White Paper

The Current State of Banking Stress Testing Technology: Closing the Gaps

A Report Based on the 2015 GARP and SAS Survey of Banks Worldwide
# Contents

The GARP and SAS 2015 Survey: Assessing Stress Testing Readiness ............................................................. 1

  Why Technology Gaps Matter .............................................................. 2
  SAS’ Approach to Stress Testing Technology ................................. 2

Digging Deeper Into Technology Gaps and Solutions ............................................................... 2

  Data Management ........................................................................ 3
  Model Development and Governance ..................................... 4
  Process Management ................................................................. 5
  Consolidation and Reporting ..................................................... 5
  Conclusion ................................................................................... 6
Stress testing now plays a key role in protecting our financial system from systemic failure. By requiring banks to run simulations of various macroeconomic scenarios, regulators gain transparency into how banks determine their capital levels and if they are sufficiently capitalized to survive widespread, severely adverse economic scenarios.

Stress testing started as a big bank initiative – but regulators didn’t stop there. With new regulations such as DFAST (Dodd-Frank Act Stress Test) in the US, a wide range of smaller and midsize banks are expected to meet stress testing requirements appropriate to their sizes, lines of business, geographic locations and more so they, too, can demonstrate that their methods of setting capital levels are rigorous and prudent.

At the same time, regulators have shifted their focus from simply understanding the effects of stress scenarios on credit performance and revenue to making stress testing an integral part of a bank’s capital plan. This is evidenced in how they are now focusing on the effects of a broad array of qualitative and quantitative measures such as liquidity and full balance sheet projections. This shift is allowing regulators to examine the financial vulnerabilities of banks in much greater detail and from different perspectives. But at the same time, it has made stress testing a very complex endeavor. Stress tests are increasingly multiregional, international and data-intensive. They require seamless, end-to-end execution of highly complex analytics at high speeds. And completing all of this work is consuming more of banks’ time and resources.

This paper examines the current state of stress testing capabilities of banks, with a focus on key areas of weakness – and proposes how banks can address them with strategic investments in new capabilities.


According to a recent GARP and SAS stress testing survey involving 389 respondents from financial institutions around the world, banks are, as a whole, rising to meet the demands of supervisory stress testing. But regardless of institution size or type, respondents clearly perceive technology as the weakest link in their stress testing capabilities (compared to resources such as people and expertise).

Specifically, respondents were asked to assess the maturity of their organizations’ resources in four areas: data governance, modeling, scenario management and reporting. States the GARP survey paper: “In data governance, 42% agreed or strongly agreed that their technology had the right capabilities, versus 63% who said the same about their people and 56% about their institutions’ expertise. On modeling, 49% were satisfied with their technology, versus 68% with people and 69% with expertise. On scenario management, 45% were satisfied with their technology, 63% with people and 58% with expertise. On reporting, 45% were satisfied with their technology, 65% with their people and 63% with their expertise.”

Investment banks tended to have a higher level of satisfaction with their resources than do respondents overall, while retail banks’ satisfaction was lower than that of respondents overall. And most respondents indicated that they are dissatisfied with the level of information reporting and coordination across their enterprises.

It’s worth noting that larger banks, such as G-SIBs (globally systemically important banks), are certainly more mature on the stress testing front than smaller banks, as they have been forced to perform some level of stress testing since the financial crisis of 2008. For banks at the lower end of the asset range, however, robust, enterprisewide stress testing is an emerging capability. Most haven’t done stress testing with any level of rigor, as there was no perceived need until now. As a result, they are low on the stress testing maturity curve and have fewer resources – both human and technological – to redirect toward stress testing.

About the GARP and SAS Survey on Stress Testing

Conducted in May and June 2015, this survey captured the perspectives of people working on the front lines of stress testing. The 389 respondents hold a variety of executive and administrative positions at financial institutions of all sizes headquartered in 68 countries. Forty-one percent are employed by commercial banks. The rest are employed by retail banks, investment banks, asset managers and diversified companies consisting of more than one of those types of institutions.
Why Technology Gaps Matter

The implications of these findings are significant, as stress testing demands are increasing and intensifying. Even for larger banks with plenty of resources, throwing more people and spreadsheets at the problem simply won’t be sufficient. Looking ahead, banks will face:

- Increasing complexity of stress testing exercises and calculations using ever-larger data sets.
- Expectations by regulators for quick answers, response times, and turnarounds on ad hoc requests.
- Demands to run complex, new scenarios with little lead time, which will require exceptionally flexible, agile modeling capabilities.
- Requirements to provide greater transparency across bank silos, as well as clear accountability and detail tracking for regulators.

