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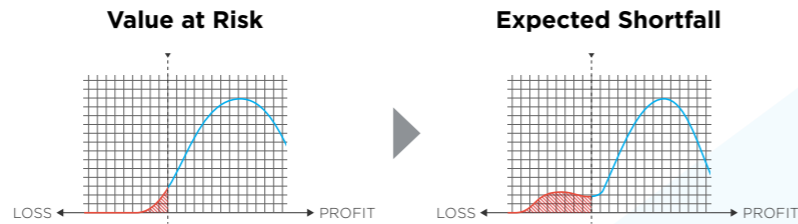
# The Fundamental Review of the Trading Book - Tackling a new approach for market risk

WHITE PAPER



# FRTB – the practical challenges

The most significant changes are the introduction of more robust rules for P&L attribution and the switch from Value at Risk (VaR) to Expected Shortfall (ES) as the risk metrics of reference. Both have their challenges – and both will affect banks' own risk models.



Under the FRTB, there are two key model approaches:

- ▶ Basel's new Standard Approach (SA), which is now based on risk sensitivities and replaces the previous cumbersome full valuation approach
- ▶ Internal Models Approach (IMA), where banks use their own systems and processes

Most larger global banks are likely to favour the IMA as the SA is seen as more conservative, which could lead to higher capital charges. However, they won't always have the freedom to choose – the application of models will be subject to approvals on a desk-by-desk basis. Banks won't be able to opt for the SA just because it is cheaper for a particular desk – and some national regulators might impose a ban altogether on blanket SA adoption.

Those opting for the IMA will need to prove the accuracy of their models, using more stringent tests of P&L attribution than before, or face moving to the prescribed sensitivity-based SA.

In addition, banks will also need approval from the national regulator to move trades from the trading book (capital charge 8%) to the banking book (capital charge 1.6%) or vice versa. This common practice is outlawed under the FRTB except in extreme circumstances.

Other new concepts include liquidity adjustments, non-modellable risk factors (which will incur the standard charge) and default risk.

# Profit and loss attribution at desk level – the need for granularity

The new rules around P&L attribution call for greater accuracy. Many have struggled with this in the past because different P&Ls – such as actual, theoretical and hypothetical – usually reside in separate internal systems and business units. Drawing correlations is difficult when there is no unified understanding of the complete picture.

With the FRTB, P&L attribution is critical and can't be ignored. It is an important part of the revised IMA for assessing model performance and the FRTB requires banks to carry out new calculations at desk-level. If the calculations show that there are significant differences between the P&Ls, that bank effectively fails the tests due to a possible weakness in the models. It would then have to revert to the more conservative – and in many cases costly – SA.

The results of the Basel Committee quantitative impact study found that, based on data from 31 December 2014, many banks were falling short. It used two main calculations, the 'MS P&L test' and the 'VV P&L test',

to compare the differences and set the acceptable thresholds at 10% and 20% respectively.

It highlighted that the shortcomings could be due to the front office not using the same models or calibration techniques as the risk management team – and it is here that banks stand to make the biggest gains in the lead up to FRTB compliance.

## ActivePivot for P&L attribution and collaboration

Replacing individual systems with a single centralised platform for all P&L would be a costly exercise and require teams to radically change the way they work.

ActivePivot, the in-memory computing analytical platform from ActiveViam, sits as an unobtrusive layer between internal systems. It allows the front office, market risk and product control divisions to use their existing data formats but also correlate them with others (Finance) from across the bank.

Specifically:

- ▶ ActivePivot can generate explanatory P&L reports with risk vectors from the front office as well as those generated by risk management
- ▶ Drill-throughs and drill-downs can quickly identify factors that contribute to any differences and allow banks to investigate and reconcile down to the trade-level
- ▶ ActiveMonitor for limit monitoring allows a bank to continuously track differences using the MS and VV P&L tests to ensure it stays within the threshold
- ▶ Banks can also use ActiveStorage, a NoSQL database with upload speeds of half a terabyte per minute, to store the vast volumes of P&L vectors for ES computation. Its ultrafast retrieval times enable quick historical analysis when required

The Fundamental Review of the Trading Book (FRTB) is designed to address the shortcomings of the market risk framework, which the Basel 2.5 package of reforms introduced in July 2009.

The new standard is set to go live for international entities by March 2018 – however, there are signs that banks could have some major gaps to close if they are to comply by the deadline.

