Perspectives on stress testing

Stress testing plays a central role in helping banks and other financial institutions to identify and measure material risks and concentrations as well as supporting management’s strategic decisions. The Basel Committee and many supervisors have emphasized the importance of comprehensive stress testing as an essential part of capital planning. This is true at all points in the cycle – when risks are taken on in booms as much as when they crystallize in recessions. It is also important for all types of financial institution—from large systemically important banks to small brokers.

The recent global market turmoil has raised unprecedented levels of interest from industry and regulators in stress testing methods and results, amidst a lack of confidence in existing projections and risk metrics:

▶ The size of losses incurred by banks and the succession of new write-downs each quarter has obliged financial institutions to drop their usual business forecasting to assess whether they would still be going concerns once the crisis reached its bottom.

▶ Other risk measurement tools, such as value at risk and economic capital, which were based on assumptions of distributions, have proven to be too optimistic and inaccurate until significant recalibration is performed.

The importance of stress testing as a core component of risk management has been emphasized. Individual banks are working further to develop their approaches to stress testing at a portfolio and whole bank level. Stress testing plays an important role in the ICAAP\(^1\) assessments under Pillar II of Basel II and supervisors in many countries are looking to banks to improve the techniques and comprehensiveness of these tests going forward.

Given the strains across the financial markets, central banks and regulators have also been conducting system-wide stress testing. In April 2009, US bank supervisors commissioned a large-scale stress testing exercise (Supervisory Capital Assessment Program or SCAP) concerning the 19 largest US banks. The tests were designed to assess whether banks require an additional capital infusion to maintain a “well-capitalized” regulatory capital status under a potential adverse economic scenario, defined by a fall in GDP and house prices and a rise in unemployment. The transparency of the US SCAP exercise has significantly raised public awareness of capital adequacy issues and industry attention to stress testing.

Similar tests have been carried out in different ways across many other countries. In Europe, the FSA and the Bank of England have conducted a number of exercises where the banks have been required to stress their balance sheets using scenarios set by the authorities. In May 2009, The Committee of European Banking Supervisors (CEBS) conducted an EU wide stress test covering a sample of 22 major European cross-border groups. The stress tests for each banking group were carried out by the national supervisory authorities in each jurisdiction and the results were aggregated by CEBS. The stress tests used common scenarios and benchmark parameters.

Disclosure: striking a balance

There is a consensus in Europe on the importance of stress testing but not on the release of results. Whereas US agencies released results of individual institutions, the EU has not disclosed the names of the 22 banks that were recently tested. The US disclosed results to help restore confidence in the market but the EU took the stance that by singling out an individual institution’s risks, their access to capital is compromised, and can trigger the very instability stress testing is meant to help avoid.

Other issues need to be addressed to allow meaningful disclosure of stress tests. First, the choice of scenarios, and especially the severity and likeliness of the scenarios, should be clearly explained to avoid misinterpretation. There have been criticisms about the recent exercises that the defined adverse scenarios were actually close to revised economic expectations by the time that the stress tests were completed. Information on the methods and measures of impact (on earnings, capital, liquidity), as well as error margins, must be sufficient to allow comparison of the results over time and across institutions. Finally, if market participants come to rely on stress test results as an indication that a bank is a going concern, disclosure by the banks will require assurance on the reliability of the calculation, through an independent audit.

From testing individual risks to full balance-sheet modeling

The focus on banks making stress testing a core part of the informal control framework will continue. The Basel Committee defines a stress test “as the evaluation of a bank’s financial position under a severe but plausible scenario to assist in decision-making within the bank. The term “stress testing” is also used to refer not only to the mechanics of applying specific individual tests, but also to the wider environment within which the tests are developed, evaluated and used within the decision-making process.”

Stress testing is a widely used term which can be used to describe many different techniques:

► Sensitivity analysis which assesses the resulting impact of changes in the model’s parameters. For example, Basel II requires the calculation of the impact on interest rate risk of a 200 basis point shift in interest rates. It is also a standard procedure for model validation, which assesses the range of inputs for which model performance remains reasonable.

► Scenario analysis can use a historical crisis and apply it to the firm’s current or projected position. Useful when a historical scenario could re-occur, or if of an appropriate indicative magnitude, its use is limited when specific events are not applicable or severe enough to impact the firm, or when there are no suitable historical events for specific risks (as was the case with the current credit crisis).

