FIS RISK ANALYTICS MANAGER

FORMERLY ADAPTIV ANALYTICS

ENABLING FAST SENSITIVITIES TO MANAGE
XVA AND REDUCE CAPITAL REQUIREMENTS

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Do you have enough sensitivities?

Sensitivities are essential to allow a bank to manage risk, make optimal trading decisions and increasingly to calculate capital. But do banks really have enough sensitivities available to them to optimally perform these functions?
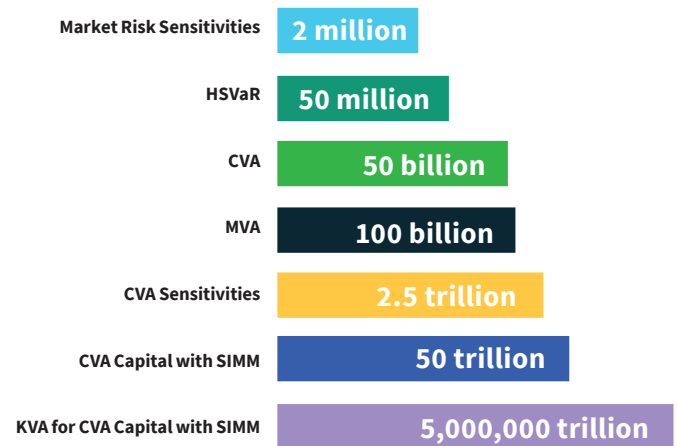
Take credit valuation adjustment (CVA) – this is now part of every bank's P&L and CVA sensitivities are crucial for hedging of CVA. However front office today is typically heavily constrained by the number of sensitivities they are able to calculate. FIS® Risk Analytics Manager (formerly Adaptiv Analytics) can deliver all the sensitivities the CVA desk is able to consume.

CVA sensitivities are not only required for front office active CVA management. Under the revised advanced CVA capital requirements, CVA capital is a function of the CVA sensitivities – banks need at least hundreds or more CVA sensitivities, across all counterparties, not just non-collateralized counterparties. Risk Analytics Manager is able to help banks compute CVA capital accurately and cost effectively.
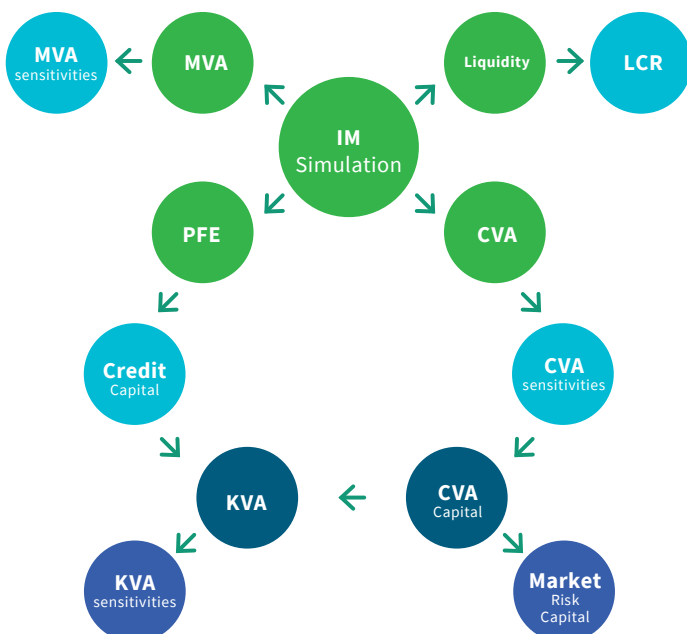
On another front, with the margin reform changes being phased in through 2020, initial margin must be computed and posted on most derivative portfolios using the ISDA SIMM. To accurately capture the future initial margin requirements and the funding cost of initial margin (i.e., MVA), or to model expected exposure for internal model

capital, it's required to calculate the ISDA SIMM forwards in time across thousands of scenarios, necessitating billions of portfolio sensitivities. Approximation techniques might suffice, but a brute force forward SIMM simulation would be the most accurate way forwards. Risk Analytics Manager can help achieve that.

And in the future, as capital valuation adjustment (KVA) becomes mainstream, the number of sensitivities required becomes even higher, with sensitivities required as the inputs to capital calculation and so KVA, which itself needs sensitivities calculated. The following graphic outlines the number of pricing calculations required using numerical sensitivities:

Market Risk Sensitivities	2 million
HSVaR	50 million
CVA	50 billion
MVA	100 billion
CVA Sensitivities	2.5 trillion
CVA Capital with SIMM	50 trillion
KVA for CVA Capital with SIMM	5,000,000 trillion

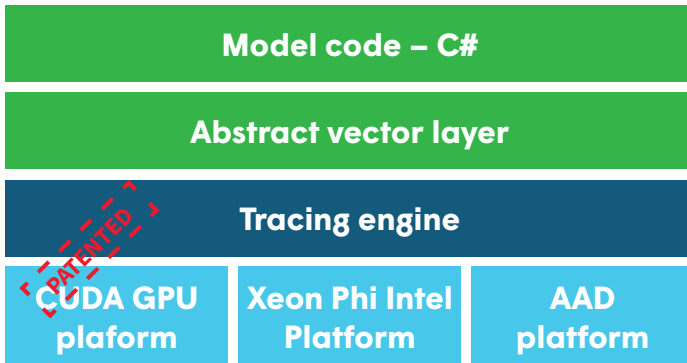## How forward simulation of initial margin has far reaching implications

What's holding banks back?

