ActiveViam™

SOCIETE GENERALE
Corporate & Investment Banking

Case Study

How Société Générale CIB supports the growth of its Global Fixed Income and Currencies business

Recognized for its long-standing expertise in the field of equity derivatives, Societe Generale Corporate & Investment Banking (SG CIB) wanted to expand its presence in global markets by growing its Fixed Income and Currencies business (FIC).

Always at the forefront of innovation, the Rates business relies on technology to meet the real-time decision-making needs of Rates traders who process large volumes of transactions on highly liquid products. Typically, as soon as market moves occur, Rates traders need to immediately understand the impact on their position so that they can potentially price a new trade.

Therefore, real-time visibility into the risk and P&L of their portfolio is a key requirement for them to be able to trade. “ Without any visibility into risk, Rates traders simply cannot trade. They’re flying blind.” stresses the Director of Fixed Income and Rates Technology at SG CIB.

Preparing the FIC systems for the future

As the bank was entering new markets, trade volumes were soaring. The Rates IT department recognized that the incumbent infrastructure did not cope with the increase in volumes and that performance suffered. The team also anticipated that the system would not be scalable enough to effectively support the expansion in Asia and North America. Network usage was identified as an issue.

The previous system consisted of a set of risk calculation systems, sourcing live trades from all trade capture systems and calculating risk sensitivities. Those were published into an OLAP cube which was used by traders to visualize their risk in real time through their client workstation. Several core processes such as P&L calculations, data enrichment and bucketing were carried out from within the traders' workstations, mostly through Excel pivot tables.

> *"There was clearly a risk that our IT system would not effectively support the international growth of the Rates business if no change was undertaken."*
>
> **Director Fixed Income and Rates technology** at Societe Generale Corporate & Investment Banking

This architecture had a number of shortcomings, with performance being amongst the most significant: whenever a trader made a new deal, risk engines computed a set of new risk measures and the central OLAP cube was updated accordingly. Because the OLAP cube structure was not designed to handle delta-based refreshes, the User Interface had to pull back the aggregation region in its entirety at each new query. This network-intensive architecture translated into slow response times, with certain measures requiring up to a few tens of seconds to complete.

To fix this situation once and for all, the IT Rates department took the decision to implement ActiveViam's in-memory aggregation engine. The goal was to perform risk aggregation in order to deliver real time insight into risk exposures, with high availability throughout trading hours across the globe.

Goal

Support the bank's growth ambition in new products and geographies by enabling the FIC trading desks across the globe to monitor and manage risk exposures and P&L in real-time

Challenges

- Guarantee high availability and fast response times during trading hours on a global scale
- Absorb soaring volumes of trades, market data, and risk measures
- Address the complexity arising from real-time market data updates
- Deal with the multiplicity of risk sources to integrate

Phase One:
Real-time Risk aggregation

At first, the IT Rates team implemented ActiveViam to build a central risk repository for Rates derivatives and to aggregate risk measures on the fly. The international deployment in Asia and North America was a key driver. Later on, the implementation addressed the other areas of the FIC business across the globe, namely FX Options and Credit.

Aggregating risk measures on the fly

ActiveViam aggregates individual sensitivities and projection matrices associated with each trade. It then generates a variety of measures that are presented at a consolidated level in a split second. As soon as a new deal is booked, ActiveViam refreshes the risk measures on the fly.

This incremental refresh mechanism allows traders to have real-time visibility into their risk. Traders can explore risk measures at various levels of depth: from the highest level – for example: what is the desk rate risk in USD - to a more granular level, for example: what is the Rate risk in USD by book, by curve or by time bucket... all the way down to the individual trade.

It is important for traders to have an aggregated view of risk across "buckets" of time points. As a matter of fact, it is impossible to exploit the huge number of time points that are generated by the risk engines in any meaningful way. Hundreds of time points are now being aggregated in ActiveViam, which allows traders to explore risk across multiple time horizons in buckets that are meaningful to them. Because the "raw" risk data can be enriched with additional attributes such as counterparty, trader, broker etc., traders can also look at their risk across a wide scope of axis, with results displayed in a split second. The ability for traders to analyze risk measures that are updated in real-time allows them to monitor their risk at a very granular level and thus, to make better and timely trading decisions.

At the beginning of the project, ActiveViam was used to compute 30 measures. Today, traders use more than 250 measures that are refreshed in real-time for tens of thousands of trades on a daily basis. In the meantime, the number of dimensions has multiplied by five. At present, traders are able to visualize and decompose their risk and P&L across 200 dimensions. This demonstrates that ActiveViam can scale out with the increase in the number of risk measures and the growth of the trade population.

