, and quality checks to ensure that data is consistent and reliable.

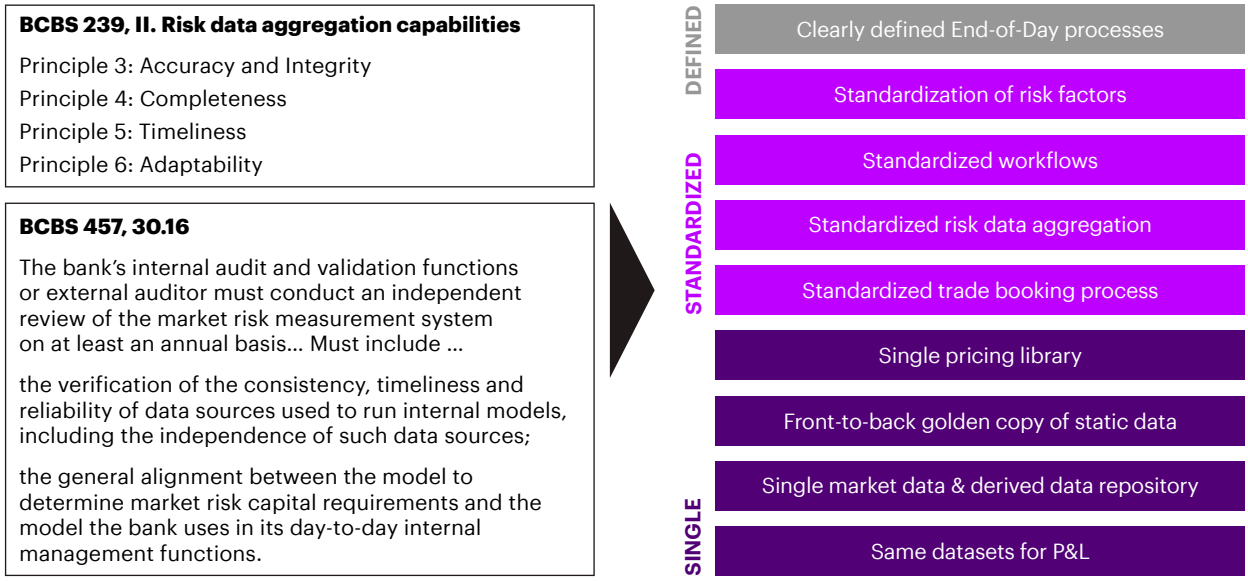
Finally, banks must be able to automate this process, and have full transparency and access to:

- The configuration of distribution of any risk factor or metadata to valuation and risk systems.
- Screens and dashboards to rectify suspect market data and/or to assign proxies when needed.

Establishing such a robust and transparent market data infrastructure that meets the specific FRTB market data requirements laid out earlier will require a significant effort from most banks, especially given the larger historical data volumes needed: a 10-year window plus stress period, compared to the typical one-year history used for Value at Risk (VaR) computations currently or the three-year window plus stress period under SIMM.

The rest of this section will describe a typical starting point for banks, and then propose a best-practices trade, risk and market data infrastructure with the most relevant changes and benefits.

Figure 2: Design Principles



Source: Accenture/NeoXam, derived from BCBS 239 and FRTB.

Integrated Trade & Risk Market Data Infrastructure

All of the drawbacks outlined earlier would be addressed by the following best practices set-up, which serves both valuation and risk via an integrated market data management solution. It also satisfies the single, standardised and defined design principles for a market data infrastructure mentioned above.

The goal is to automate as much as possible via Security of Interest (SOI) subscriptions, a data service that triggers auto-loading and mapping. The SOI concept takes into account the fact that the scope of the data to be managed is not static, but changes based on trading activities. When a trade results in the bank opening a security position, this is added to the SOI list; it is removed from the SOI when the position is closed. This automatic adjustment enables fully automated loading and mapping of the relevant data. User interaction is only needed in the case of exceptions, either during this automated process or in the event that any pre-defined data quality checks are not passed.

