

Modelling Operational Risk Project

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ABSTRACT

The Basel committee had proposed to replace the existing approaches with the Advance Measurement Approach and As the Operational Risk Management Head of AA Bank, a detailed report has been made to evaluate whether the bank is eligible to migrate in to the Advanced Measurement approach for the operational risk measurement and needs to be presented to explain the AMA approach for the risk and how it can be implemented in the bank having the other approaches. The report will cover the basic understanding of Advanced Measurement Approach, explain in detail its advantages and drawbacks for the other risk measurement approaches that are currently present, and the different techniques of quantitatively modelling various types of operational risks.

INTRODUCTION

The Basel II gives banks 3 alternative options that can be used to calculate the regulatory capital for operation risk.

What is Operational Risk?

Operational Risk can be defined by the Basel Committee as the risk of loss that is resulted from failures in internal process or from external events. It includes legal risk for example fines, penalties, or damages due to supervisory action.

Banks have had huge losses and have struggled to control operational risk.

In addition to permitting compliance with the Basel Committee's standards to the banks, management of operational risk inevitably leads to improved production conditions: streamlining of processes, which leads to enhanced productivity, improved quality, which contributes to a better brand image... Such an approach enables the creation of quantitative instruments that create measurable operational risk reduction objectives for operational teams.

There are 5 categories of operational risk: people risk, process risk, system risk, external event risk, legal and compliance risk.

What is Operational Risk Management?

Senior Management has two major ideas on risk. There is Enterprise Risk Management (ERM) where they aim to find the perfect balance of risk and rewards. It identifies and prepares for the hazards and cushions the risks.

The other idea is the Operational risk Management (ORM) which is greater risk-averse and makes a specialty of protective the organization. The main objective is to mitigate risks that can affect the daily function of the company.

ERM focuses on controls and eliminating risk and ORM seeks by eliminating or minimizing risk.

The key to effective operational risk management is by training people to understand which are the possible risks and what could go wrong.

There are three approaches in Operational Risk

- 1) the Basic Indicator Approach (BIA)
- 2) The Standardized Approach (TSA)
- 3) the Advanced Measurement Approach (AMA)

These will be explained more in detail in the main body of the report.

The 3 Approaches of Operational risk

According to the Basel Committee, there are three ways to measure operational risk: the basic indicator approach (BIA), the standard approach (SA) and the advanced measurement approach (AMA). Each of these options requiring a basic risk measurement, with increasing complexity and refining of capital calculations, one can move from the most simple to the most advanced approaches

1) Basic Indicator Approach

It is a simpler technique for measuring operational risk where the operations are not complex.

The basic indicator is measured as a percentage of gross income over previous three years that means that the bank holds capital for operational risk equal to the mean of the preceding three years of alpha (the percent fixed) of positive annual gross income. This indicator is calculated with gross income because it can be verifiable and it can be immediately and is easily available.

Under the BIA, banks are advised to calculate capital charge for operational risk as follows:

- Average of $(GI * \alpha)$ for the preceding three financial years (only positive)
- Gross income = Net profit + provisions and contingencies + operating expenses
- Alpha as 15 percent

2) The Standard Approach

Compared to the previous approach, it is a more advanced method to determine the capital required for covering operational risk losses.

In this, activities of bank is divided into different lines of businesses and with each line of business, the gross revenue helps to calculate the approximate exposure of operational risk for each line.

It is calculated by taking three years mean of the sum of the regulatory capital charges for each line for every year.

Except for the insurance side, the bank that chooses the TSA should apply it to both single banks and the entire banking sector. In this, negative gross income in any business can cancel positive capital charges in the lines of business. Whereas, if the aggregate capital charge across all lines is negative, then the numerator will be zero. Each business line's capital charge is then computed by multiplying gross income by the factor assigned to that business line.

3) Advanced Measurement Approach

Out of the above two approaches, this is the most advanced and refined method. With this model, banks could create their own experimental model to quantify the capital required for operational risk

In AMA, the regulatory capital requirement will equal the risk measure that is gotten by the bank's internal measurement system using either quantitative or qualitative criteria for the approach.

What is the essence of AMA model approach :

- You assume that risk events (losses) happen with the frequency they happened before
- You assume that the magnitude of the loss, while random, is adequately captured by the pattern exhibited by previously experienced events.

This is the only risk-sensitive approach to operational risk that Basel II allows and describes.

Advantages of using AMA

- A favourable influence on reputation and perception by stakeholders is one of the most evident outcomes of using an advanced approach to operational risk management. To shareholders, clients, rating agencies, and the market, more sophisticated and advanced risk management conveys a clear message of robust and effective risk management. This reassurance is critical, since it provides comfort to stakeholders, particularly during times of economic turmoil and uncertainty.
- Using internal models to compute capital needs under the AMA could result in regulatory and economic capital being reduced. As opposed to the more fundamental alternatives, capital is based on risk exposures rather than income levels.
- The most significant benefit, however, is that implementation of the AMA leads to improved risk management processes and more sophisticated risk measurement mechanisms.. Better-quality risk management ultimately protects the bank's value and the interests of stakeholders.
- The AMA implementation has also resulted in improved relationships between deployed risk managers and risk specialists. Deployed risk managers have to take on a lot of responsibility in their business units for the implementation of all operational risk measurement and management components. Because Guidance,

frameworks and policies for these implementations were developed by centralized risk specialists, and therefore close cooperation between both parties was required.