Having the right technologies in place – preferably integrated systems that make it easy to aggregate, share and reuse a trusted source of data – will be essential to meeting these types of demands. At the same time, banks will increasingly use stress testing as a way to gain deeper insights into their business and balance risks and returns for higher performance.

The key is to strategically invest in technology to address core areas of weakness, resulting in a more efficient, effective and accurate stress testing process that meets current and future stress testing demands.

SAS’ Approach to Stress Testing Technology

At SAS, we approach stress testing with an integrated solution suite that enables banks to run revenue and loss models on a single, integrated platform (see Figure 1). This approach allows banks to define and execute any regulator-required and bank-specific scenarios to support what-if model sensitivity and capital planning analyses.

The platform’s capabilities are powered by the SAS® Stress Testing Workbench, the SAS Risk Modeling Workbench, and the SAS Model Implementation Platform. Figure 1 shows how these solutions align with the key technology components identified by SAS as essential to enabling end-to-end governance and transparency of the entire stress testing process (starting from the bottom up):

- Data sourcing.
- Data extraction, transformation and validation.
- Data and model staging.
- Model development.
- Model implementation.
- Risk aggregation.
- Consolidation, planning and reporting.
- Governance.

Note that data consolidation is built into the platform; having a consolidation tool that is integrated with the stress testing platform saves time by integrating results from risk, finance and treasury and eliminates the need to pass interim results from models to different financial systems.

Digging Deeper Into Technology Gaps and Solutions

To better understand the implications of technology gaps on stress testing, consider the feedback provided by 10 risk professionals at a SAS roundtable held in June 2015 regarding areas of stress testing where they face the most challenges. Their discussion focused on:

- Data management.
- Model development and governance.
- Scenario and process management.
- Reporting.

In each case, insufficient technology can be traced as the underlying cause of stress testing challenges.

Data Management

Comprehensive stress testing poses higher demands on data provisioning, data consolidation, and data aggregation. Everyone involved in stress testing needs to work from the same reconciled data source, as well as have consistent data definitions and a way to map data to a common data hierarchy. This is often difficult to achieve when banks have legacy systems that silo data and make it difficult to establish a single, trusted version of the truth across all departments.

While all banks have some areas of weakness, technology remains a serious issue, especially for smaller banks.
The SAS roundtable participants shared a number of data management and data governance challenges in their regulatory compliance process, particularly in areas such as:

- **Integrity** – ensuring data integrity when collecting large amounts of data from across the enterprise.
- **Integration** – combining data between credit risk, treasury and accounting, as data often exists in silos (such as different systems or spreadsheets on various machines throughout the bank).
- **Granularity** – dealing with different granularities of data from around the enterprise (such as loan-level data versus consolidated data grouped into segments).
- **Consistency** – ensuring consistency of data definitions (which is especially key when a bank has acquired another entity and data must be integrated).
- **Augmentation** – enhancing internal data with bank-level, peer-group data in order to conduct benchmark modeling and enhance internal, historical data that may be incomplete or suspect.

**SAS Perspective**

Banking has always been a highly data-intensive industry, making effective data management vital to every strategy, process and decision. But as business decision makers face demands for more effective risk management, they are calling for more sophisticated risk data quality, aggregation and reporting capabilities than many bank systems currently support. At the same time, these decision makers need to take ownership of their data – ideally through a centralized system that allows them to define and refine all-encompassing business rules for governing their data.

SAS’ approach to meeting these needs is to provide users with comprehensive data management capabilities in a single application that integrates seamlessly with other SAS software that harnesses enterprise data (for instance, for modeling, analytics and reporting applications). For example, SAS Risk Data Aggregation and Reporting provides the foundation for a complete data governance platform that covers risk data governance, data quality information accuracy, integrity and completeness. It provides data quality monitoring over time with operational metrics and enables a consistent approach to getting correct data when and where it is needed, thus increasing confidence in the accuracy and timeliness of operational and business information. Data quality auditing tools monitor the quality of data coming from a variety of source systems. Users can also see where data originated (lineage) and how it was transformed, as well as create data dictionaries, perform master data management tasks, and execute custom workflows to remediate data issues.