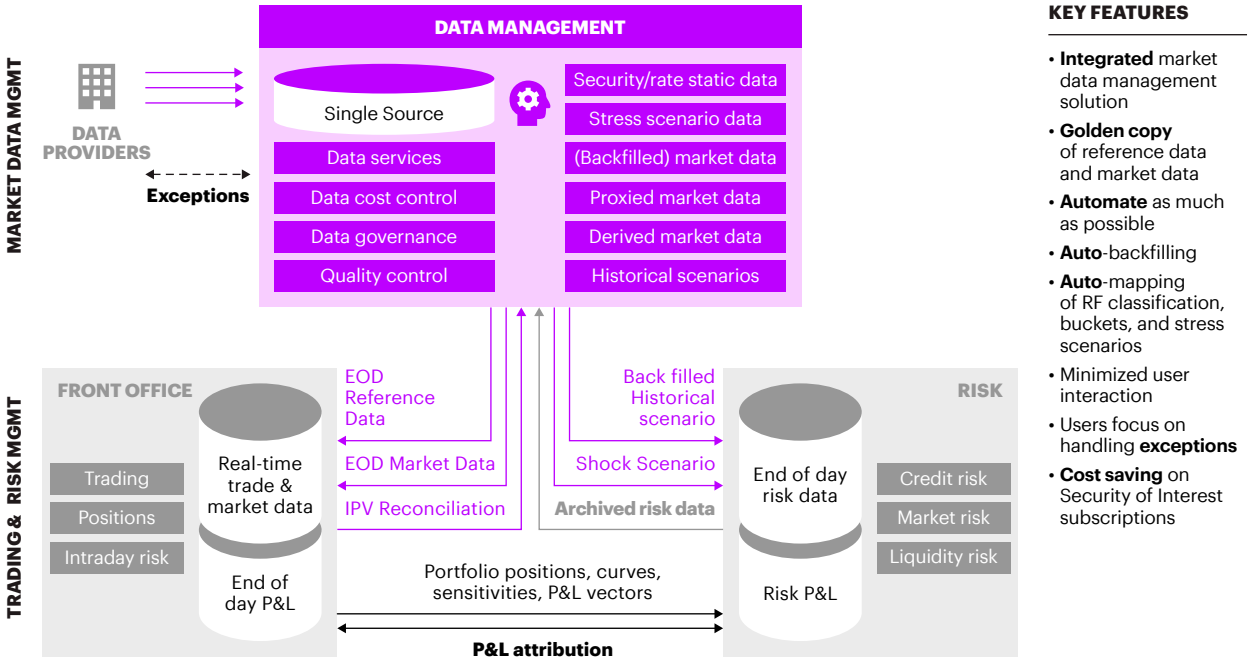
Basing trading and risk models on a single market data repository ensures consistency in terms of market data taxonomies as well as straightforward handling of processes dependencies, such as automatically backfilling for historical data, along with mapping to risk factor classification, risk and sensitivity buckets, and stress scenarios for any new SOI.

Earlier, we looked at eight specific data challenges with respect to FRTB adoption. We will now look at how the above framework addresses those challenges from an SA and an IMA perspective, taking the SOI subscriptions as a starting point.

Standard Approach Specific

Banks should set up the sensitivity buckets and their shocks for all risk classes, then define the mappings to the relevant risk-factor reference data. When a new SOI is added, or when its reference data is updated, the related risk factor(s) must be added or updated and mapped to the defined risk buckets and sensitivity shocks. Subsequently, the sensitivity shock data should be fed into the risk system. Each risk classification should be consistent between trading and risk, as per the taxonomy discussed above, and each should be audited.

Figure 3: Target State Market Data Management Infrastructure



Source: Accenture/NeoXam.

Internal Model Approach Specific

When a new SOI is added or updated under the IMA, the bank must add the applicable risk factor and map it to the appropriate risk buckets and liquidity horizons for the provided supervisory, and to the self-developed simulation scenarios shocks. This data should be fed into the risk system in the same way as the sensitivity shock data is under the SA.

