



Decision Support

Operational risk: Emerging markets, sectors and measurement

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ABSTRACT

The role of decision support systems in mitigating operational risks in firms is well established. However, there is a lack of investment in decision support systems in emerging markets, even though inadequate operational risk management is a key cause of discouraging external investment. This has also been exacerbated by insufficient understanding of operational risk in emerging markets, which can be attributed to past operational risk measurement techniques, limited studies on emerging markets and inadequate data.

In this paper, using current operational risk techniques, the operational risk of developed and emerging market firms is measured for 100 different companies, for 4 different industry sectors and 5 different countries. Firstly, it is found that operational risk is consistently higher in emerging market firms than in the developed markets. Secondly, it is found that operational risk is not only dependent upon the industry sector but also that market development is the more dominant factor. Thirdly, it is found that the market development and the sector influence the shape of the operational risk distribution, in particular tail and skewness risk. Furthermore, an operational risk measurement method is provided that is applicable to emerging markets. Our results are consistent with under investment in decision support systems in emerging markets and imply operational risk management can be improved by increased investment.

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1. Introduction

Operational risk, the risk arising from operational activities, has been gaining increasing attention as a source of risk within firms (Beroggi & Wallace, 2000). The role of decision support systems in reducing costs and operational risks is well established within literature; there has been much research documenting that decision support systems improve operational performance (see for instance Chan, Jiang, & Tang, 2000; Beroggi & Wallace, 1994; Clark & Chapman, 1987; Repede & Bernardo, 1994).

Despite this, little analysis has been done to quantify the degree of operational risk in firms, yet a key role of decision support systems is reducing operational risk. Consequently, the importance of decision support systems in relation to managing operational risk is not fully understood. For instance, is operational risk sufficiently low enough (compared to other firms) or is additional decision support systems investment required? Did past decision support systems investments improve (or worsen) operational risk and if so by how much?

The ability to answer such questions and benchmark one's operational risk performance is especially important in emerging markets, where it is recognised that companies tend to be exposed to greater operational risk e.g. system errors, fraud etc. (see for instance (Ray & Das, 2010; Smimou, 2014), who cites fraud as an important factor in emerging markets). Emerging markets have attracted significant interest in industry and research (e.g. Dong, Kouvelis, & Su, 2013; Kallio, Kuula, & Oinonen, 2012; Vidal-Garcá & Vidal, 2014; Zmeškal, 2005). Despite that operational risk is an important factor in emerging markets, there is a lack of investment in decision support systems in emerging markets when their firms are compared to their peers in developed markets (see Berardi, Patuwo, & Hu, 2004; Meng & Lee, 2007). This is even more puzzling given that there exist incentives to invest in decision support systems; foreign investors tend to avoid emerging markets solely due to operational risk issues (see Khanna & Palepu, 2006; Khanna et al., 2005).

The fact that incentives exist to implement decision support systems in emerging market firms but do not invest in them suggest that they do not fully comprehend their level of operational risk exposure. This has been due to a number of interacting reasons. Firstly, most research relating to operational risk has not

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focussed on emerging markets. Hence emerging market firms have less understanding on their operational risk, which in turn impacts decision support systems expenditure. Secondly, emerging markets typically present significant data acquisition challenges and so applying any quantitative methodology becomes impractical. Hence, the understanding and analysis of operational risk in emerging markets has been limited.

Thirdly, there has been little development in techniques to quantify operational risk. The current methods of quantifying the impact of decision support systems have not focussed upon operational risk or any risk measurement, rather they have focussed around event studies (such as in (Chai, Kim, & Rao, 2011; Meng & Lee, 2007)) and cost-benefit analyses (for example (Gayialis & Tasiopoulos, 2004; Ozdamar, Bozuyel, & Birbil, 1998; Santhanam & Kyparisis, 1996)). The cost-benefit analyses typically focus on cost reductions and efficiency savings; the event study method examines the benefit in share returns from introducing systems. Both methods do not quantify risk but also they focus on the operational gains from a single system, rather than examining the operational risk of the overall company, hence their analysis is limited in scope.

In the past decade, operational risk literature has significantly developed; various methods and techniques have been developed which now enable us to analyse operational risk more effectively. For instance, models and data are now being utilised to quantify the operational risk of firms (Chorafas, 2004; Loader, 2002). This now enables us to compare the operational risk between firms, markets and sectors and so enable us to determine whether firms are adequately managing their operational risk (e.g. through sufficient decision support systems investment). However, the literature on decision support systems and operational risk in emerging markets has been practically non-existent. Furthermore, many operational risk measurement techniques have demanding data requirements that prohibit their application to emerging markets (since such markets have low data availability).

