Stress-Testing Frameworks and Techniques in the Banking Industry

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Agenda

- Purpose of the presentation
- Overview of the concept of stress-testing
- Stress-testing: Purpose and rationale
- Typology of stress-tests
- Reaction to the crisis
- Implementing a stress-testing programme
- Some closing thoughts

Note that the views expressed in this presentation are those of the author, and do not imply that Absa Group Ltd endorses or shares the views expressed herein.
Purpose of the Presentation

• To provide an overview of the “field” of stress-testing
• To help the audience gain a deeper appreciation for the need for stress-tests
• To discuss some topical developments related to stress-testing
• To provide some (hopefully) useful guidance in developing, enhancing, or formalising stress-testing practices
• Note that macro-prudential or system-wide stress-tests are beyond the scope of this presentation
Overview of the Concept of Stress-Testing

- Stress-testing is the process of determining the ability of a system or entity to withstand plausible severe adverse conditions.
- Basel II definition includes the identification of these plausible, severe conditions as part of the program.
- Stress-testing is used in a wide variety of disciplines.
  - In the fields of medicine and of engineering, for example, stress-tests have been conducted as part of the discipline for many years – the area of finance is a relatively “late bloomer” in this regard…
- Stress-testing is closely linked to the concept of scenario analysis – the term “stress-testing” as applied in the financial sector may be seen to incorporate elements of scenario analysis and planning.
Stress-Testing: Purpose and Rationale

- As implied by the definition given above, stress-testing is designed to identify and quantify potential vulnerabilities which a portfolio might have.

- Stress-tests are playing an increasingly important role in the assessment of capital adequacy.
  - As internal model approaches are implemented and the usage thereof approved, there is a regulatory imperative to conduct stress-tests in order to validate the economic capital amounts which these models produce.

- Stress tests play an integral role in the process of setting risk appetite.
Stress-Testing: Purpose and Rationale

• Certain types of stress-tests can identify risk concentrations within a portfolio
  • Concentrations are often overlooked as a result of a focus on aggregate performance
  • Sub-portfolio stresses and scenarios can identify vulnerabilities and thereby inform strategy
• Consideration of adverse scenarios which have yet to materialise historically, transcends the limitations of most (if not all) quantitative models, which are typically calibrated on either historical or market-implied “scenarios” or data
Stress-Testing: Purpose and Rationale

- A successful stress-testing programme will engage senior management and players across disciplines, and enable an organisation to better understand their KRI’s.

- Stress-testing functionality is very closely linked to the forecasting process, since often input-based “forecast-type” models are needed in order to quantify economic stresses on the portfolio.
  - A base-line economic forecast will be a good forecast of likely end-of-period performance.

- Stress-testing is thus a useful tool in establishing budgets (baseline cases) as well as “test-driving” various strategies, and as such plays a key role in strategic decision-making.
Typology of Stress-Tests

- Stress-tests encompass a wide range of methodologies, ranging in complexity.

- A number of approaches to defining and categorising stress-tests exist. These may be broadly categorised into:
  - Sensitivity tests
  - Scenario-based stress-tests

- The following diagram provides a visual representation of the broad framework of the types of stress-tests typically conducted.
Typology of Stress-Tests

Stress Tests

- Sensitivity Analysis
- Scenario-Based Analysis
  - Portfolio Driven
    - Historical
    - Hypothetical
  - Event Driven
    - Historical
    - Hypothetical

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Typology of Stress-Tests

• Sensitivity Analysis
  • Entails assessing the impact of movements in a single factor or parameter
  • Large moves are often considered in order to assess, for example, potential hedging strategies, or the impact of a single factor on the book / portfolio
  • Smaller moves are often considered in order to assess the impact of model risk in terms of incorrect parameter estimates
    • Where performance metrics are highly sensitive to small changes in certain parameters, these parameters need to receive the most attention in the modelling process
Typology of Stress-Tests

Scenario-Based Analysis

- *Portfolio-driven scenarios* are derived by considering what the vulnerabilities within a particular portfolio are.
- *Event-driven scenarios* are derived by considering specific adverse external (often economic) scenarios, and determining the impact of such events on the performance of a particular portfolio.
Typology of Stress-Tests

Scenario-Based Analysis

• Both portfolio-driven and event-driven scenarios may be either historical or hypothetical in nature

• Historical scenarios consider the impact of adverse conditions or events which have already materialised

• Hypothetical scenarios are the consideration of scenarios which have not materialised in our history, but are plausible
Reaction to the Crisis

• “It is better to be roughly right than exactly wrong…”
  - John Maynard Keynes

• Many very advanced statistical models and quantitative techniques exist for measuring risk, but remember that all models are wrong!