The Rates IT team has also completed an additional phase of the risk aggregation project to address the needs of Exchange-Traded Fund trading desks (ETF). An ETF consists of a basket of several bonds but it is traded as a single unit. Because many assets compose one basket, it is equally as important to view the risk at the "basket" level as it is to view the risk associated with each single asset. While the risk engines compute the global risk figure for the ETF, ActiveViam aggregates the risk at the bond level. This allows traders to decompose the global risk figure into individual risk figures associated with each single bond. The benefit for the ETF trading desk is a better ability to identify cross-asset synergies and to do additional business with the credit desks.

> *"Although the volume of facts stored in the cube was multiplied by 70 in four years, we didn't experience any breakdown since we deployed ActiveViam. I've rarely seen systems that can absorb such volumes and achieve such performance."*

The implementation of ActiveViam for risk aggregation took five months from proof of concept to worldwide deployment. It has also since been expanded to the Equity Derivatives, Credit and FX Options desks.

Achieved Benefits for the Business

- An operational decision-making tool that traders can't do without
- Ability to absorb more trading demands from clients
- Total freedom of analysis for traders
- Ability to generate incremental margins through real-time visibility into risk and P&L
- 100% P&L accuracy and accelerated deal stamping

Phase Two: Real-time P&L on Rates Derivatives products

Rates traders are market makers. They execute large volumes of transactions on vanilla products that are highly sensitive to market data changes. The dependency of margin levels on trades volumes is very high. Therefore the ability to accurately gauge the profit and loss during the day is of paramount importance for Rates traders to generate margin.

The previous architecture did not deliver the P&L accuracy levels that the traders expected. Because the business logic pertaining to P&L calculations was located on each trader's workstation, the architecture was heavy-weighted on the UI's side. Typically, the UI could not take the whole set of market data into account to re-compute P&L figures each time a new trade was executed. In order to keep performance levels acceptable, traders had to use market data interpolations. Although correct, P&L figures were approximated and traders were potentially losing opportunities to generate incremental margins.

Deploying ActiveViam for real-time P&L on Rates Derivatives

Following the success of the risk aggregation project, the IT Rates team decided to centralize the business logic pertaining to P&L into ActiveViam, to perform real-time P&L calculations on Rates Derivatives products. The goal was to deliver accurate P&L figures at any time during the day, with P&L views being refreshed within a few seconds from market data changing.

The implementation started in New-York as the USD derivatives market was directly impacted by the growth of electronic transactions. Therefore, the New-York trading desk represented a solid basis to build from and expand across other geographies and later on, across other desks.

Dealing with the complexity of the P&L of Rates products

The computation of the P&L for Rates products is no trivial undertaking because there are several ways of explaining the P&L. In fact, complexity stems from the combination of two factors: Firstly, a Rate product is sensitive to multiple types of risks that have various maturities themselves. The second challenge relates to the fact that a Rate product is sensitive to different rate curves. Simply put, the calculation method is strongly influenced by the type of product and the type of risk considered. Because there are a large number of parameters to take into account, it requires quite a lot of computing power to process these massive amounts of data, let alone to refresh them as soon as a new trade is being booked or a change in market data occurs.

ActiveViam sources data from several systems, including risk sensitivities, bucketing matrices, market data from the previous day, as well as market data updates every two to three seconds. Based on this input data, ActiveViam aggregates P&L figures depending on the explain method that is relevant to each trader ('Delta Rate', OIS/BOR, ASW, future spreads...).

It then presents the results at a consolidated level. ActiveViam is able to aggregate thousands of facts per deal to produce consolidated P&L figures. P&L figures are refreshed as soon as there is a change in the market data. Traders can drill into the P&L figures to the most granular level (trade id), slice and dice, and view them according to as many axis as they wish.

"The beauty of ActiveViam is its ability to process large volumes of unit data and to present aggregated results across an entire portfolio with a real-time view so that the trader can take decisions off the back of it. Because it works in memory and is event-driven, ActiveViam can absorb both the high frequency of market data changes and the large volumes of data that are typical of the Rates business."

A "can't do without" tool for traders

Since they've been using ActiveViam, traders have the ability to view their P&L at any time during the day with the confidence that it is 100% accurate. By presenting the information in a consolidated manner, ActiveViam makes the trader's life easier and helps him save valuable time by eliminating manual manipulations. Aggregated P&L views are extremely useful to analyze products used as part of hedging strategies. Consider a trader who executes the same transaction 300 times at the same price with the same counterparty. ActiveViam automatically aggregates these transactions to produce one single P&L figure instead of 300 figures. Consolidation can also happen at the trader's request: Traders can manually group their trades from the day by meaningful categories, such as client, portfolio, product, trading strategy, hedging strategy etc. Because of the large number of deals, it would indeed take too much time for traders to look into the P&L of their deals on a one-by-one basis.

