

Practical methods for measuring and managing operational risk in the financial sector: A clinical study [☆]

Ariane Chapelle ^a, Yves Crama ^b, Georges Hübner ^{b,c,d,*}, Jean-Philippe Peters ^{b,e}

^a Solvay Business School, Université Libre de Bruxelles, Belgium

^b HEC Management School, University of Liège, Rue Louvrex 14, Building N 1, B-4000 Liège, Belgium

^c Limburg Institute of Financial Economics, Maastricht University, The Netherlands

^d Luxembourg School of Finance, University of Luxembourg, Luxembourg

^e Advisory and Consulting Group (Risk Management Unit), Deloitte Luxembourg

Received 23 January 2006; accepted 3 September 2007

Available online 1 October 2007

Abstract

This paper analyzes the implications of the advanced measurement approach (AMA) for the assessment of operational risk. Through a clinical case study on a matrix of two selected business lines and two event types of a large financial institution, we develop a procedure that addresses the major issues faced by banks in the implementation of the AMA. For each cell, we calibrate two truncated distributions functions, one for “normal” losses and the other for the “extreme” losses. In addition, we propose a method to include external data in the framework. We then estimate the impact of operational risk management on bank profitability, through an adapted measure of RAROC. The results suggest that substantial savings can be achieved through active management techniques.

© 2007 Elsevier B.V. All rights reserved.

JEL classification: C15; G20; G21

Keywords: Operational risk; Advanced measurement approaches; Extreme value theory; RAROC; Risk management

1. Introduction

Since the first Basel Accord was adopted in 1988, the financial sector consistently complained about its simplistic approach based on the Cooke ratio for the determination of regulatory capital. The need for reorganizing the framework under which exposures to credit risk should be assessed was a major impetus for the revision of this system

through the second Accord, or Basel II. The Basel Committee on Banking Supervision (hereafter the Basel Committee) seized this opportunity to extend the scope of its proposals by introducing explicit recommendations with regard to *operational risk*.¹

While the two simplest approaches proposed by Basel II (i.e., the basic indicator approach, or BIA, and the standardized approach, or SA) define the operational risk capital of a bank as a fraction of its gross income, the advanced measurement approach (AMA) allows banks to develop their own model for assessing the regulatory capital that

[☆] This paper was reviewed and accepted while Prof. Giorgio Szegö was the Managing Editor of The Journal of Banking and Finance and by the past Editorial Board.

* Corresponding author. Address: HEC Management School, University of Liège, Rue Louvrex 14, Building N 1, B-4000 Liège, Belgium. Tel.: +32 42327428.

E-mail addresses: ariane.chapelle@ulb.ac.be (A. Chapelle), y.crama@ulg.ac.be (Y. Crama), g.hubner@ulg.ac.be (G. Hübner), jppeters@deloitte.lu (J.-P. Peters).

¹ Operational risk is defined by the Revised Framework of the International Convergence of Capital Measurement and Capital Standards (hereafter Basel II) as the “risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk.” (BCBS, 2004).

covers their yearly operational risk exposure within a confidence interval of 99.9% (henceforth, this exposure is called operational value at risk, or OpVaR). Among the eligible variants of AMA, a statistical model widely used in the insurance sector and often referred to as the loss distribution approach (LDA) has become a standard in the industry over the last few years. Yet, the implementation of a compliant LDA involves many sensitive modelling choices as well as practical measurement issues. The *first objective* of this paper is to develop a comprehensive LDA framework for the measurement of operational risk, and to address in a systematic fashion all the issues involved in its construction.