XVA calculations like CVA, FVA and KVA are computationally expensive, so to keep costs under control, banks usually limit the number of sensitivities they calculate. But they still have to maintain hundreds or even thousands of computer cores to run even limited numbers of calculations. Moreover, these bump and run sensitivities are less accurate than analytic sensitivities, and many banks take shortcuts such as omitting sensitivities on collateralized portfolios and many of sensitivities they would ideally run. These approaches are neither efficient, nor cost effective, nor sustainable, especially under Basel's CVA capital requirements.

What's the way forward?

Adjoint algorithmic differentiation (AAD) is an exciting mathematical technique for calculating super-fast sensitivities on complex mathematical computations. FIS has embedded AAD in the market leading Risk Analytics Manager engine to enable the calculation of thousands or even billions of sensitivities – quickly, accurately and cost effectively.

Risk Analytics Manager produces exact mathematical derivatives – not approximations or estimates. And it can do this efficiently as it is built upon FIS' vectorization and GPU pedigree. Moreover, AAD is not a niche feature in Risk Analytics Manager, but is implemented in such a way that the entire Risk Analytics Manager engine is AAD-enabled, allowing super-fast sensitivities on all asset classes and more than 200 product types.

Model code – C#

Abstract vector layer

Tracing engine

[PATENTED]

CUDA GPU plaform   **Xeon Phi Intel Platform**   **AAD platform**

Make the impossible possible

Calculate vastly more sensitivities at lightning speed to get a competitive advantage in XVA and capital. Manage this while reducing total cost of ownership.

See the full and true picture – not an approximation

Risk Analytics Manager can calculate a massive number of sensitivities and give you a huge amount of accurate information across interest rates, FX, equities, energy, commodities, and credit to reduce risk and increase profit.

Be ready for the future

With banks becoming increasingly sensitive to the full set of valuation adjustments, you will need a way forward to model the higher order adjustments such as KVA on credit capital, CVA and even market risk capital. With Risk Analytics Manager you'll have the infrastructure necessary to provide the sensitivities required to first calculate sensitivities needed for these KVAs and further to risk manage them.
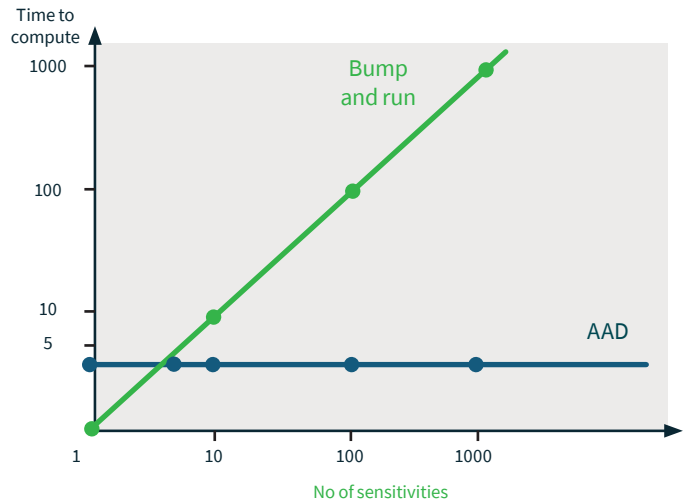
AAD IN NUMBER

Twelve million valuations from **100 deals**

Some **1.2 billion** applications of chain rules

Smart memory compression reduces peak memory usage by **30 times**

Zero lines of valuation models code changed

Normally, if it takes "x" amount of time to calculate a quantity, then it takes 1000x to compute 1000 sensitivities. With Risk Analytics Manager, it's only 5x – no matter how many sensitivities you want.

The AAD implementation is embedded in Risk Analytics Manager, so all of our valuation models, as well as those written by our customers, will work without any changes. By extension, our customers' asset coverage extends across Risk Analytics Manager all at once, not asset class by asset class. There's no additional code to implement, which eliminates extra time and cost. Risk Analytics Manager contains not just XVA calculations, but also SA-CCR, sensitivity-based approach and liquidity adjusted expected shortfall for FRTB and ISDA SIMM, meaning AAD's power can be enabled on all of these calculations.

In addition, our proprietary memory compression technique reduces the memory consumption of AAD by orders of magnitude – giving you dramatic performance benefits without hitting memory barriers.

Solution benefits

- Enables an XVA desk to manage P&L and optimize resources efficiently

- Massively reduces your hardware footprint and total cost of ownership

- Provides a path to effectively complying with latest CVA capital regulations

- Enables forward initial margin calculation via the accurate "brute force" calculation

- Provides a single, front- and middle-office platform for pricing, market and credit risk, capital and funding management

About FIS

FIS is a leading provider of technology solutions for merchants, banks and capital markets firms globally. Our employees are dedicated to advancing the way the world pays, banks and invests by applying our scale, deep expertise and data-driven insights. We help our clients use technology in innovative ways to solve business-critical challenges and deliver superior experiences for their customers. Headquartered in Jacksonville, Florida, FIS is a Fortune 500® company and is a member of Standard & Poor's 500® Index. To learn more, visit **www.fisglobal.com.**

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