"Gone are the days when P&L was approximated. Since we've centralized calculations into ActiveViam and are able to take all market data into account, traders have the confidence that their P&L is accurate by the cent."

Consolidation can also happen at the trader's request: Traders can manually group their trades from the day by meaningful categories, such as client, portfolio, product, trading strategy, hedging strategy, etc. Because of the large number of deals, it would indeed take too much time for traders to look into the P&L of their deals on a one-by-one basis. Now, grouping happens on the fly without requiring any form of pre-aggregation or any involvement of the IT team.

Finally, traders also use ActiveViam as part of the deal stamping process. Now, if risk figures look abnormal, traders can explore the data at a lowest level, down to the singletrade id, in order to identify the 'misbehaving' deal. Since risk and P&L figures are computed a few seconds from a new trade, a trader can see immediately whether these figures match with those of the deal that he sent. Based on that insight, the trader can decide to validate the deal or reject it. Thanks to ActiveViam, traders are able to identify a booking error or a risk computation issue quicker than in the past and have it immediately corrected by the middle office or the IT department. Traders can now work by exception and focus only on the figures that have changed. They have the confidence that there is no risk of them missing any outlier, which secures the reliability of the deal stamping process.

A global roll-out

Following the deployment of ActiveViam for real-time P&L aggregation in the New York long-term derivatives product desk, the IT Rates team began the roll out to other desks and other geographies.

Once the "reference" desk was on board with ActiveViam, the other desks followed smoothly. The IT Rates team deployed ActiveViam by 'delta' compared to the reference implementation, which shortened implementation times. It took only three months to complete the implementation of the long-term cross-currency desk, a desk where traders deal with the eleven most liquid currencies.

The deployment of ActiveViam in the Rates derivatives business is now complete for the USD and cross-currency desks across the globe. The Rates IT team has also completed the deployment of ActiveViam on the trading desks in charge of the G10 currencies and emerging markets.

The bank is in the process of rolling out ActiveViam for its equity derivatives desk and plans to have it complete by the end of 2021. For such a project ActiveViam's technology has to approximate Greeks and PnL and update aggregated risk positions continuously whenever market data changes on a high frequency basis (up to 100,000 price updates per second). This is how ActiveViam's technology can provide a trading desk with up-to-date metrics for optimal risk management even on huge portfolios of several hundred thousand trades.

