

## CCAR/DFAST Process Automation

The Federal Reserve Bank runs the Comprehensive Capital Analysis and Review (CCAR) program to assess bank capital adequacy in various downturn scenarios. EY reports on the Bank Holding Company (BHC) participants in the 2015 CCAR program:

*“Thirty-one BHCs with \$50b or more in consolidated assets were required to participate in CCAR/DFAST 2015. ... The FRB has heightened expectations for capital planning processes at these [larger GSIBs] institutions relative to other CCAR participants because of their size and complexity.”*

We observe the following:

1. CCAR/DFAST simulation and reporting is important for the safety of the global banking system.
2. BHCs moving IT development offshore for CCAR/DFAST - lower cost developers save money.
3. BHCs reporting massive data sets like EOM accrual portfolio at contract/position-level for CCAR.
4. New Large CCAR Data sets running through 100s or 1000s of new Quant Models is error prone.
5. New apps can detect inconsistency/quant modelling errors prior to FRB CCAR submission.

If the new process automation is more efficient in detecting errors than current methods, then the new process automation should be employed across the BHCs global resources to assure global banking system safety. The BHC can leverage access to hard to find world-class Finance Code Modernization expertise through a flat rate software-service contract rather than an employment contract. Think of this like YieldBook for optimized CCAR Balance Sheet simulation error checking. Some clients see simulations running 1000x faster than their current production simulators giving much improved error detection coverage. The process automation distributes valuable expertise in Finance, CCAR/DFAST simulation testing, and numerical analysis throughout the BHCs geographically dispersed development centers.

We plan to offer code in AWS that can complete a full 60-month, static scenario, half million account Balance Sheet, CCAR/DFAST simulation for a large BHC in several seconds on one core of a commodity Intel x86 microprocessor. We expect position counts in the neighborhood of 5mm to 10mm for large GSIBs. We have headroom up to a billion positions so we can simulate very large BHCs as well as entire markets (e.g., EUR Assets and Liabilities). To some BHCs (and possibly the FRB) this is a significant performance increase, to others it is simulation performance as usual. That is not really a safe state of affairs in the global banking system. In this regard, we will make the generic simulation code Open Source in GitHub to promote the safety of the banking system.

This code can be used for CCAR/DFAST process automation/error detection without any change to the current production process. Since all the BHCs use the same FRB input Baseline, Adverse, Severely Adverse scenario data the only thing that changes between simulations are the accrual portfolios and the quantitative balance and return rate models driving the simulations from period to period. Our server uses a series of proxy quantitative models calibrated to standard FRB products and balance histories. If you can simulate fast, and you know the accrual portfolio,

you can employ a set of proxy quantitative models to check the simulation for consistency/accuracy. If you have the BHC native quantitative models then you can check the simulation even more rigorously. You simply have to generate the optimized simulator code integrated with the native models.

In 2016, We have the infrastructure and code optimization expertise to make CCAR/DFAST Balance Sheet simulation code run with optimal performance on various Intel x86 microprocessors. The more of the quant balance and rate model code that can be directly integrated into the simulator, the closer the performance of the simulator will be to optimal even though the code becomes less generic. We expect to be able to run 1 billion independent full re-simulation checks per day for a negligible hardware cost (e.g., an 8 CPU server or several dozen grid cores) for standard balance and rate models. Working with the BHCs we can offer similar enhanced performance using native models.

With optimized simulation code new error detection methodologies are feasible:

- Portfolio completeness between scenarios
- Explanatories for predicted versus actual Balance Sheet moves
- Dead positions identification - positions that do not move with simulated market moves.
- FX errors or inconsistency detection
- Position balance or rate of return inconsistency detection
- Detect quant model changes/errors.
- Identify dead market data or scenario data
- Identify extra market data or scenario data
- Locate balance or rate overrides/amendments

We want to help make the banking system safe for all the CCAR/DFAST participants including:

Ally Financial Inc., American Express Company, Bank of America Corporation, The Bank of New York Mellon Corporation, BB&T Corporation, BBVA Compass Bancshares, Inc., BMO Financial Corp., Capital One Financial Corporation, Citigroup Inc., Comerica Incorporated, Deutsche Bank Trust Corporation, Discover Financial Services, Fifth Third Bancorp, The Goldman Sachs Group, Inc., HSBC North America Holdings Inc., Huntington Bancshares Incorporated, JPMorgan Chase & Co., KeyCorp, M&T Bank Corporation, Morgan Stanley, MUFG Americas Holdings Corporation, Northern Trust Corporation, The PNC Financial Services Group, Inc., RBS Citizens Financial Group, Inc., Regions Financial Corporation, Santander Holdings USA, Inc., State Street Corporation, SunTrust Banks, Inc., U.S. Bancorp, Wells Fargo & Co., and Zions Bancorporation.

#### References:

1. CCAR and Stress Testing as Complementary Supervisory Tools, [here](#)
2. 2016 Supervisory Scenarios for Annual Stress Tests Required under the Dodd-Frank Act Stress Testing Rules and the Capital Plan Rule, January 28, 2016, [here](#).
3. 2015 CCAR/DFAST Results, EY, [here](#).