



Risk and Compliance Case Study **AMBIT STRESS TESTING**

How BancorpSouth Built and Implemented a Stress Testing Strategy

In the fall of 2013, all U.S. banks with \$10 to \$50 billion in assets started conducting annual stress tests of their full balance sheets using a set of three macroeconomic scenarios prescribed by their regulators under the Dodd-Frank Act.

This deadline represented a challenge for the management team at BancorpSouth, a \$13-billion asset regional bank headquartered in Tupelo, Mississippi. To meet this challenge, the bank spent the first half of 2013 in close partnership with modeling consultants and solution experts from FIS, building and implementing an enterprise-wide stress-testing program with the dual aim of making sure it could run the regulators' scenarios and also improve management information regarding the effect of severe stresses on the institution.

This case study tells the story of how BancorpSouth found its way toward some answers, tackling several key issues such as:

- Whether to build a top-down or bottom-up modeling framework, given the associated data challenges.
- How to integrate the stress-testing framework by leveraging and building on the bank's existing core credit and balance-sheet management systems and processes.
- Ensuring that qualitative factors, management judgment, and governance concerns would receive as much attention as the quantitative modeling.

The emphasis here will be on the bank's credit risk modeling and its integration with the overall balance-sheet management framework.

Strategic challenge #1: Bottom up or top down?

One of the key modeling choices management faced was whether to attempt building a "top down" approach or a more ambitious "bottom up" approach to establish the relationship between macroeconomic variables and each business line or portfolio.

Top-down approaches use statistical techniques to model the relationship between macroeconomic variables (such as unemployment) and portfolio-level losses (for example, the CRE portfolio). On the other hand, bottom-up approaches use similar statistical techniques to model the relationship between macroeconomic variables and the individual risk factors that drive the bank's credit risk, such as occupancy rate or loan-to-value (LTV) for CRE loans.

The key advantage of the bottom-up approach was that it would allow the bank to drill down to the loan level and analyze the loss drivers in a more granular way. For example, bank management would see how different loans are affected by the macroeconomic scenario in different ways through loan-level migrations and borrower-level credit deterioration. As expected, loans of lower credit quality tend to be impacted by adverse macroeconomic scenarios much more severely than healthier loans.

Conversely, the top-down approach has its own set of advantages: lower data requirements and more flexibility in applying the model to different portfolios or groups of loans (see table below).

After extensive discussions, management decided to adopt the best of both worlds: The bank would build top-down and bottom-up models so that the strengths of both could be retained and each approach could act as a benchmark comparison point to the other.

Another key factor in this decision was that regulators seemed to expect that banks would eventually employ multiple approaches in the stress-testing framework, such as combining the best properties of portfolio-level and loan level analytics. BancorpSouth didn't want to invest in a solution that might need to be completely revamped or replaced in a year's time.

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Strategic challenge #2: Standalone or integrated?

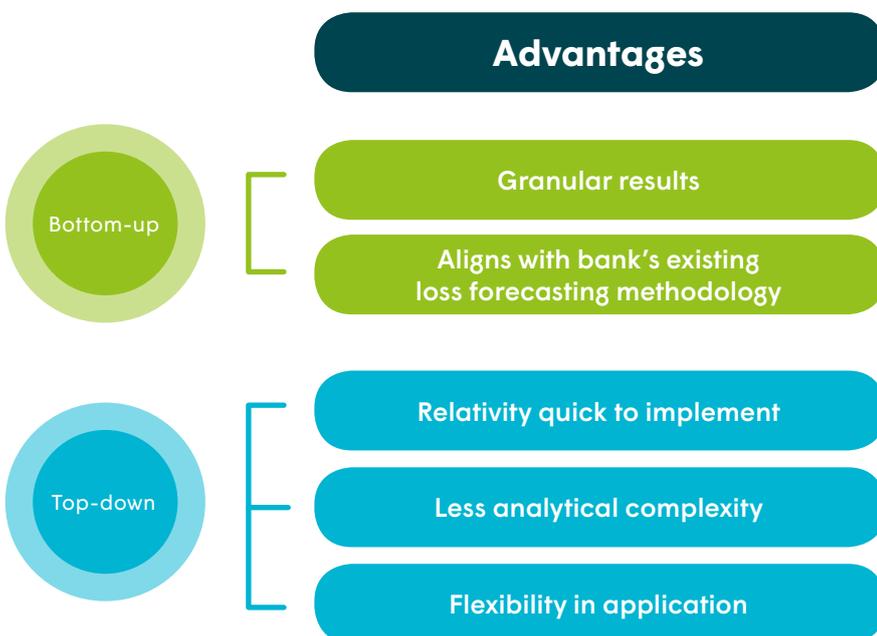
Seasoned bankers have a natural and perhaps justified tendency to dismiss or discount the words "system integration." It can therefore be tempting for regional and smaller banks to build their stress-testing program as a standalone spreadsheet based process, dedicated to complying with one-off or occasional stress tests. However, there is a danger that these programs will be isolated from the rest of the bank's operations and run in a vacuum-like environment.