As a consequence of their conceptual simplicity, BIA and SA models do not provide any insights into the drivers of operational risks, nor into the specific performance of the bank with respect to risk management. By contrast, the LDA model lends itself to quantifying the impact of active operational risk management actions, and justifying (potentially substantial) capital reductions. Unlike credit risk modelling, however, the cost-benefit trade-off of this alternative approach is largely unknown to date. Therefore, the *second major objective* of this paper is to examine the costs and benefits associated with two distinct decisions, namely: the adoption of the LDA instead of the basic approaches on one hand, and the improvement of the operational risk management system on the other hand. We propose a RAROC-based framework for the analysis of the financial impact of various operational risk management decisions, where the distribution of losses is viewed as an input and cost variables as an output.

To achieve the two objectives mentioned above, we face most of the practical issues encountered by a financial institution in a similar situation. Namely, in the process of implementing the LDA, the institution must, in turn: (i) infer the distribution of rare losses from an internal sample of observations of limited size; (ii) incorporate possibly heterogeneous external loss data into its estimation; (iii) account for dependence – or lack thereof – between individual series of losses. Furthermore, the economic analysis of the operational risk management system requires; (iv) assessing the impact of managerial actions on the distribution of losses, and finally; and (v) mapping this loss exposure into an economically meaningful cost function.

The last two issues (iv)–(v) in the above list have apparently not been handled in the literature and require an *original* investigation. For this purpose, using analogies with credit risk and market risk modelling, we introduce a measure of risk-adjusted return (RAROC) on operational capital and perform a sensitivity analysis based on models developed in the LDA implementation.

By contrast, the first three issues (i)–(iii) in the above list have been previously identified and separately addressed in the financial risk management literature. For instance, Embrechts et al. (1997) recommend the use of extreme value theory (EVT) to model the tail of the distribution in risk management, and so do McNeil (2000), King (2001), Moscadelli (2004), Cruz (2002, 2004) or Chavez-

Demoulin et al. (2006). Frachot and Roncalli (2002) and Baud et al. (2002) both address the incorporation of external losses in the internal dataset. Applications of copulas to model dependence between financial risks have been reported in the field of market risk, credit risk, insurance or overall risk management (see for instance Cherubini et al., 2004), but very few applications seem to have been performed in the context of operational risk (for an example, see Di Clemente and Romano (2004) or Chavez-Demoulin et al. (2006)). Even so, however, our claim is that these issues cannot be considered as satisfactorily solved from the point of view of operational risk practitioners, since either they have been investigated in a purely theoretical framework (disregarding the inevitable hurdles encountered in any real-world implementation), or, in the best case, they have been addressed as separate and disconnected issues only. As a consequence, methodological gaps remain to be filled in order to link different components of the approach, and practitioners are often at loss when confronted with the formidable task of developing a complete operational risk measurement system based on the LDA.

Our work can be seen as an attempt at overcoming these shortcomings. In the empirical part of our paper, we opt for a clinical case study that encompasses all components of the discussion in a single framework based on real operational loss data collected by a European bank. This methodological choice enables us to adopt the realistic point of view of the risk manager of a specific financial institution. To our knowledge, no published application adopts a similar perspective. The closest work in this respect is a study by Chavez-Demoulin et al. (2006) in which the authors focus on individual statistical modelling issues and illustrate them using transformed operational risk data, a framework that prevents them from discussing the underlying practical issues in great detail. Other related investigations are reported by de Fontnouvelle et al. (2003), who rely on a public operational loss database (which is not exhaustive and restricted to large losses), and by Moscadelli (2004), who uses loss data gathered during the 2002 Loss Data Collection Exercise carried out by the Basel Committee. The paper by Di Clemente and Romano (2004) performs its analysis on catastrophe insurance data.

The paper is organized as follows. In Sections 2 and 3, we discuss the modelling choices underlying the measurement and management of operational risk capital, respectively. Section 4 tests the risk measurement methodology on real data, and assesses the impact of operational risk management on the profitability of the bank. Finally, Section 5 presents some conclusions.

2. Measuring operational risk

2.1. Overview

Although the application of AMA is in principle open to any proprietary model, the most popular methodology is by far the loss distribution approach (LDA), a parametric

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات