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Physica A 338 (2004) 166–172
PHYSICA A
www.elsevier.com/locate/physa

Statistical models for operational risk management

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Abstract

The Basel Committee on Banking Supervision has released, in the last few years, recommendations for the correct determination of the risks to which a banking organization is subject. This concerns, in particular, operational risks, which are all those management events that may determine unexpected losses. It is necessary to develop valid statistical models to measure and, consequently, predict, such operational risks. In the paper we present the possible approaches, including our own proposal, which is based on Bayesian networks.

PACS: 02.50. − r; 89.65.Gh

Keywords: Bayesian networks; Operational risk management; Predictive models; Value at risk

1. Operational risk: an introduction

The aim of this paper is to provide a brief review on some model which allows to manage operational risk (OR) and measure capital requirement, compliant with recommendation of Basel Committee on Banking Supervision (Basel II) for any bank's type, especially internationally active banks (see e.g. Ref. [1]). Different reviews are provided in Refs. [2,3].

In fact, the rising interest of supervisor and banking industry, in the recent years, for OR is due to the growth of e-commerce, large-scale mergers and acquisitions and the use of more highly automated technology which test integrated system and provoke a number of situations increasing OR. In "The New Basel Capital Accord"

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0378-4371/$ - see front matter
doi:10.1016/j.physa.2004.02.039

(Basel II), published by Basel Committee, OR is defined as "the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events", including legal risk but not strategic and reputational risk (see Ref. [4]). The Accord asks a minimum capital requirement (K) which has to be detected against credit risk, market risk and OR;[1] it has also stated a figure of 12% of minimum capital requirement for OR[2] and, in the same time, it allows different calculation approaches for the regulatory capital, rising in complexity and decreasing in capital requirements. In particular, the Committee has stated a figure of 12% of minimum capital requirement that would produce a capital amount in line with the OR actually faced by large and complex banking organizations.

2. Risk management: statistical and Basel's view

In general, the objective is to estimate a loss distribution and to derive functions of interest from it (such as the Value at Risk, VaR); in particular, losses in market risk are realizations of a continuous stochastic process, while losses in credit risk are realizations of a convolution between a binary process (default or not) and a continuous one. Differently, losses in OR are realizations of a convolution between a counting process (frequency) and a number of continuous ones (severities).

Because of the complexity of event which generate operational loss and the heterogeneity of causes, the Committee purposes three approaches which can be, generally, clustered in two main strategies: top–down and bottom–up.

- *Top–down methods*: ORs are measured and covered at a central level, so local business units (e.g. bank branches) are not involved in the measurement and allocation process. The calculation of the capital requirement is performed using variables that are strongly correlated with risk exposure. The Basic Indicator Approach (BIA) proposed by the Committee is an example.
- *Bottom–up methods*: differently from the preceding methodologies, OR exposures and losses have been broken into a series of standardized[3] business units (called business lines) and into a group of OR losses according to the nature of the underlying OR event (called event type); ORs are measured at the level of each business line and then aggregated.

  Although capital coverage is decided centrally, the contribution of each business line is visible and can be monitored; at the same time it's more expensive to implement, but it allows much better management control and planning in a particular business line.

  We can include Standardized and Advanced Measurement Approaches (AMA) in this class of methods.

[1] The amount of capital charge has to cover also other types of risk, defined as "other risk".

[2] This requirement would produce a capital amount in line with the OR actually faced by large and complex banking organizations.

[3] The standard is defined in "The New Basel Capital Accord", by Basel Committee.