Disadvantages of using AMA

- Internal data is utilised for risk management and reporting, regulatory returns, and a variety of additional reports to the regulator, as well as for submission to external data consortiums and the capital model. Internal loss data is a key component of the AMA and a direct input into the capital model; however, the importance of data quality cannot be overstated, and this reliance on data may be a disadvantage in extreme market occurrences.
- Because the AMA is such a young science, it's easy to misjudge the project's scale, as well as the amount of time and experience required. The successful deployment of such an advanced risk management system necessitates extensive topic expertise and resources.
- One can accuse the AMA of something, it is that it is excessively simple, to the point of being naive about the causes of operational risk events. The AMA framework misses the opportunity to try to integrate other sources of company data (key risk indicators, other internal company metrics) into a more informed view of what is really going on, what is the true nature of the processes that generate operational losses, because of its simplistic and agnostic attitude toward the system attributes that cause operational risk events.
- Recent incidents of genuine Whale proportions include, of course, massive misconduct fines, to which the AMA framework remained oblivious.

Quantification of Operational Risk:

Quantifying operational risk for capital calculations is a difficult task that necessitates the application of a number of advanced statistical approaches.

- Data used and classification :
 - The capital calculation model has two inputs: internal loss data and risk scenarios. Loss data are generally endured losses, while risk scenarios are planned risk exposure estimates or approximations. Experts quantify each risk scenario, specifying loss amounts at certain probability (or frequency) levels. Loss data and risk scenarios are categorized in a matrix, with business lines shown on the vertical axis and risk classes depicted on the horizontal axis.
- Data and extreme value theory analysis :
 - Exploration and analysis of internal loss data are critical steps in the entire modelling process and must be completed before analytical modelling of accessible internal loss data can begin. The modeler can use tabular and graphical data analysis to determine data completeness, distribution, classification, patterns, breaks, and possible compatibility with specific analytical model families.
 - Summary tables, regulatory data matrices, multidimensional histograms, and empirical distribution representations are common techniques used.
 - Mean excess plots, Hill estimator plots, HKKP-Hill plots, DEdH plots, tail plots, and stability parameter plots are some of the graphical plots used to test the applicability of utilising extreme value. These plots can be used to determine whether the data is light-tailed, heavy-tailed, or both (in different segments), whether certain data segments can be modelled using the empirical distribution, what the possible modelling thresholds are, and whether a single dataset or cell needs to be divided into and modelled across multiple segments.
 - Examining foundational facts and applying extreme value theory can also help determine whether risk scenarios should be included in models. This is usually done when observations are sparse and business regions are vulnerable to high-severity incidents.

- Modelling of risk scenarios:
 - At varying probability/frequency levels, each unique risk scenario should be assessed (loss estimations). In addition, for each situation, experts estimate an annual loss frequency. For each scenario, this data is utilised to create an empirical severity cumulative distribution function, which may then be modelled using an analytical distribution.
 - The mean parameter of the Poisson distribution is assigned to the annual frequency estimate for frequency modelling. Each risk scenario is modelled separately, as previously mentioned.
 - Using Monte Carlo simulation with a large number of iterations, scenarios are pooled per cell in the classification matrix. As a result, an empirical dataset containing all annual permutations and combinations of scenario realizations has been created.

- Independent simulation and aggregation :
 - Before starting the simulation, a choice must be made on the weights that will be assigned to internal loss data models and scenario models for each segment in each cell. The percentage of random values obtained from loss data models and risk scenario models is determined by these weights. Each segment in each cell, where both an internal loss data model and a risk scenario model were built, has its own set of weights. The weighting of the two types of input data models is arbitrary and subjective.
 - Monte Carlo simulation is applied to all segments and distributions within a single cell at the same time. Total losses across all segments are totaled together for each simulation iteration to arrive at a yearly aggregate loss for that iteration.
 - For each cell, a huge number of iterations are used to create a dense annual aggregate loss distribution. To arrive at the regulatory capital charge for a single cell, the value-at-risk (VAR) at the 99.9% percentile is determined for each cell. The 99.9%ile values-at-risk of all applicable cells are put together to calculate the Group's (and each business line's) capital charge. This entails assuming complete interdependence among all cells and business lines.

- Using insurance as mitigation agent :
 - When assessing operational risk capital requirements, insurance can be employed as a mitigation tool. Losses generated during the Monte Carlo simulation procedure are covered by insurance.
 - In addition to the policy and clause mapping to each cell, certain insurance properties, such as maximum coverage, deductible, and whether coverage is global or per incident, must be parameterized for each cell.
 - It's also critical to have information on all relevant policies' compliance with Basel II minimum standards. This includes parameters that will be utilised in the calculation of haircut (discount) parameters. All of the above-mentioned parameterised insurance features are then applied to each simulated loss during the simulation process to arrive at a mitigated aggregate loss distribution that includes insurance.

- Capital Allocation :
 - The amount to which each business line and loss-event type combination contributes to the overall operational risk profile is calculated after computing the Group's total capital charge. Risk managers will be able to focus their efforts and prioritise the mitigation of operational risk using this information. The capital charge for each business line in independent simulation is just the sum of the VAR figures at the 99.9% percentile across all loss event categories.
 - Total capital is distributed based on the marginal contribution of each division/loss-event type combination's unexpected loss (UL) to the Group's unexpected loss (UL) where an annual aggregate loss distribution for the Group has been built taking correlation structures into account.
 - One of the most essential properties of this capital allocation methodology is that the total calculated Group capital equals the sum of the allocated capital figures.

Conclusion

By this, I hope there is proper understanding of what operational risk is, what its management is, the approaches to manage this risk, the pros and cons for AMA, the quantification of the operation risk. Understanding the data used for classification, extreme value theory analysis, risk scenario modeling, mitigation agent and capital allotment in full detail.

Thank You!!