

STRESS TESTING AS A RISK MANAGEMENT METHOD

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In regard to the growing importance of stress testing, a discussion forum devoted to stress testing was held at the National Bank of Slovakia in January 2006. The event was attended by representatives of commercial banks and the NBS. Among the issues discussed at the forum was the use of this method in bank risk management.

The position of stress testing in risk management

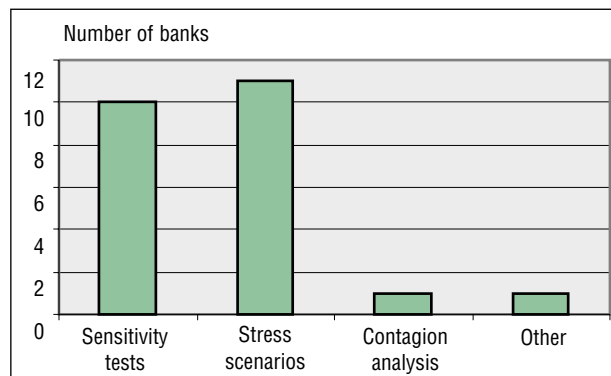
Stress testing is a relatively new yet highly relevant field in risk management and generally in bank management. One of the first documents to focus on stress testing was the report published by the Derivatives Policy Group¹ in 1995, which recommended that stress testing for various risk factors be introduced into the risk management of investment banks. In 1996, the Basel Committee published criteria for the calculation of market risk capital requirements for banks using internal models. Stress testing has a significant position under these requirements, as well as in the draft amendments to EU directives. Stress testing in draft directives is examined more closely in a consultation paper of the Committee of European Banking Supervisors (CEBS). The issue of stress testing is also being addressed by central banks and commercial banks through various specialist working groups, seminars² and conferences.

The entry of stress testing is to a large extent related to the introduction of models into bank risk management. The models themselves represent a simplification of reality and may be used to measure bank risks under certain assumptions. The assumptions differ depending on the particular model and the risk measured, though most models are based on the assumption of normal or ordinary development of risk factors. However, the real market situation includes extreme and exceptional situations which these models and their assumptions are not able to take account of. The main aim of stress testing is therefore to analyse any such gaps in bank risk management.

¹ "Framework for Voluntary Oversight" is published on the internet at www.riskinstitute.ch

² In December 2005, the National Bank of Slovakia in cooperation with the German Bundesbank organized a seminar for supervisors on the subject of macro stress testing.

Chart 1 Use of stress testing in the Slovak banking sector in 2004



Source: Stress testing questionnaire, NBS 2004

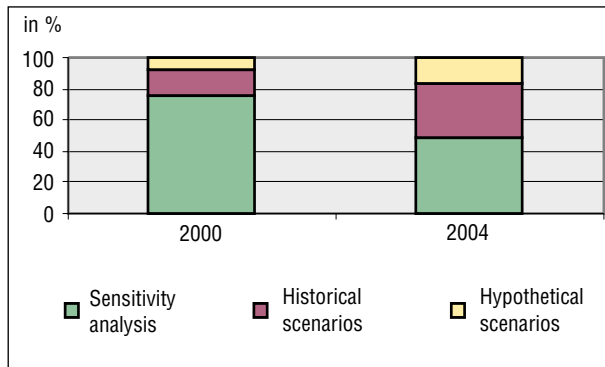
As for where stress testing is and was found in the Slovak banking sector, the situation was described by the results of a stress testing survey conducted by the NBS in 2004. Where banks apply stress testing, they most often used stress scenarios and sensitivity tests. When interpreting these results, it should be noted that banks, based on the definition³ of stress scenarios and sensitivity tests, define sensitivity tests for risk factors as stress scenarios. Generally speaking, the use of complex stress scenarios with explicitly or implicitly defined correlations was somewhat neglected. The banking sector also made lesser use of tests for risk transfer between banks (contagion analysis). Banks are not at present considering the integration of market risk and credit risk stress testing.