► Hypothetical scenarios are typically used for extreme “tail” events, where data is sparse or not available. Used by many firms during overall capital adequacy assessments, the technique allows evaluation of events which are plausible but challenging to model. These hypothetical scenarios use a mixture of elements including shocks seen for parts of the portfolio in previous events mixed with other purely hypothetical stress elements to cover the current profile of the portfolio.

► Reverse stress testing is used to demonstrate the strength of a firm’s capital position, by identifying the severity of the scenarios needed for the firm to fail, or losses to exceed a given level (What losses lead to dropping below minimum capital ratio and what events and developments could cause these losses?). The FSA requires all banks to carry out reverse stress testing to focus attention on the combination of events which would put a severe strain on the bank. The results then need to influence decisions on capital, mitigating actions and strategy.

2  Id.
These techniques have been applied to varying extent across the different major risk types:

► **Market risk** – stress testing has been an established technique for many years, with the application of both historical and hypothetical scenarios and development by advanced banks of multi-factor analyses.

► **Credit risk** – advances in stress testing have largely followed the implementation of internal rating systems to meet Basel II. Banks are working on methods to project forward arrears rates and loss given default for different portfolios. Stress testing of counterparty credit risk continues to be an area of methodological development at banks using advanced potential future exposure models. In the current environment stress testing of structured products often actually amounts to a line-by-line credit review. Under Basel II the banks also face issues regarding procyclical capital requirements (i.e., requirements which rise in a downturn and fall in booms). Banks are required under Pillar II to assess how far capital requirements could rise and are developing a range of techniques to do this, in particular, stressing the inputs to the IRB models and calculating the new distribution of loans across rating bands and therefore the capital requirements.

► **Operational risk** – scenario analysis is a key component of Basel II's advanced framework but the sophistication of approaches varies.

► **Liquidity risk** – many banks are now conducting scenario analyses as a result of the recent market events.

Banks have had to develop the firm wide, cross-risk capabilities required for the assessment of the overall risks faced by the firm and the capital required to meet the ICAAP requirements under Basel II. But these techniques are under redevelopment both to make the stress testing easier to complete and to make the tests more holistic and able to reflect the real risks.

One type of new approach is balance sheet modelling. Such an exercise can be summarized as a full modeling of the balance sheet under adverse conditions or a stressed version of the business plan. This requires a stressed projection of credit provisions and trading losses, and a challenge of redemption forecasts, forecasting of treasury assets and hedging, and assumptions on income and the cost base, including tax rate. Rigorous analysis means that few P&L items can be left unchanged. For example, effective tax rates have moved significantly in the current economic environment. Adjusting variables through stress testing may have the effect of changing the nature of tax assets; for example, from current to deferred, which is likely to have consequences for capital adequacy. It also means that the tax rate for testing purposes may not be the accounting tax rate.

**Critical steps in developing a stress testing framework**

Supervisory exercises conducted in various countries showed that many institutions lacked an efficient firmwide stress testing framework. Indeed, several supervisors had to extend their original deadlines from a few weeks to several months, to grant banks the time to deliver the results.

It is apparent that firmwide stress testing is still a highly manual process with significant coordination needed to align assumptions and the projection process between risk, finance, treasury and business units. A clear integration approach and infrastructure is also required to efficiently aggregate estimates from multiple models and link balance sheet and income dependencies. Consistent forecasting models are not typically in place for all balance sheet and income statement categories to support integrated projections.

Modeling capabilities vary across institutions and portfolio types. The most sophisticated banks have developed macro economic factor driven loss forecasting models. Other institutions without these modeling capabilities used more basic models based on historical loss rates, supplemented by expert judgment and benchmarks.

Many existing financial forecast models lack sufficient risk granularity to readily support integrated income and loss forecasting. Beyond market, credit risk and net interest margin, few models or established processes exist to robustly project losses and income statement effects under alternative scenarios to existing baseline forecasts.

Many institutions have encountered data quality, reconciliation and data management issues as they set up models, ran the projections and tried to aggregate across categories.