**Model Development and Governance**

To produce stress testing reporting required by Dodd-Frank regulations, banks must develop models to forecast PPNR, losses, provisions, capital and liquidity. However, according to the SAS roundtable participants, banks typically face challenges with model integrity, implementation efficiency, and execution speed, as well as developing and integrating enterprise-level stress testing models. They need to improve how they handle:

- **Scenario development** – translating the national-level macroeconomic scenarios provided by regulators into regional factors.
• **Low-loss portfolio modeling** - because some portfolios have historically very low losses, which creates modeling issues.

• **Linkages** - automating the linking of models that are dependent on one another in order to minimize manual interventions.

• **Compatibility** - ensuring that the modeling approaches used to forecast various measures throughout the enterprise are consistent so that results can be aggregated in a meaningful way.

• **Transparency** - maintaining adequate model documentation and transparency, which becomes especially difficult with black-box models from vendors or with models developed by employees no longer with the bank.

• **Change management** - managing the creation and retirement of production models to ensure that integrity is maintained.

• **Model governance, or processes** - ensuring the integrity of models.

SAS Perspective

Without the right tools, centralizing and governing data models needed for enterprise-level assessments like stress testing is a huge challenge. Equally important, models must be readily available in a controlled environment so they can be implemented quickly and efficiently to meet regulatory demands.

Specialized model management solutions vastly simplify these efforts – and are increasingly essential tools for stress testing. For example, the SAS Model Implementation Platform makes it faster and easier to manage models and put them into production. This software, which uses SAS High-Performance Risk, reduces the setup time needed to implement very complex systems of models from over a year to less than a week. Moreover, it enables banks to complete this work without having to hire a team of internal C++ model developers.

When banks combine SAS Risk Modeling Workbench together with SAS Model Risk Management, they can access generalized and specific capabilities supporting model development and model governance. For example, users can independently review and validate models used in internal capital planning. And using a web-based front end, they can see a complete inventory of models, the model validation process, and a champion/challenger assessment process. These types of model risk management capabilities are consistent with existing supervisory guidance on model risk management.

To accelerate the modeling implementation process of stress testing and fulfill the regulatory requirements, SAS stress-testing capabilities are delivered through a single, simplified platform. This makes it easy for users to pull from portfolio exposure calculation engines, run calculations, and aggregate results for a bankwide view. In addition, using our proprietary, high-performance, in-memory architecture, users can execute models on large amounts of granular data, aggregating what's needed to any desired level for analysis and reporting. The solution's comprehensive and efficient computational platform ensures all appropriate calculation steps are completed, monitored and repeatable.

The SAS High-Performance Risk engine enables fast and efficient integration of a wide range of risk models. The engine is specially designed to be scaled up to implement extremely complex and computationally intensive systems of models, such as Monte Carlo state transition models. In addition, the engine connects to a secure model execution library that allows institutions to store the models they need to execute in a controlled environment. When a model is run and distributed, in-memory computing enables extremely fast and adaptive aggregation of results for quick analysis and decision making.

SAS High-Performance Risk shines in the implementation of stress testing models, where many economic scenarios are run through loan-level modeling systems in a short time window.

Process Management

To comply with current regulations and business requirements, stress testing methodologies and processes must cover the entire enterprise and incorporate results for all legal entities and subsidiaries. Thus, in order to produce stress testing results, banks must coordinate efforts between many different departments, including lines of business, risk, finance and treasury. This coordination must also be documented, as regulators often spend as much time auditing the integrity of the stress testing process as they do the calculations themselves.

As noted by the roundtable participants, process management and workflow issues hinder banks in producing stress test results. These issues include:

• **Orchestration between departments** - coordinating activities between the various departments of the bank – which is often a time-consuming and error-prone process.
• **Orchestration between systems** – managing the flow between the financial budgeting process, capital management process and liquidity forecasting process, which is typically very problematic.

• **Accountability** – identifying process owners and holding them accountable for timelines and accuracy, which is easier in banks that operate in a centralized fashion, and harder in those that operate in a highly decentralized way.

• **Documentation** – creating and maintaining documentation that describes the entire stress testing process.