BancorpSouth was also concerned that a standalone process would be very labor intensive and prone to error, since data would have to be gathered from many different bank systems and manually input into a sequence of spreadsheets each time a stress test is run.

Bank management knew that the stress tests had to be run at least twice a year for regulatory reasons—once at the bank level and once at the bank holding company level. More importantly, the bank's executive team wanted to run stress tests on a more frequent basis to support strategic and capital planning decisions.

Additionally, while many vendors were offering stress-testing products, BancorpSouth management realized that process integration would be an even greater challenge if its stress-test process included multiple vendors using different methods. Furthermore, many vendor provided stress-testing products were focused on common portfolios such as CRE and large C&I, while leaving smaller banks to find their own way to model portfolios such as small business and construction/development.

Figure 1. Key advantages for bottom-up and top-down approaches



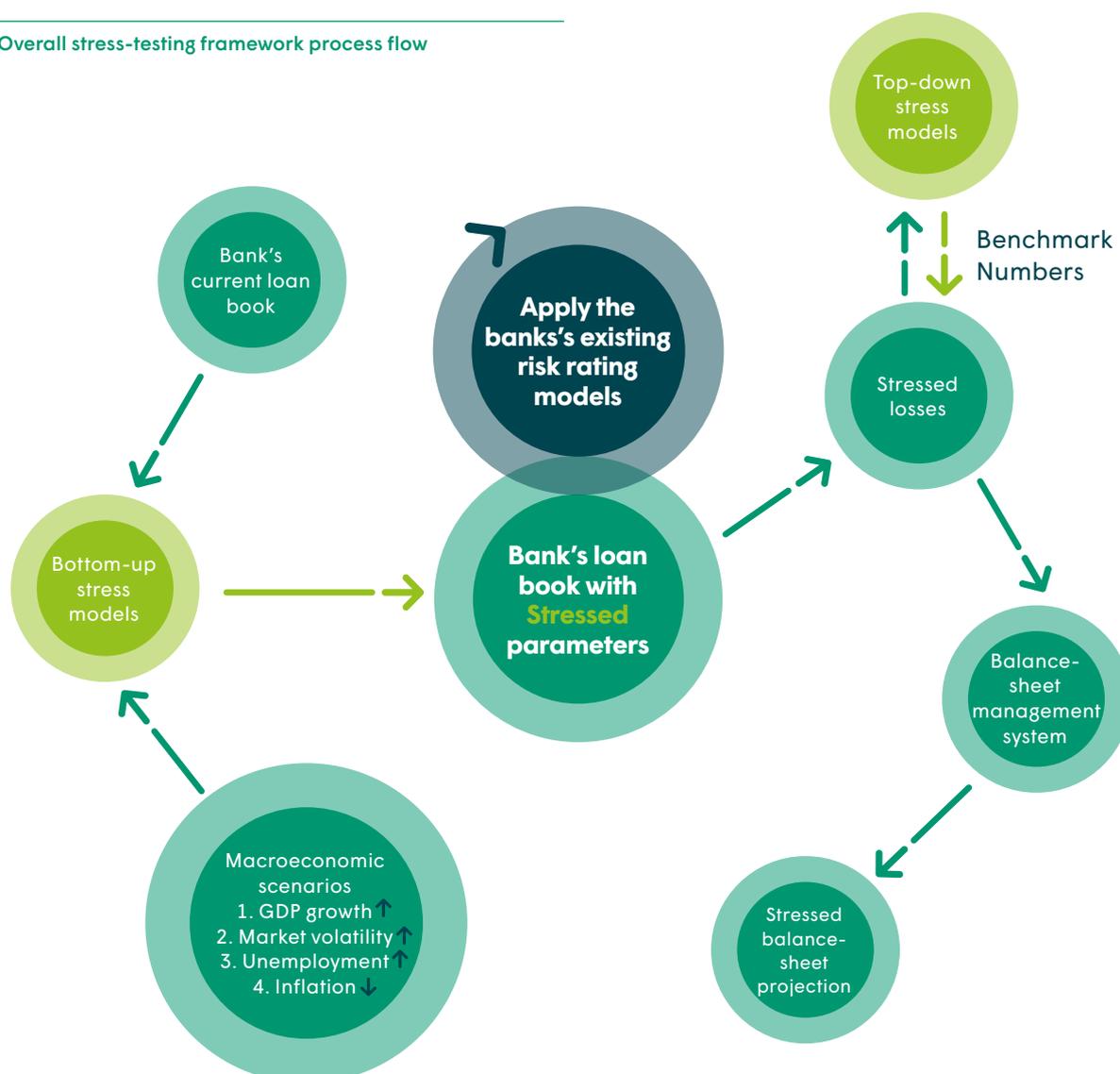
Management therefore decided to build on the bank’s existing FIS-provided credit risk models and balance sheet management systems. The credit risk models were statistical risk rating models that combined probability of default (PD) with loss given default (LGD) in order to determine expected loss (EL) at the loan level. Separate risk rating models comprehensively covered the bank’s exposure to business, consumer, and real estate loans.