In this paper the operational risk in emerging and developed markets is measured and compared for 100 different firms, over 4 different industry sectors and in 5 different countries. Our operational risk measurement method utilises publicly available financial data that is available in emerging and developed markets; in particular stock price data from 2007 to 2012 is used and other empirical financial data such as balance sheets. Hence our method does not prohibit analysis of emerging markets.

This paper makes a number of contributions. Firstly, a method of measuring operational risk is provided that is applicable to developed and emerging markets; it is not prohibited from investigating emerging markets by circumventing significant data demands. Secondly, it is shown that operational risks are dependent on the level of market development (specifically emerging or developed), suggesting that emerging market firms are significantly underfunded in decision support systems. Thirdly, it is found that there is a dependency on operational risk to industry sector, which is expected since differing industries have differing exposure to operational risk. Fourthly, it is found that the level of market development is more important than the industry sector in determining operational risk. Finally, market and sector factors affect the shape of the operational risk distribution, in particular skewness and tail risk. Such results are consistent with insufficient investment in decision support systems in emerging markets.

The rest of the paper is organised as follows: in the next section operational risk is introduced, defining it, the motivation for study and providing a literature review of related research. The next section explains the method for measuring operational risk, its implementation and calibration. The proceeding section explains our method, data, presents our results and analysis. The paper finally ends with a conclusion.

2. Introduction to operational risk and motivation of study

Risk management is one of the key functions of any business (see for instance (Ansariipoor, Oliveira, & Liret, 2014; Fertis, Baes, & Lüthi, 2012; Gaivoronski, Sechi, & Zuddas, 2012; Mitra, Date, Mamon, & Wang, 2013; Singh, Murthi, & Stefes, 2013)), although the 2008 financial crisis demonstrated the continued existence of weak risk management practices (Voinea & Anton, 2009). Operational risk is the risk arising from the operational activities in conducting business, rather than the business's 'financial' risk; in Hahn and Kuhn (2012) defines operational risk as the result from the uncertainty of future events in the ordinary course of business. Examples of operational risk include I.T. failure (physical or software), damage to physical assets (e.g. through natural disasters), administration errors (e.g. incorrect data entry), fraud and other operational activities. Operational risk is therefore encountered by all types of businesses, regardless of industry sector.

Operational risk has increased over the years as operations have begun to play an increasingly prominent role in businesses. The primary reasons for this are that firstly companies use highly sophisticated technologies to manage operations nowadays (Chowdhury, 2003). This typically increase the risk in operations and so the likelihood of unpredictable losses. Secondly, businesses have increased their degree of reliance upon operational activities over time, hence they become increasingly more vulnerable to operational risks. For instance, Westland (2002) and Ngai and Wat (2005) discuss the operational risks associated with e-commerce and the impact on businesses.

The literature on decision support systems playing crucial roles in reducing operational risk has been well established. For example, in Ngai and Wat (2005) the importance of operational risk is highlighted in e-commerce and its impact on businesses. In Hong and Lee (2013) the operational risk confronting procurement processes is investigated and decision support systems are proposed to model various operational risks that exist. In Garcia-Dastugue and Lambert (2003) discuss the use of internet specific decision support systems in reducing operational risk facing companies in supply chain related risks. In Kim, Altinkemer, and Bisi (2012) yield management decision support systems reduce operational losses but also improve workforce utilisation.

Despite the acknowledged importance of decision support systems in improving operational risk management in firms, it has been recognised in various studies that emerging market firms typically do not have the same level of decision support systems as in developed markets. For instance Berardi et al. (2004) point out that emerging market firms are unable to take advantage of decision support systems due to emerging markets firms having inadequate systems. In Meng and Lee (2007) it is discussed that the gap between developed and developing countries is widening due to the slow adoption of IT systems.

A potential explanation for the lack of decision support systems investment in emerging markets could be attributed to a lack of investment demand in such firms, however, emerging market firms typically attract high investment demand. In fact, the emerging markets have attracted significant investment demand from investors in developed markets. This can be explained by a number of factors. Firstly, they offer potentially relatively higher returns than their domestic counterparts. Secondly, investment in emerging markets enables one to diversify his portfolio. Thirdly, stringent capital controls have become increasingly relaxed, which has encouraged foreign investment in emerging markets.

The lack of investment in decision support systems is even more puzzling given that a key cause for discouraging foreign investors in emerging markets arises from poor operational risk management. For instance in Khanna et al. (2005) the operational

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