Scenario-Analysis in 15 steps

Dr. Gerrit Jan van den Brink

The potential of expert estimates is underestimated due to the inherent subjectivity, which may cause massaged results not reflecting the reality. Therefore some risk managers prefer "hard data" like internal and external losses, which were caused by risk events. Especially in the case of operational risk the collected operational risk losses show a small subset of the risk potential an organisation is exposed to. Therefore these losses cannot serve as a sole basis for the calculation of the risk capital numbers.

In the meantime it is common sense in the risk community that a scenario-analysis plays an important role in the data collection process. In the banking industry the regulators explicitly require a scenario-analysis based on external data and expert judgment[1].The process to define and roll-out a scenario-analysis, however, has not yet converged to a general accepted approach, which ensures quality results. In this article a contribution to such an approach is made. The various steps to include the scenario-analysis in the risk management process will be discussed.

The scenario-analysis process can be decomposed in three phases:

1. The preparation phase
2. The execution phase
3. The quality assurance phase.

The preparation phase contains most steps; this phase is deemed to be the most critical phase. If some risk element is neglected in this phase, a repair in a later phase is hardly possible. The single steps in this phase can be reflected as follows:

1. The scenarios are structured in such a way that all areas relevant for the expert estimation are clearly described. A main area are the internal and external loss data events, which can affect the organisation. These structure of the scenarios should ensure an accurate and complete assessment resulting in a complete risk profile.
2. In the next step the target variables are defined. The uncertainty around these variables will be estimated by the experts in a later stage. Target variables in view of a scenario-analysis are:
    a. Variables to determine the frequency distribution: expected value and the variance
    b. Variables to determine the loss severity distribution: expected value and the variance
    c. Variables to determine the opportunity cost/missed income: expected value and variance
    d. Quality scores for the assesses processes, which are additional evidence for the frequency distribution.
3. After having defined the target variables the variables to be estimated by the experts need to be defined. The values of such variables need to observable by experts. If the variable can be determined by use of a process familiar to the experts, such processes can be judged as a variable as well. If such processes are not possible, the experts are not able to assess the values of variables directly. In such cases experts need to conclude the values of those variables by use of other variables which can be directly measured. This situation is common for risk assessments by use of scenario-analysis methods.

[1] Basel Committee on Banking Supervision, 2005

The question if experts are able to assess the typical frequency (mean) and the loss severity (mode) and the corresponding ranges for a scenario is valid. Scenarios are driven by various risk drivers (mostly cause related), which need to be considered. Furthermore the dependencies among those risk drivers need to be assessed as well.
A simple example of a "delayed payments" event shows various causes. The payment processing can be delayed due to a human error, IT-system may disrupt, transaction volumes may increase suddenly over the transaction processing capacity or the data quality of the payment order data is insufficient (e.g. a wrong bank code has been indicated in an incoming foreign payment). The list of examples can be easily expanded. The examples itself all refer to the frequency of a delayed payment event. The loss severity should be determined in the same way. E.g. Interest claims are determined by the transaction amount, the duration of the delay, and the currency over which the interest rate is determined. Such risk components can be assessed by the experts. Moreover, in an ideal case classified data is available to support the expert during the assessment. In many cases a graphical presentation of the risk drivers and the interrelationships is helpful. It structures the assessment process and the way of thinking (see figure 1). It should be noted that the figure is a simplified expression of a more complex case. E.g. the internal controls have been completely neglected in the figure. If the figure is complete, the expert is then able to assess each bullet. After the assessment of each bullet the dependencies need to be considered as well. The result reflects the values for the variables which are requested for in step 2.

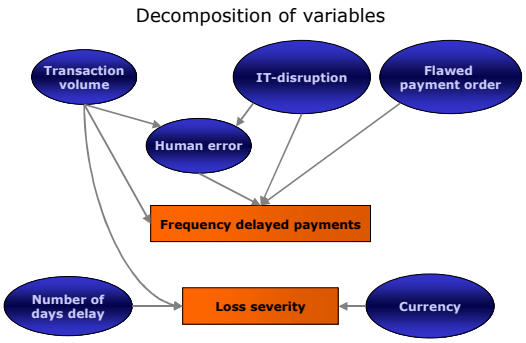

Figure 1

4. After the preparation variables to be assessed and the inter-relationships experts for the execution of the assessments are identified. The identification of experts requires a structure of the processes to be assessed. The identification of the experts should be treated with care, since they dominantly influence the quality of the results. The following criteria can be used to identify experts:
    a. The candidate's experience
    b. The number of years employed
    c. The education and training
    d. The overview over the end-to-end process
5. In co-operations with the business operational risk controller experts are selected. Basis for the selection are:
    a. The pool of identified experts
    b. The object to be assessed by use of the scenario-analysis.