For comparison, we will look at the results of a similar stress testing survey conducted in Germany. As regards the development of stress testing, German banks over a period of two years began making less use of sensitivity tests and greater use of hypothetical and historical scenarios based on correlations between risk factors.

³ The definition is mentioned later in the text.



Chart 2 Use of stress testing in Germany



Source: German Bundesbank

The results of the German survey indicate different levels of stress testing between larger and smaller banks. The wider range of activities in larger banks accounts for the different level of sophistication. As in the Slovak banking sector, stress testing in German banks is developed more for market risk and to a lesser extent for credit risk.

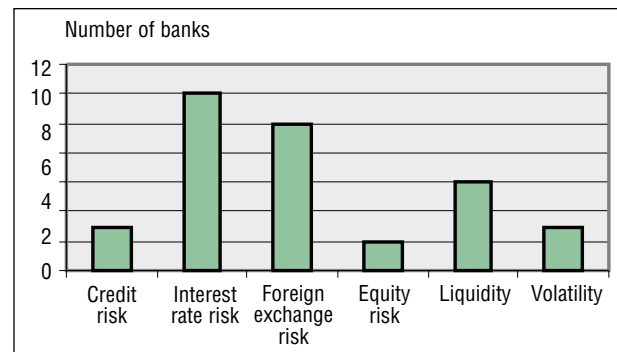
Chart 3 shows to what degree particular risk categories were covered by stress testing in the Slovak banking sector. Banks performed most of the testing on the effects of extreme changes in market factors, reflecting the fact that the methodology for calculating market risks is relatively simpler and there is better access to the data. In this respect, the banks focused mainly on interest rate risk and foreign exchange risk. As regards interest rate stress testing, they used simple gap analyses or methods based on calculating the net present value of interest-sensitive items. In the case of foreign exchange risk, the stress testing was typically based on the simple simulation of how exchange rate shocks affect banks' open foreign exchange positions. For both interest rate and foreign exchange stress testing, banks proceeded from the historical development of risk factors. Relatively few banks focused on the most significant risk in bank business – credit risk. The quantification of stress situations in credit risk often requires sophisticated macroeconomic models in order to connect credit losses with macroeconomic shocks. The banking sector made less use of stress testing for risk liquidity, share risk, and volatility.

The stress scenario results at the same indicated differences in the sophistication of stress testing between banks closely tied to parent institutions (stress testing is performed on the group level and local banks receive the results in various levels of detail) and banks that perform their own stress testing at the local level. In the case of the former group, the fore-

ign banks were clearly shown to have greater experience in the use of stress testing for risk management.

In both specialist financial literature and practice, it is possible to come across several definitions of stress testing. It is most frequently defined as a risk management method used to examine the potential effects on a firm's financial condition of a set of specified changes in risk factors, corresponding to exceptional but plausible events.

Chart 3 Coverage of risk factors by stress testing in 2004



Source: Stress testing questionnaire, NBS 2004

Besides being used to supplement models, stress testing may be used to assess a bank's internal capital. The results of stress testing may also be used to define a bank's risk profile, with scope to be employed as a forward-looking and assessment tool in bank risk management.

In differentiating between types of stress testing, we will focus on sensitivity tests and stress scenarios. Whereas sensitivity tests are designed to measure a bank's sensitivity to risk factor changes in isolation (for example, the effect of interest rate changes on a bank's profitability), stress scenarios are more complex and their purpose is to analyse a bank's vulnerability during simulated fluctuations in various risk factors (for example, in the event of a macroeconomic imbalance brought on by political instability). Each approach has its advantages and disadvantages. Sensitivity tests are less difficult to calculate and calibrate, but only allow a bank to see its vulnerability to a change in one risk factor. In reality, however, stress situations involve the fluctuation of various relevant risk factors. Stress scenarios encompass this feature of real situations by means of correlations between risk factors.