**SAS Perspective**

To address process management and workflow issues, banks need:

• The ability to orchestrate the entire stress testing process from a single user interface for auditability, transparency and repeatability.

• Broader risk and finance collaboration through carefully orchestrated model execution, result consolidation, reconciliation and exception remediation.

• Stress testing process efficiency, transparency and governance so that they can stand up to close regulatory and internal scrutiny.

With the right technology supports, all of this is vastly simplified. For example, the SAS Stress Testing Workbench pulls all of these related stress testing capabilities together in a web-based environment that enables analysts to:

• Orchestrate the stress testing process.

• Review and execute models.

• Aggregate results.

• Integrate other data sources.

• Apply business, regulatory and accounting rules into balance sheet, income statement, RWA and capital planning financial statements.

In short, the SAS Stress Testing Workbench serves as a central hub from which banks can orchestrate the various aspects of the stress testing process and consolidate results from the various systems. The workbench is linked to other components of the stress testing system through a centralized inventory of models and a stress testing data repository. It also supports integration and reconciliation between risk and finance. Analysts can specify scenarios and consolidate modeling results into balance sheets, financial statements and capital plans.

**Consolidation and Reporting**

Comprehensive stress testing activities place higher demands on data provisioning, data consolidation and data aggregation systems. To submit regulatory reports, banks must aggregate stress testing results from around the bank and present them in templates provided by regulators. For all the different parties involved in stress testing to align and understand one another, they must operate from a reconciled data source with a consistent data definition, and data must map to a common data hierarchy.

As noted by the SAS roundtable participants, data aggregation processes are often manual, and maintenance of regulatory templates is very time-intensive. Major issues in stress testing-related aggregation and reporting include:

• The iterative nature of the aggregation process. Producing aggregated stress testing results for the bank requires an iterative process between credit risk, financial planning and treasury. It is a time-consuming, manual process to consolidate results, review them and then send them back for different iterations.

• On-demand aggregation across dimensions. Generating results across banking dimensions may change month over month. Often, reporting dimensions will change as a result of acquisition or new business, and aggregating results using these new dimensions is a very manual process.

• Reporting across both business and regulatory dimensions. Consolidating results into both a business view and a regulatory view creates issues because of inconsistencies in granularity and incompatibilities among reporting hierarchies.

**SAS Perspective**

Many banks continue to encounter difficulties in establishing strong data aggregation, governance, architecture and processes. Still, banks often rely on manual workarounds, Excel-based processes, and interventions to create risk reports – and they are unable to create accurate and timely risk data reports during stressed or crisis situations.

To address these issues, SAS offers SAS Risk Data Aggregation and Reporting, a foundational solution spanning all risk areas. It provides an integrated suite of functions that holistically address risk data aggregation and reporting needs, thereby enabling banks to respond to the full range of stress testing requirements.
The SAS Stress Testing Workbench complements SAS Risk Data Aggregation and Reporting by providing management overlay capabilities and regulatory report generation features, as well as detailed audit functionality. The result is an end-to-end system for orchestrating the stress testing process.

Conclusion

Regulators, boards, and executive management demands are influencing the kinds of stress test environments that banks need today. And as a result, stress testing processes are in a state of continuous refinement.

But one thing is clear: Banks need an efficient, firmwide stress testing process supported by the right technology to meet current and future demands. The firmwide stress testing process not only allows a bank to gauge its capacity to meet regulatory capital requirements such as CCAR and DFAST, but also significantly improves an institution’s ability to identify and prevent potential issues that may affect its revenue, liquidity, market growth and earnings. In a typical stress testing environment, various parties - including risk, treasury, finance and lines of business - employ a number of systems to accomplish the necessary processes, ranging from data management, modeling and scenario management to the calculations, planning, and adjustment needed for the final capital stress testing. The entire process must be well-governed with properly documented policies and assumptions.

But there’s no one-size-fits-all approach to reaching this goal. Given the variations in stress testing technology maturity and experience among banks, organizations must make strategic, modular changes to technologies that pragmatically augment their stress testing processes. In many cases, they can do this by using existing systems and models. But in other cases, they must invest in new ones that address gaps that simply can’t be bridged by human resources and current tools.

To learn more about how SAS can enhance your stress testing process, please see:

- SAS Stress Testing solution brief.