The FRTB introduces changes to how banks handle risk – including the way they manage and interact with data. This has some far-reaching consequences for technology and also how internal teams will need to collaborate.



# Expected Shortfall stress-testing – a big data challenge

Another change that has grabbed a lot of the attention so far is the replacement of VaR at 99% confidence levels with ES at 97.5%.

ES is considered, by the Committee, to be better at picking up severe losses as it focuses on the whole tail and can be decomposed within any given hierarchy. Therefore, the new concept will be to stress the ES rather than the VaR.

On the surface, the transition to ES seems relatively simple. However, difficulties could arise when having to perform calculations on much larger volumes of data.

The FRTB states that ES must be “calibrated to a period of significant financial market stress”. It also states that “the process of identifying a stress period using the full set of current risk factors in the bank’s ES model is practical only for relatively short windows of historical data... the Committee is proposing that the observation horizon must go back at least to 2007.”

The Committee recognised that it is difficult to determine the appropriate period of financial stress and that it involves significant approximations. Therefore, it has proposed an “indirect” method of calculating the maximum stress over the observational period. This involves a reduced set of factors as long as the bank’s portfolio history is long enough to avoid approximations.

A valid test for having chosen the appropriate stress period is that the factors must explain at least 75% of the variation of the full ES model. Also, the chosen stressed period is based on the bank’s aggregated portfolio and not individual risk factors.

## This presents some major data Challenges:

- ▶ The computational power required is, quite simply, immense. Technology must allow banks to choose the most recent appropriate 12-month stress period from the stored horizon dates with full risk factors. It must then compare it against the current period with a reduced set of risk factors
- ▶ The back-testing and P&L attribution could raise severe problems with model performance, causing it to fail and the bank to fall back to the SA
- ▶ The regulator may ask for evidence of a bank’s choice of period, which will involve quick access to stored data

## ActivePivot for multi-dimensional analytics:

- ▶ ActiveStorage is ideally suited to storing and quickly accessing these high volumes of data in the ActivePivot server. Banks can then analyse the observe horizons and perform the necessary risk vector aggregations
- ▶ ActivePivot can handle hundreds of dimensions and hierarchies on huge datasets. The architecture enables banks to compute measures such as VaR and ES on-the-fly, without having to reload and re-aggregate P&L vectors coming from several risk engines. This facilitates trade-level reconciliations as well as fast incremental or what-if calculations

# Boundaries – a classification exercise

Risk managers have indicated that one of their most common challenges is deciding where to draw the boundaries between a trading book and the banking book – and indeed how to officially define a trading desk.

The FRTB is far more prescriptive than the current ‘intention to trade’ criteria. In general, instruments held in the trading desk are for short-term resale, expectation of or locking in profits and hedging. They include instruments held as an accounting trading asset or liability, those resulting from market-making activities, and instruments resulting from underwriting activities, among others.

The banking book, however, should include instruments that are not easily made liquid such as unlisted equity, real estate, and those designated for warehousing.

The FRTB states that “banks must have clearly defined policies, procedures and documented practices for determining which instruments to include in and to exclude from, the trading book for calculating their regulatory capital.”

The classification of a trading desk allows room for manoeuvre. The document states that it “is an unambiguously defined group of traders or trading accounts” where “each individual trader or trading account must be assigned to only one trading desk.”

This could lead to experimentation, where banks group existing desks together under the same risk management structure. The result could be a new trading desk with operational sub-desks that need “not be used in the market risk capital framework.”

Crucially, the desk structures – like the book structure – would have to gain approval from the regulator to achieve IMA compatibility. Therefore, banks need take care over citing instruments with non-modellable risk factors that require a separate capital charge.



## Classification with ActivePivot:

ActivePivot’s ability to support complex decision-making means it is ideally suited to help banks determine their market risk policies and procedures:

- ▶ It can simulate desk or book structures in many dimensions. Banks can reorganise desks, trades and portfolios and see the resulting impact on the capital charge instantaneously, even for complex measures. They can also model an optimal instrument, desk or book hierarchy that will at the same time satisfy the regulators.
- ▶ With ActivePivot, there is no need to pre-define aggregation nodes. This means banks can design multiple book and desk hierarchies or other classifications for different modelling structures without compromising the performance or having to upgrade hardware.



## Liquidity adjustments – not just a matter of bucket definitions

The FRTB recognises that “the time required to execute transactions that extinguish an exposure to a risk factor, without moving the price of the hedging instruments in stressed market conditions” is not necessarily 10 days, as previously prescribed.