The integrated stress-testing process would first draw stressed credit risk information from the bank’s risk rating models and then feed this portfolio data into the bank’s core balance-sheet management system (see figure below). The bank’s balance-sheet management system would then augment the stressed credit risk inputs with other balance sheet information so that the stress-test output would be sensitive to non-credit-related activities such as revenues, deposits, new business, and investments.

The integrated nature of this approach meant that running additional stress tests for strategic planning purposes would be relatively effortless. It also meant that the stress-test outputs would adopt procedures and formatting consistent with the bank’s existing ALCO practices—minimizing the training and disruption caused by the introduction of new models. In turn, this would boost the credibility of the results to internal and external audiences, as many of the stress-test assumptions and inputs would already have been reviewed and validated by numerous third parties at different points in the past.

Critically, the use of the balance-sheet management system as the central aggregator of stress-testing data allowed the bank to build a comprehensive picture of its whole balance sheet, while also allowing liquidity and operational risk assumptions to be included in the future.

Figure 2. Overall stress-testing framework process flow



Implementing the bottom-up credit approach

BancorpSouth was helped by the fact that it had installed its suite of credit risk rating models a few years previously. Since that time, the bank had been building up a rich time series of data on the risk factors of each credit model, which would significantly facilitate the bottom-up modeling approach. However, this is not to say that a bank is required to have this foundation in order to pursue the bottom-up modeling method. Many banks have more data than they realize from systems used for statement spreading, loan underwriting, and the call report.

BancorpSouth's first step was to work out how to leverage its existing family of credit models to support the bottom up approach to stress-testing. The bank took inventory of the credit models available in each business line and the multiple risk factors that drove each model.

The next step was to build models that described how each risk factor would respond to a stressed macroeconomic environment. This required constructing a time series of data for both the credit risk factors and the macroeconomic variables.

The U.S. regulators have specified 26 macroeconomic variables they will be using to define the macroeconomic scenarios for the annual Dodd-Frank stress tests (14 domestic U.S. variables and 12 international variables). Owing to BancorpSouth's U.S.-only footprint, the bank elected to focus on the domestic variables.

A further seven regionalized macroeconomic variables were added, such as regional unemployment and a regional housing price index, to make sure the models captured the nuances of the bank's regional footprint. These regional macroeconomic variables were forecast for each stress scenario based on the projected paths of their corresponding national macroeconomic variables, which ensured alignment with the regulatory forecasts.

For the historical data on the credit risk factors, the bank used a combination of internal bank-recorded data and external vended data. Bank data was generally sufficient to cover the most recent economic cycle, whereas external data was required in instances where the bank's own data was limited or unavailable.

The bank then worked in coordination with a team of FIS modeling consultants to build the bottom-up stress-test models using a two-stage process consisting of univariate and then multivariate statistical analysis. Importantly, the bank made sure that the intuitions of its business experts were fed into the analytical process at critical junctures.

Implementing the top-down credit approach

The top-down modeling approach was developed using a process similar to that applied to the bottom-up approach, but with one key difference: The models were built to describe how each of the portfolio-level overall loss rates would respond to a stressed macroeconomic environment. This relationship formed the basis for the top-down models used to estimate the expected losses in each of the bank's portfolios under stressed macroeconomic conditions.

Once the results from both the top-down and bottom-up approaches were available, the bank was able to compare and benchmark the two sets of expected losses.



The use of the balance sheet management system as the central aggregator of stress-testing data allowed the bank to build a comprehensive picture of its whole balance sheet.

Integration with the balance-sheet management model

BancorpSouth was now in a position to integrate the credit risk stress-testing models with the bank's core balance sheet management system. This allowed the bank to forecast stressed future revenues and cash flows across the entire balance sheet, as well as calculate pro-forma capital adequacy ratios at the end of each month across the entire stressed macroeconomic scenario horizon.

Using the balance-sheet management system as the central aggregator also allowed the bank to use a single set of assumptions across all its major risk types: credit, operational, and market. For example, the investment and securities portfolio would be stressed with the same interest rate assumptions as the loan portfolio.