Given the current unprecedented environment, models that extrapolate from historical data need to be carefully complemented with management expertise; stress tests require significant management involvement to interpret scenarios, approve assumptions, and business strategies and analyze offsetting or compounding risk effects.
As a component of the overall capital adequacy framework, institutions need to have a repeatable process for similar scenario analyses, rather than relying on “ad hoc” solutions. This requires the following critical steps:

1. **Analyze and define the approach**
   
The scope of a stress testing program must be determined — risk coverage, risk profile/materiality, and required outputs and reporting granularity. A review of existing stress testing capabilities should be performed against these objectives.

   To establish projection methodologies that link risk and finance model inputs to macroeconomic factors requires an understanding of the specific risk drivers within portfolios and their impact on financial metrics and portfolio performance. It is also important to estimate the time between the initial economic shock and the impact on the bank’s financial situation (the lagged effect).

   Stress testing must be integrated into the risk management framework/risk governance and decision-making at the appropriate level of seniority.

2. **Choose appropriate scenarios**
   
   For stress testing to effectively support senior management decisions, the number of scenarios must be kept to a handful to be manageable, while still providing a thorough assessment of risk. Relevant scenarios must be selected between adverse variations from the plan, using the same type of indicators as for baseline business planning and additional scenarios, given the institution’s risk sensitivities.

   Scenarios must then be translated into factors that drive risk and finance models, developing a set of model inputs for each scenario to stress the key income statement and balance sheet metrics that measure the bank’s solvency and liquidity position. Data requirements must be defined and assumptions around new business and risk profiles under each scenario established.

   For larger institutions, the key challenge is to apply consistent scenario interpretations across multiple risk and financial statement models, and design stress testing capabilities at different levels (e.g., bank wide, business unit, business line).

3. **Build a repeatable process**
   
   Execution of the assessment must take place within a clearly defined and repeatable process. Process must cover the gathering of required data, addressing cases where it may be scarce and lacking in quality. The application of stress testing models must be supported by the development of an adequate infrastructure. Process planning must allow for expert judgment review sessions and workshops where needed.

   Such an integrated process can require establishing additional governance as applicable, either through a distinct stress testing committee involving senior risk and finance representatives or through integration with capital planning committees. Activities must be documented to support internal analysis and supervisory dialog.

4. **Aggregate, report and review results**
   
   This was perhaps the step that large institutions found most challenging during supervisory exercises.

   Within a short time frame, institutions must run aggregation of financial model and capital projections and produce management reports — explanatory diagnostics, sensitivities, key behavioral assumptions.

   The results must be reviewed to challenge behavioral assumptions and if appropriate models may need to be re-run. The results should be reported to senior management to determine their action regarding capital adequacy strategy and risk management, including potential revision to the business plan.

   For stress test results to support decision-making within large institutions, the calculation and reporting process must provide for appropriate controls and timely delivery of information. One approach could be to implement stress testing within the yearly budget process. To ensure necessary management involvement within businesses lines, this process must provide relevant business information. This can be achieved by including not only scenarios on severe but rare events, but also sensitivity analysis of business to potential adverse conditions that could cause operating income to become negative.
Due to the continued economic uncertainty, volatility of earnings and evolving capital regulations, firmwide stress testing is a critical management information tool to supplement existing standalone financial and risk metrics. Developing a stress testing framework is a multi-year effort requiring significant management direction and infrastructure investment, with clear definition and prioritization of activities. Articulating the “business as usual” capabilities necessary to support capital management and business decisions, and developing a rigorous plan to phase in these capabilities is key to an efficient implementation. Banks should not be distracted by a sense of returned normality from improving their ability to manage future volatility of earnings and capital.

**Key questions to consider**

Stress testing can involve complex models and infrastructure and is frequently dependent on expert judgment, and yet it must be transparent, replicable and reliably able to support strategic business capital, planning and management processes.

To ensure its relevance, senior management must oversee the development of an integrated framework aligning resources from risk, finance and business to make sure that key considerations are addressed.

**Critical questions include:**

- Is the bank's stress testing sophistication proportionate to the size and complexity of the firm?
- Are scenarios meaningful for the bank's activity and risk profile?
- Do underlying models sufficiently capture the true risk sensitivities of the bank's business?
- Are the results aggregated and communicated in ways that are meaningful to the business?
- Is stress testing integrated into the decision-making process, i.e., a formal element of limit setting and capital allocation as opposed to being a simple informational tool?
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