    If a scenario-analysis covers the greater part of the value chain, more experts need to be involved to ensure that the full object can be assessed.
6. The assessment format is to be defined as well. In this document the precise questions are documented. It needs to be considered which detail information need to be required from the experts to achieve the target information. Important issues are:
    a. The usage of a simple but precise wording which

supports the expert's estimation

b. The questions should be formulated in such a way, that extensive interpretation is not necessary. Everybody should know, which types of answers are expected on the questions asked
c. If "hard data" is asked for questions should be so designed, that the experts are automatically directed to answers. Data which can support the assessments, should be integrated in the scenario-analysis template. They should be so prepared, that the exert can use them immediately during the assessment.

7. Before the scenario-analysis is started, the methodology should be test under real conditions. The test not only proves the methodology but also the selection of the experts. The elicitation of the variables as mentioned in (2) and (3) is also proven. It should be clear if the experts are able to assess the values belonging to the variables. If the test reveals that the experts are not able to assess the variables further elicitation is necessary.
8. The last preparation step is the training of moderators and experts to prepare them for the assessments. Experts need to be prepared on the estimation of frequency and loss severity. Moderators need to be prepared on the scenario-analysis process, to enable them to detect error potentials early and to remove those in time. Moderators should know how approaches affect the results of the scenario-analysis. Biases need to be identified and detected. A well known example of a bias is "anchoring". The expert refers in such cases to other already estimated results. An other bias occurs, if the experts believe he is in control, but this is not true. The result of such biases is a systematic underestimation. Events which caused a serious loss, however, are tendentially overestimated by experts. It is assumed, that such overestimations are caused by the brain structure: the section in which fear and other emotions are stored can overlay the cognitive section of the brain. Although the experts rationally know that serious events like 9/11 do not happen often, they tend to overestimate the frequency of such events.

Phase 2 contains the execution of the scenario-analysis. In the preparation phase the scenario has been designed in such a way, that each variable can be estimated and the evidence for each estimate (information and other data) is available. The experts should receive the information package before the meeting with the expert and the moderator (a person who is familiar with risk assessment and statistical methodology). The moderator plays an important role in the execution phase.

9. the following issues play an important role:
   – The moderator ensures a common understanding regarding the estimating process with all experts. He also explains the critical points in the information package. Experts and moderator should have a mutual understanding of the risk components and the dependencies among those. The moderators also checks the completeness of the material risk components with the experts.
   – The moderator takes care of an open atmosphere during the interview. Each expert should be fully respected, the discussion should be free of emotions and the experts should be able to assume, that a complete assessment of the scenario does not have any

negative consequences for them.
- If the scenario is estimated by more experts in a workshop format, experts should give their own first estimates in written form, to ensure that no expert is influenced by the answers of other experts. Those estimates are shared among all experts and they will further discuss in order to achieve a common knowledge base among them. At the end of the discussion the experts should converge to a common view regarding the typical value (mean for the frequency and mode for the loss severity) and the variance.
- Information sources, argumentations and estimations need to be accurately documented (audit trail).

The data quality phase contains the following steps:

10. All scenario-analysis results are condensed in the risk capital calculation. Scenario-analysis results may be weighted.
11. The scenario-analysis results are analysed and checked on plausibility. The consistency between the information used (evidence) and the results is checked. The results are compared internally and externally to ensure the robustness of the results. The sensitivity of the model for specific scenario results is also checked.
12. A feedback-round with the experts is used to discuss the issues raised in the data quality analysis.
13. The risk capital numbers allow for a ranking to focus on the scenarios which contain the highest risks. Actions are defined to optimise the is profile of the organisation.
14. All scenario-analysis results are so documented that the results can be traced.
15. The follow-up on the implementation of actions is periodically checked.

References:

Basel Committee on Banking Supervision, International Convergence on Capital Standards and Capital Measures, Basel, 2005

Cooke R. M.; Goossens, L. H. J.: *Procedures Guide for Structured Expert Judgement in Accident Consequence Modelling, Delft University of Technology, 2004*

Author

Dr. Gerrit Jan van den Brink, Head of Operational Risk Controlling, Dresdner Bank AG, Frankfurt am Main