In addition, the bank must backfill the time series for any new risk factor—which could be based simply on sourced historical market data for the new SOI. In a number of cases, however, this will require deriving a risk factor (such as zero rates or widening credit spreads). In the event that historical data is not available, the bank should assign a proxy, with the backfilling derived from the proxy's historical prices.

As noted in the previous section, some historical price data might not be eligible for use as a risk factor; that eligibility is determined by the RFET, which implies a derivation and/or a storage requirement. The result of the RFET concerns meta-data over a time series period and should this be stored and managed like this, rather than on an individual risk factor level. The test itself can be run by sourcing from a data-pooling service or it can be executed within the data management solution based on actual trades and on verifiable quotes sourced. Either way, this would involve large amounts of data which would require optimised storage and analysis processes.

Lastly, the bank will need to generate historical scenarios based on this historical risk factor data, and those scenarios must be generated, stored and delivered to the risk system. As with trades, this historical data and these scenarios involve a large amount of data, which must be stored optimally.

Other Considerations

Banks must also be aware of the following aspects when designing a new market data solution and process:

User experience – The volume and complexity of data that is managed on a daily basis must cater for market data teams, product controllers and risk managers. It is imperative to focus on a positive user experience by using both out-of-the-box and customised dashboards. Different user groups must also be able to query, visualise and consume data in a way that best suits their respective function. For example, risk operations and the FO risk manager have a different focus. All of this must be anchored in the BCBS 239 principles and must incorporate objective KPIs and monitoring.

Cost to Serve – With the continuing cost and regulatory pressures faced by banks, it is critical to think of both compliance and cost dimensions. We estimate that centralising market data systems, feeds, contracts and processes (where relevant) should generate cost savings of up to 20 percent. Banks should also be able to enjoy a centralised view of data consumption and allocate the cost to respective data users accordingly.

Table 1: Summary of Market Data Impacts

	Generic	Standard Approach	Internal Model Approach
Initial	Define taxonomy	Set up sensitivity scenarios	Develop hypothetical stress scenario
New SOI	Create required (derived) risk factor(s) for new SOI	Generate sensitivity scenario shocks	Hypothetical stress scenario mapping Generate historical stress scenario (backfill/proxy) Generate historical scenario (backfill/proxy/ liq. horizon mapping)
Ongoing		Update sensitivity scenario mapping (after ref update)	Maintain self-developed hypothetical stress scenarios Update hypothetical scenario mapping (after ref update) Generate historical scenarios (proxy/liq. horizon-mapping)