As a result, it proposes that time horizons be linked to risk factors, not instruments. Each risk factor will be given a specific period ranging from 10 days to one year, depending on the difficulty of hedging certain risk factors in times of market stress.

The Basel Committee applied shocks over differing times and settled on a long horizon – because not all risks can be unwound over a short period. This assumes that for a three-month horizon, for example, banks can exit or hedge a risk without any rebalancing assumptions.

As such, an equity price risk factor is ascribed a 10-day horizon compared with 120-days for a structured credit spread risk factor.

### The challenges for banks will be:

- ▶ Associating positions to risk categories and then to the appropriate time horizon, which the committee may change from time to time
- ▶ Incorporating varying liquidity horizons in ES

### Managing time horizons with ActivePivot:

- ▶ Because of the multi-dimensional nature of its architecture, ActivePivot is able to perform this type of classification and aggregate the results of the liquidity adjustments over the five defined time horizon buckets. It can then quickly adjust the classification criteria to test the impact

## Default risk charge (DRC) – to the nth percentile

The FRTB states that “default risk must be measured weekly using a VaR measure with a one-year time horizon calibrated to a 99.9th percentile confidence level”. A 99.9th percentile ES might be too unstable, hence the use of VaR. Banks would have to simulate hundreds of thousands of scenarios with the appropriate aggregations and calculations at the differing nodes.

### Using ActivePivot for DRC:

- ▶ Calculating VaR to the 99.9th percentile becomes a simple task to perform with ActivePivot. It can run the necessary scenarios to calculate the DRC across the entire portfolio
- ▶ ActivePivot’s architecture enables it to handle very large risk vectors and complex datasets in memory, which makes it easy for banks to create or amend measures and other KPIs

## Tackling the cost of FRTB – a technology challenge

The FRTB requires significant changes in governance, processes, methodology, data management and technology. Delivering these changes creates additional costs – and when combined with other regulatory changes, those costs begin to mount.

Tactical workarounds to address individual regulatory mandates are fast proving to be inadequate. The FRTB goes beyond adding extra reports, gathering more data or delivering a new user interface. It highlights the need for a broader, more strategic approach to compliance – one that tackles multiple mandates and addresses the common issues.

As with BCBS 239, the FRTB requires a flexible and efficient IT infrastructure able to cope with massive amounts of data. One option is to replace legacy systems for risk and P&Ls across the entire bank – but this would be a multi-million-dollar exercise that could take years. Another option is to

adapt existing systems to comply with the new standard – however, in reality, this would be hugely complex given the number of systems and users involved.

Instead, banks are deploying a long-term, effective, yet far easier approach. By using tools that integrate with existing infrastructures, they can obtain all the required functionality without having to invest in large-scale IT projects.

ActivePivot integrates with rather than replaces a bank’s current architecture. It uses the existing risk and valuation engines to perform the necessary tasks to analyse, monitor and report on the bank’s enterprise-wide risk while calculating the overall impact on its capital. According to a credit and market risk COO at one of the world’s largest banks: “ActivePivot is the reason why I don’t panic over FRTB”.

The FRTB is the opportunity to get it right – for today and in the future.

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### ACTIVEPIVOT – HELPING TO EASE THE TRANSITION

The ActivePivot family includes a range of components suited to the FRTB:

**ActivePivot** – an in-memory OLAP aggregation and analytics engine with the ability to perform calculations and analyses across potentially hundreds of dimensions and millions of risk vectors, and over large timeframes

**ActiveStorage** – for ultra-fast storage and retrieval of over ten years of observational data, including risk vectors and correlations

**ActiveMonitor** – for limits and threshold monitoring, and data validation of P&L approval and adjustment, with a fully-audited user-defined workflow for escalation

**ActiveUI** – for simple visualization of the complexity that is the FRTB

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# About ActiveViam

ActiveViam provide precision data analytics tools to help organisations make better decisions faster.

ActiveViam started in 2005 with the vision of leveraging in-memory technology to create an analytics platform where businesses could leverage the largest data sets without restrictions, keep them up-to-date in real time and use them to empower their decision makers.

Our goal at ActiveViam, is to let organisations not only make decisions faster, but better; to not only reach their data, but their potential; to not only see their data, but find their way into the future.

ActiveViam is a privately owned company with offices in Paris, London, New York, Hong Kong and Singapore.

For more information please visit:  
[www.activeviam.com](http://www.activeviam.com)