One challenge here was to make sure that the output from the balance-sheet management system aligned with the regulatory reporting templates issued for the Dodd-Frank stress-test results. Bank effort was spent here to ensure that the balance-sheet reporting structure aligned with the regulatory reporting structure. This alignment facilitated more efficient and automated stress-testing runs, making it easier for the management team to apply the new stress-testing results on a more frequent basis.



Managers at the bank feel that the steps taken to develop the stress-testing process have led to more cohesive and holistic collaboration across bank functions.

Fact: BancorpSouth management has developed a sophisticated stress-testing framework that positions the bank to meet the upcoming regulatory requirements.

Qualitative factors and governance concerns: the real hurdle?

When banks build stress-testing programs, it's tempting for them to focus solely on the quantitative issues, such as data collection, statistical rigor, and methodology sophistication.

These components are certainly crucial elements of the overall stress-testing framework, but they are not the only ones. The stress-testing process and results will be reviewed and scrutinized by a wide-ranging audience, including internal bank stakeholders, third-party validators, auditors, regulators, and even the general public through the Dodd-Frank disclosure requirements.

This means that, in advance of the first set of Dodd-Frank stress tests for the \$10 billion-to-\$50 billion banks, firms need to re-examine their corporate and risk management governance structures in order to demonstrate that everything underpinning the numbers—risk management policy, data reporting, etc.—is robust and well documented.

During the stress-test model development process, the suitability of the existing credit risk models was reaffirmed—specifically, whether the risk factors that powered them and the assumptions and risk data sets that underpinned them were right for the portfolio in question and calibrated appropriately for the bank.

Additionally, the bank had to pull together information from businesses and activities that were not usually involved in this kind of centralized risk exercise. The bank also considered a series of operational risks, including the risk of the bank depending on a vendor that failed to perform.

To address these governance concerns, BancorpSouth made the stress-testing program a top priority at the most senior level. In the final analysis, the bank knew that management and the board of directors would be answering detailed questions from regulators on how the stress-testing process was tailored to the bank's risk profile and procedures. Support from the top allowed the project owners to invest the resources and effort required to make the program a success.

Conclusion

BancorpSouth now has in place a stress-testing framework that combines the strengths and advantages of the top-down and bottom-up modeling approaches. Separate loan-level models comprehensively cover each of the bank's major product types, and the use of regional macroeconomic variables ensures that the process is built specifically for the bank's unique portfolio composition and geographic footprint.

The framework draws on the bank's existing family of credit and balance sheet management models to help make the process more credible to bank stakeholders, including executives who review the results and analysts who run the stress-test models.

The integrated and automated nature of the stress-testing process means that management will be able to run a comprehensive, enterprise-wide scenario analysis more frequently and build the results into bank strategy and business decisions, such as capital planning.

BancorpSouth management has developed a sophisticated stress-testing framework that positions the bank to meet the upcoming regulatory requirements. However, the bank also recognizes that this is the first step in a still evolving process. There will be opportunities to refine and improve the framework over the next few years based on industry and regulatory feedback. No bank has all the answers in this fast evolving area of risk management.

However, one benefit has already been fully realized. Managers at the bank feel that the steps taken to develop the stress-testing process have led to more cohesive and holistic collaboration across bank functions. Throughout the project, the biggest lesson management learned was that the entire institution, from the board down and across all key bank functions, must become involved in building an enterprise-wide stress testing program.

Customer challenges

- Regulatory compliance.
- Capital plan approval.
- Deadline pressures.
- Project and organizational complexity.
- Multiple legacy bank systems, solutions, and databases.
- Accounting for the bank's unique balance sheet composition and footprint.

Solutions

- Automated and integrated process that minimizes manual handoffs.
- Comprehensive view of entire balance sheet.
- Customized models tailored to bank's unique characteristics.
- Executive reports and dashboards highlighting key risk and profitability metrics.
- Loan-level granularity.

Results

- Regulatory approval of stress testing and capital plans.
- Improved balance sheet management framework.
- Better-informed decision making processes, such as capital planning and risk appetite.
- More cohesive and holistic collaboration across bank functions.

Fact: BancorpSouth now has in place a stress-testing framework that combines the strengths and advantages of the top-down and bottom-up modeling approaches.

About Ambit Risk Advisory Services

Brings together strategy consulting know-how with a wealth of banking, technology and regulatory expertise. Advisory services focusing in areas of stress testing, capital adequacy, model validation, pricing and profitability optimization, risk appetite setting, risk rating, ALLL and loss forecasting.

About Ambit Stress Testing

Solution suite addresses Dodd-Frank's current stress testing requirements and provides a long-term framework to fulfil wider risk management and regulatory objectives, helping to turn the practice of compliance into a competitive advantage. For more information, please visit

www.fisglobal.com/ambitriskinstitute

About FIS

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