XVA, scaling up to Big Data

Case Study: How to establish innovative partnerships with Fintech companies in order to develop new IT models and solutions that compliment in-house legacy systems?

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Agenda

1. Bank Innovation
2. FinTech Solutions
3. Win-Win Partnership

Conclusions
1 Bank Innovation
Quant Work

Traditional Quant Work

✓ “Localized” data
  ▪ Trade level simplified data as inputs
  ▪ Low dimensional output data (MtM + greeks ~ 50 data)

✓ “Localized” computation
  ▪ Dedicated pricer / model / numerical method
  ▪ Isolated call, end of the supply chain

✓ High level simple aggregation
  ▪ MtM and greeks can be arbitrarily aggregated by a simple sum as long as a common set of independent variables is maintained

XVA Quant Work

✓ Data chaos
  ▪ Trade data is not enough, need booking details, portfolio description, CSA… that are usually not available at the pricing system level

✓ Decentralized interconnected computation
  ▪ Need to expose internal computation status to the rest of the system
  ▪ High dimensionality
  ▪ Ensure consistency across the board

✓ Complex high level aggregation
  ▪ Non linear post treatment (embedded VA option, CSA…)
  ▪ Increasing number of sensitivities
XVA Challenges

Data Challenge

✓ A natural approach consists in storing computation cubes
✓ Example of data for a basic XVA book:
  ▪ 500k trades
  ▪ 100 time steps
  ▪ 10k simulations
  ▪ 500 Greeks
  ▪ 5 metrics
✓ Order of a PetaByte
✓ Thing is, a bank is not Google, or is it?

Computation Challenge

✓ A naïve approach consists in calling billion of million times your standard pricer
✓ Standard pricers too slow, with issues on:
  ▪ Model consistency
  ▪ Path dependency
  ▪ Monte Carlo of Monte Carlo
  ▪ Greeks precision
✓ And integration / function call is probably just not meant to be called repeatedly
✓ Need an integrated solution with optimized pricers
  ▪ Regenerate only required risk factors
  ▪ Use of regression / already computed cashflows
  ▪ Generic Greeks fwd/bwd propagation
  ▪ General splitting techniques
Solutions

**QUANT**
- American Monte Carlo
- AAD
- Splitting

**NEW TECHNOLOGIES**
- Fast evolving technology
  - Zoo of Big Data technologies, difficult to choose from
  - Do not want to get stuck with deprecated technology
  - “Nobody ever got fired by choosing IBM” effect
- Global community
  - Mature technologies, used by Tech industries
  - Open source code, forums, online help
- Hiring issues
  - How to get “experts”?  
  - Competition with the Tech industry
  - Image

**HARDWARE OPTIONS**
- CPU
- GPU, vectorized data but need to recode to OpenCL or equivalent
- Intel Xeon Phi, alternative using almost standard compilers
- FPGA (Field Programmable Gate Array), but complex to maintain and to evolve

**PARALLELIZING SOLUTIONS**
- Grid computing (Datasynapse...)
- Cluster computing (Spark...)
- In house vs cloud
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