• Following the onset and development of the global financial crisis, greater focus has shifted more to the art and science of stress-testing, in the hope of a more pro-active risk management strategy that goes beyond our historical experience and captures potential root causes.
Reaction to the Crisis

- Banks are required by Basel II to conduct stress-tests on their portfolio. Pillar II stress-tests in particular require firms to “have in place sound stress testing processes for use in the assessment of capital adequacy”

- The Committee of European Banking Supervisors has recently published guidelines for stress testing in order to enhance and support such processes within organisations
Reaction to the Crisis

- FSA has implemented “supervisory recommended scenarios” in order to strengthen the Pillar II stress-testing currently performed by organisations
  - Has the benefits of engaging senior management, overcoming tendencies to underestimate the likelihood of adverse conditions, and allows consistent comparison across organisations
- FSA has furthermore required the explicit consideration of so-called “reverse” stress-tests, and CEBS has echoed this requirement
Reaction to the Crisis

- Banks themselves have highlighted certain areas within their stress-testing regimes as requiring future development.

- These areas are:
  - Revisiting scenarios on an ongoing basis, and highlighting previously unidentified ones
  - Utilising stress-testing to inform strategic decision-making
  - Incorporating stress-testing into the development of new products
  - Heightened awareness of analysis of correlated risks – across portfolios as well as across risk types
  - Greater focus on appropriate time horizons, and the consideration of secondary or feedback effects
Implementing a Stress-Testing Programme

“No stress-test or scenario is an island”...

- Stress-scenarios on their own will not be taken very seriously if they are not integrated into the overall ERM framework of the organisation.

- A stress-testing and scenario analysis framework should include the phases of:
  - design;
  - implementation;
  - communication; and
  - monitoring.
Implementing a Stress-Testing Programme - Design

- The process of how a stress-test is constructed is critical to its success.
- All types highlighted in the typology should be given due consideration.
- Individuals from various disciplines – risk, business and economics – should all be involved in the process to ensure buy-in as well as to ensure robust and considered scenarios.
- Care should be taken to avoid “disaster-myopia”…
- Facilitation skills are essential to a successful process – if you don’t have them, outsource!
Implementing a Stress-Testing Programme - Implement

• The implementation phase of scenarios which have been developed is where the real work starts…

• Models are required to translate the various scenarios into income statement and balance sheet impacts

• Many models in the banking industry use linear modelling techniques to relate macro-economic indicators to income statement and balance sheet performance measures

• Often AR(p) time-series models are used to forecast the macro indicators in order to establish a “model view” forecast
Implementing a Stress-Testing Programme - Monitor

- Once scenarios have been translated into financial impacts, the outputs become useful in terms of informing strategy.
- Monitoring then happens at two levels, monitoring of the scenario set, and monitoring of the environment.
- The set of scenarios needs to be regularly monitored to ensure their ongoing relevance and to identify potential new scenarios.
- The environment should be monitored in order to recognise the materialisation of any of the identified scenarios in due course.
Implementing a Stress-Testing Programme - Communication

- Ongoing communication throughout the process is vital to a successful program.
- Multiple perspectives are involved in the design phase, and the imperative for good communication here is self-evident.
- In order for the participants (and other business stakeholders) to believe in the financial impact of their scenarios, communication of the modelling process is essential.
- Keeping a set of early warning indicators visible in regular reporting will ensure that they are actioned at the appropriate level.
Implementing a Stress-Testing Programme

Some key focus areas to ensure a successful programme:

• Data quality and aggregation
• Tailored communication strategy
• Robust model – build and – validation
• A strong economic and business rationale for predictive inputs into stress-testing models
• Take the time to consider true “enterprise-wide” scenarios. Consider events which may cause multiple risks to materialise, and give cognizance to the interaction between risks, for example default and liquidity
Some Closing Thoughts

• Stress-testing is part art and part science, and as such deserves the status of a “field of expertise” rather than merely a technique to be employed.

• Stress-testing is very closely linked to the forecasting process, and actuaries involved in model-building in this field would do well to strengthen their forecasting “toolbox”.

• The embedding of stress-testing into the business entails developing sufficiently granular insight into the economy and incorporating this knowledge into reliable forecasting models.

• Never under estimate the power and usefulness of the knowledge of the front-line managers – integrating a “Delphi-view” is essential to a successful stress-testing programme.
Questions
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