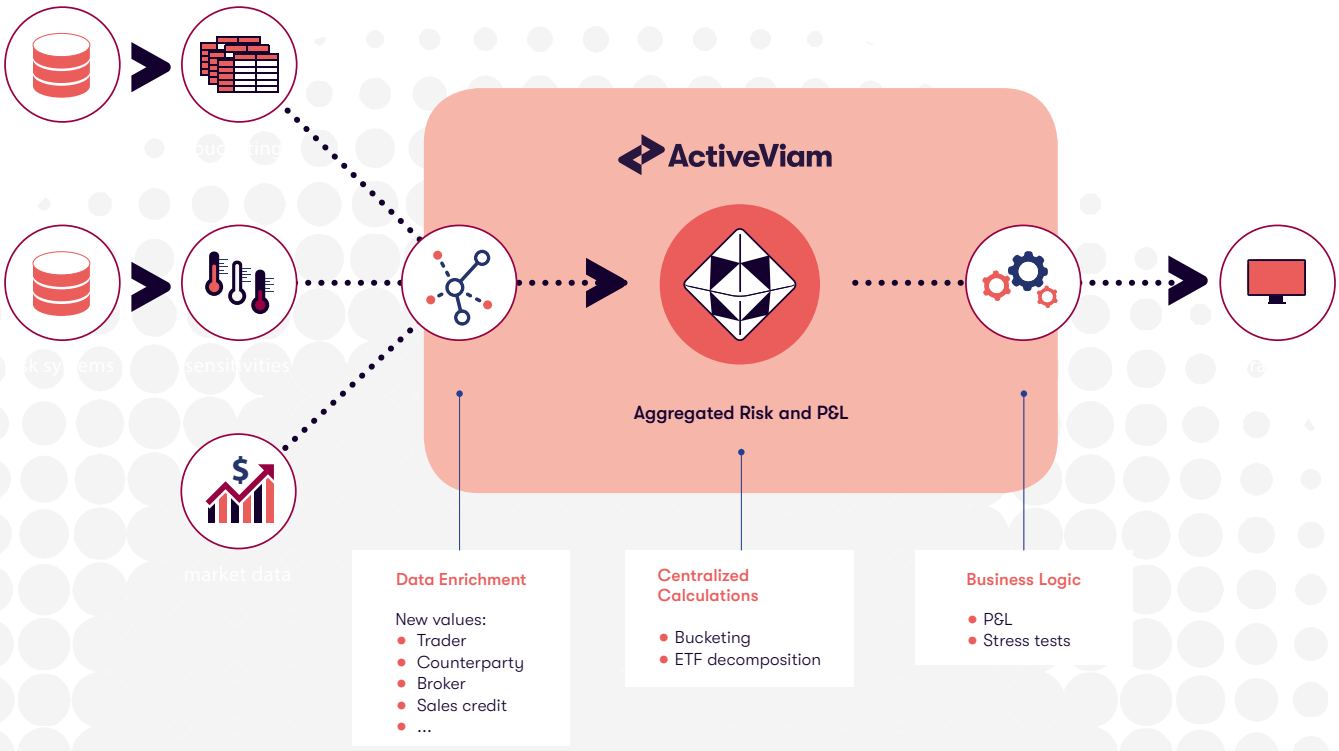
Achieved Benefits for the IT Team

- Innovation through the move from intraday to real-time calculations
- Scalability on a global scale
- Performance in aggregating large volumes of dynamic data
- A centralized architecture, decoupled from source systems
- Consistent deployment of new business rules
- Ability to leverage the same technology for other scopes

The centralization advantage

The centralization of the P&L and bucketing business logic brought more agility to the overall architecture, which translates into lower development and maintenance costs over time. Because all the aggregation work is done on the server side, the burden on the User Interface has been eliminated. The User Interface is much lighter as only delta-based refreshes are now pushed on the UI. As a result, response times are extremely short. Another benefit of centralization is that it is now much easier to deploy a new product, or a new business rule to other desks and geographies in a scalable and cost-effective manner. This directly contributes to executing the global growth ambition of the bank.
Finally, because the bucketing logic is a centralized process on the server instead of on each trader's workstations, the IT team has eliminated the issues stemming from inconsistent risk views.

"Since we've adopted ActiveViam as our central aggregation and calculation technology, we have the confidence that each trader, each risk manager, each head of desk has a consistent view of risk and P&L."



Combining stress tests and limit monitoring

Further to the deployment of ActiveViam for risk and P&L aggregation for each asset class and across all assets, it was only a natural step to envisage the automation of stress tests and limit monitoring.

The business logic pertaining to stress tests has been centralised into ActiveViam. Driven by the FIC management risk reporting desk, stress tests are now executed transversally, across Rates, Credit and FXO on an intraday basis. Despite the large volume of data, executives have the ability to drill down into the data to identify the individual desk or desks that failed a stress test. This allows the cross-trading desk to be more effective in optimizing positions.

The IT team has deployed ActiveViam for real-time limit monitoring. The FIC division relies on one single operational analytics platform to analyze risk and P&L, monitor risk against limits and execute stress tests, thus allowing traders to reduce operational risks and to be in better control of their business. *"By managing and monitoring limits within the operational analytics environment that traders use every day, we help them to become proactive in the usage they make of limits. By using ActiveViam, traders will themselves be able to see when they near or surpass limits. This insight is useful for them to take corrective actions or discuss limit adjustments with their management and the risk department."* Limits are deployed both for the cross-asset trading desk and for each individual trading desk.

> *"As our core risk aggregation and P&L calculation engine, ActiveViam has become a "can't do without" tool that supports the real-time risk management imperatives that drive our FIC business."*

Director Fixed Income and Rates technology
at Societe Generale Corporate & Investment Banking

Key Facts and Figures

- **Scope:** Rates, Credit, FXO
- **Data volumes** (Rates business)
  - The number of measures computed in ActiveViam has multiplied by almost nine in four years (more than 250 measures currently)
  - The number of dimensions has multiplied by five in four years (200 dimensions currently)
  - The number of facts increased by 70 compared to four years ago (30 million per day)
  - Two days worth of data are stored in ActiveViam to enable Day-1 P&L Explain and Day/Day-1 comparisons
  - Market data updates every 2-3 seconds
  - 15,000+ real-time market data at any given time

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 London, New York, Paris, Singapore and Hong Kong.

For more information please visit: **www.activeviam.com**

LONDON
6th floor,
Shaftesbury House
151 Shaftesbury Avenue
London WC2H 8AL
Tel: +44 20 7836 8820

NEW YORK
550 Seventh Avenue,
19th Floor
New York, NY 10018 USA
Tel: +1 646 688 4442

PARIS
46 rue de l'Arbre Sec
75001 Paris, France
Tel: +33 1 40 13 91 00

SINGAPORE
80 Amoy Street
#02-01
Singapore 069899
Tel: +65 6816 4988

HONG KONG
21/F, On
Hing Building,
1 On Hing Terrace
Central, Hong Kong