⁴ BIS (Committee of the global financial system), Stress Testing by Large Financial Institutions: Current Practice and Aggregation Issues, April 2000.



Core principles of stress testing

Where the following principles are fulfilled, the assumption is made that stress testing is a settled and integrated part of bank risk management. However, the complexity of stress testing differs depending on the size and sophistication of the bank, the diversification and structure of the portfolio, and on other factors too. The application of particular principles thus varies from bank to bank. In general, institutions with more complex portfolios may be expected to take approaches to stress testing that are more demanding on knowledge and data.

Each stress testing process begins with the identification of the risks to which the stress testing will be applied. The identification is based on the analysis of the bank's portfolio, whose structure is to a large extent determined by the materiality of particular risk categories. Also important is the analysis of the external environment affecting the exposure of bank positions.

Once the material risks have been identified, it is necessary to select the relevant risk factors. They may be defined, for example, on the basis of past experience. Therefore the identification of relevant risk factors may be carried out using an analysis of the reasons for historical losses and the circumstances in which they occurred. The number of selected risk factors depends mainly on the complexity of the portfolio and the nature of the risk to which the bank is exposed.

The calibration of stress scenarios is to a large extent a subjective matter for the bank. Unlike risk measurement by means of various models, stress scenarios do not have a defined probability of occurrence. As for its starting point, the bank may use past market events (historical scenarios) or create hypothetical scenarios based on its own expert assessments and own conception of the risk. The severity of the scenarios or the size of the shocks is therefore in line with the bank's "risk appetite", in other words, the level of risk which it is willing to accept. As regards the calibration of stress scenarios, it is generally the case that the scenarios are based on exceptional but plausible events. Central to this calibration requirement is the designing of scenarios that may realistically occur in regard to the bank's external environment and portfolio.

To have a comprehensive grasp of the risk to which the bank is exposed in extreme situations, it is necessary to aggregate the stress testing results. Where the results of individual stress tests are aggregated, there needs to be a certain degree of consistency maintained between the aggregated tests, i.e. a similar implicit probability in the tests. The best way to

aggregate stress testing results is to use correlations between risk factors. Where there are not the appropriate historical correlations for stress testing, the bank will use its expert assessments.

The frequency of stress testing is in line with the nature of the tested risks and the selected methods of testing. The frequency is therefore mainly related to the volatility of the risk factors. Due to the higher volatility of market factors, market risk stress testing is performed with greater frequency than is, for example, credit risk stress testing.

As for the position of stress testing within the bank risk management system, the bank's management has fundamental and general responsibility for the stress testing framework. The management must play an active part in the design of stress scenarios. This requirement relates to the role of the management responsible for business strategy and risk of portfolio. The management's conception about future risks is thus incorporated into the scenario designs.

The management is familiarized with the results of stress testing and the possible effects of stress scenarios, as well as with their limitations. A proper understanding of stress scenarios and their effects is essential for assessing whether the risk to which the bank is exposed corresponds with the bank's risk appetite. The amount of detail contained in the reports on stress testing results provided to the management depends on the nature and importance of the risk.

In the event of an excessive risk in the stress scenarios, the bank's management shall be prepared to take appropriate measures in order to bring the bank's risk appetite into harmony with the potential risk in the stress situations. The measures may include, for example, re-evaluating limits, reducing the bank's exposure in risky areas, changing the business strategy, or making an additional capital increase.

Banks regularly evaluate the adequacy of stress testing, especially the assumption relating to the risk profile of the portfolio and the external environment. The evaluation includes assessing the validity of the test assumptions, the involvement of management in stress testing, the quality of results reporting, the quality of documentation, the reliability of the data, and so on. The evaluation of stress testing adequacy is subject to internal audit.

The aim of this article has been to highlight the basic principles of stress testing and its position within bank management. Stress testing is a name covering various techniques used by institutions to assess their vulnerability to extreme but plausible situations. In this context, it has become an integral part of bank risk management.