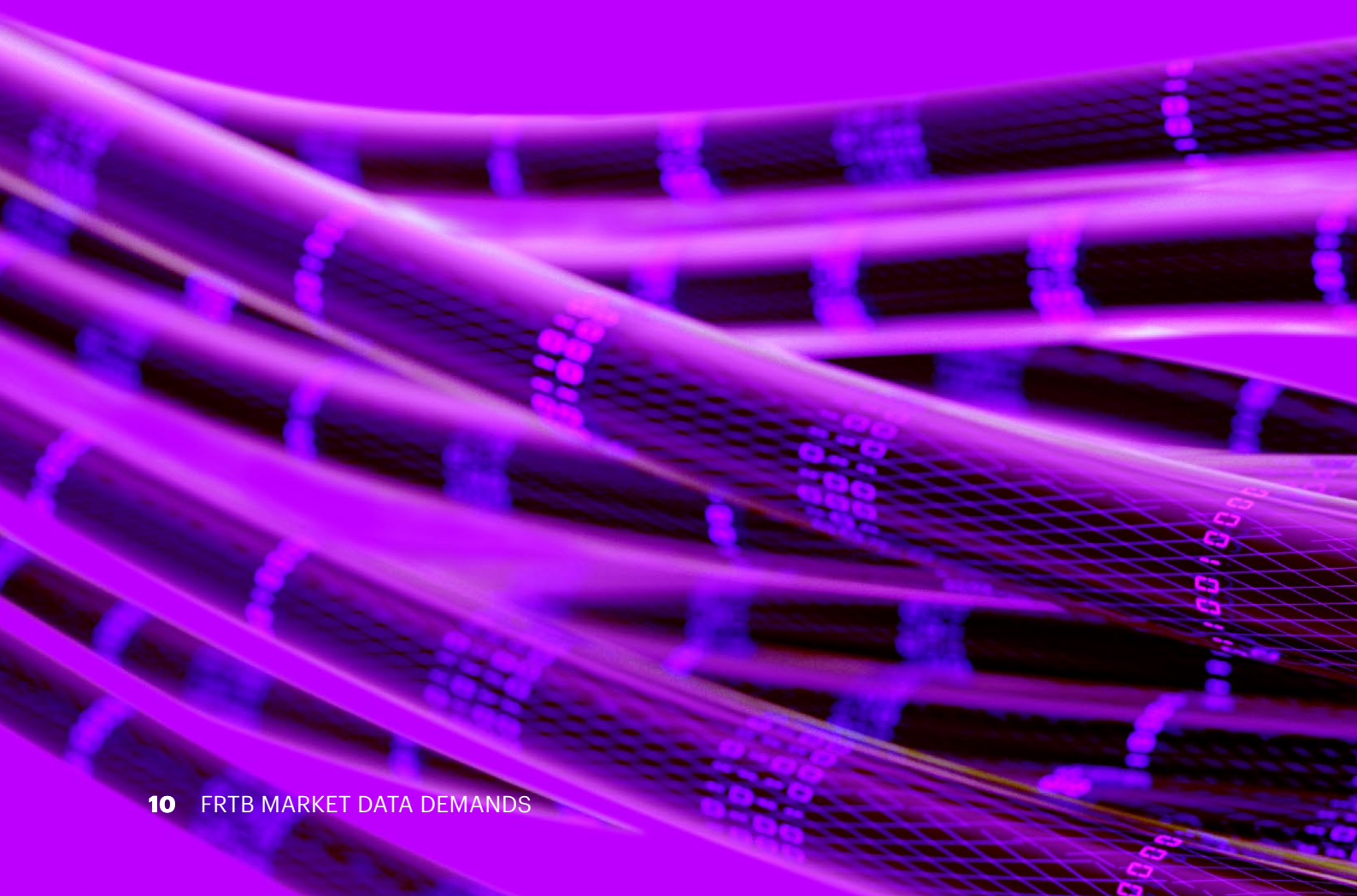
Source:

CONCLUSION

Compliance with the revised market risk capital charge is a multi-year journey that affects front office, risk and finance organisations.

In our view, this transformation journey should start with the reorganisation of trading desks and evaluating businesses where strategic choices are to be made—whether they should stay with the SA or adopt the IMA. This sets the tone for the other hurdles to be surmounted, the most significant of which is the market data that is the foundation of all calculations and reporting.

Given the punitive implications of failure to comply with the revised standards, firms should review their legacy solutions and processes—which are unlikely to be fit for purpose—and embark on an overhaul of market data management solutions. At the very least, their market data solution and processes must be transformed in parallel with other system implementations and model development, as enhanced market data is needed to test and refine those systems and models ahead of supervisory approvals. This means that the time to plan and act is now.



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NeoXam is one of the first market players in the APAC region attempting to address these issues. It has successfully implemented DataHub for several major financial institutions in Singapore[1], to help with centrally managing market data and reference data. As regulatory compliance demand like BCBS 239 and FRTB increases, NeoXam with its customizable software solution is able to achieve an easy-to-govern and transparent way to manage the data supply chain for risk management.

[1] "NeoXam to support UOB's FRTB and BCBS239 market data requirements", Finextra, Mar 2018. Access at: https://www.finextra.com/pressarticle/72910/neoxam-to-support-uobs-frtb-and-bcbs239-market-data-requirements

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