



# Modeling operational risk incorporating reputation risk: An integrated analysis for financial firms



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## ABSTRACT

It has been shown in the empirical literature that operational losses of financial firms can cause severe reputational losses, which, however, are typically not taken into account when modeling and assessing operational risk. The aim of this paper is to fill this gap by assessing the consequences of operational risk for a financial firm including reputational losses. Toward this end, we extend current operational risk models by incorporating reputation losses. We propose three different models for reputation risk: a simple deterministic approach, a stochastic model using distributional assumptions, and an extension of the second model by taking into account a firm's ability to deal with reputation events. Our results emphasize that reputational losses can by far exceed the original operational loss and that neglecting reputational losses may lead to a severe underestimation of certain operational risk types and especially fraud events.

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## 1. Introduction

Reputation risk is among the most relevant risks for firms (see, e.g., [The Economist, 2005](#); [ACE, 2013](#); [Deloitte, 2014](#)), and at the same time considered to be more difficult to manage than any other specific risk category (see, e.g., [ACE, 2013](#)). For example, while other risks may imply direct (real) costs, the extent of potential financial consequences of a damaged reputation typically depends on various moderating factors, such as the prior level of reputation or the ability of the firm to recover its reputation over time. In addition, due to the fact that reputation risk is a risk of risks, it takes a special role in risk management and should generally be managed in an integrated way by considering the underlying risks along with their effects on reputation (see, e.g., [Tonello, 2007](#); [Regan, 2008](#)). Since reputational losses in financial firms are most often caused by underlying operational loss events,<sup>1</sup> especially in case of fraud (see, e.g., [Cummins et al., 2006](#); [Gillet et al.,](#)

[2010](#); [Fiordelisi et al., 2014](#)), the aim of this paper is to present a model approach that extends existing models for operational risk by taking into account reputational losses, which to the best of our knowledge has not been done so far.<sup>2</sup> In particular, purely empirical event study approaches typically do not study operational and the resulting reputational losses at the same time, and they can also not be applied in model settings under Basel III or Solvency II, for instance. Providing a model thus does not only allow us assessing reputation risk caused by operational loss events, but it also allows a better and more holistic understanding of the actual consequences of operational losses (pure operational loss and resulting pure reputational loss), which is of high relevance when deciding about the type and extent of preventive measures regarding operational risks, for instance. The model and the numerical

<sup>1</sup> [2009](#); [Young and Coleman, 2009](#)), the Société Générale trading loss 2008 (see, e.g., [Soprano et al., 2009](#)) or the UBS rogue trader scandal 2011 (see, e.g., [Fiordelisi et al., 2014](#)).

<sup>2</sup> Note that we therefore only consider reputation risk caused by underlying operational losses. To assess reputation risk in its entirety, other underlying risk types such as, e.g., credit risk (see [KPMG, 2012](#)) also have to be taken into account, which can be done similarly.

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<sup>1</sup> Examples of large operational loss events include, e.g., the involvement of the CEO of Banca Italease in the Danilo Coppola affair 2007 (see, e.g., [Soprano et al.,](#)

analysis are thus intended to offer first insight into the relation between operational losses and reputational losses by calibrating the model consistently based on results from the empirical literature. It can further be used for scenario and sensitivity analyses under Basel III or Solvency II, for instance, to identify general interrelations between operational and reputational losses. We also discuss limitations of the presented approach and point out the need for future research in regard to reputation risk.

A large part of the literature is concerned with the modeling of operational risk, including, for instance, McNeil et al. (2005), Chavez-Demoulin et al. (2006), Gourié et al. (2009), Chaudhury (2010), Shevchenko (2010), and Brechmann et al. (2014), while Gatzert and Kolb (2014) study operational risk from an enterprise perspective under Solvency II with focus on the insurance industry. Another part of the literature empirically analyzes operational loss data. While most of these studies examine empirical data from the banking sector (see, e.g., de Fontnouvelle et al., 2003; Moscadelli, 2004), Hess (2011b) also investigates operational loss data for insurance companies, whereas Hess (2011a) examines the impact of the financial crisis on operational risk.

In addition, a further strand of the literature empirically examines the impact of operational risk events on reputational losses based on event studies by examining stock market value reactions that exceed the pure operational loss. While some papers focus on the banking industry (Perry and de Fontnouvelle, 2005; Fiordelisi et al., 2013, 2014), others also include the insurance industry (Cummins et al., 2006; Cannas et al., 2009), consider the financial (services) industry in general (Gillet et al., 2010; Biell and Muller, 2013; Sturm, 2013) or investigate the consequences of certain subsets of operational risk also in other industries than the financial (services) industry (see, e.g., Murphy et al., 2009; Johnson et al., 2014). Most authors thereby find significant negative stock market reactions to operational losses that exceed the announced operational loss size, thus indicating substantial reputational losses, and most find that these losses are especially pronounced for (internal) fraud events. Fiordelisi et al. (2014) further show that reputational losses of banks are higher in Europe than in North America. The consideration of reputational losses arising from operational risk events is thus of high relevance.

In general, the potential impact of a bad reputation on the financial situation of the company can be fatal (see Kamiya et al., 2013), and reputation is even more important in the financial industry, especially for banks and insurers, whose activities are based on trust. Thus, reputation is a key asset and therefore an adequate management of reputational risk is vital (see Fiordelisi et al., 2014). Reputation risk is becoming increasingly important for firms especially against the background of the increasing prominence of social media and the internet, where particularly bad news spreads faster. Finally, reputation risk is also of high relevance in the context of Solvency II and Basel III, the new regulatory frameworks for European insurance companies and global banks, where all relevant risks must be adequately addressed qualitatively and quantitatively in a holistic and comprehensive way. In this context, while for operational losses different types of insurance policies are available for different event types, reputational risk insurance as a stand-alone product has only recently been introduced (see Gatzert et al., 2016).

Overall, the literature so far has thus studied various aspects of operational and reputational risks, but the models for operational risk generally do not take into account the resulting reputational losses, whereas the empirical literature does not focus on operational risk model frameworks, which can be used for risk assessment. Therefore, the aim of this paper is to combine both strands of the literature by extending current models for operational risk by incorporating resulting reputational losses as observed in the empirical literature for financial firms. We thereby propose three

different ways of adding reputation risk that are generally based on the typical event study approaches, including a simple deterministic approach, a stochastic model using distributional assumptions, and by integrating a probability of a reputation loss that reflects a firm's ability to deal with reputation events (e.g., crisis communication). In a numerical analysis, we calibrate the model based on consistent empirical data, which allows a comprehensive assessment of the impact of operational and reputational risks. We thereby also study the impact of firm characteristics (market capitalization and total assets) by integrating a scaling approach (based on Dahen and Dionne, 2010) in the operational and reputational risk model.

Accounting for reputation risk is of high relevance as it represents a risk of risks and should thus be taken into account when assessing underlying risks such as operational risks that may result in reputational losses. By proposing a simple model framework, we aim to provide first insight into the quantitative effects of reputational losses resulting from operational risks and to thus obtain a more comprehensive picture of the impact of operational risk. The extended model allows a more precise analysis of operational risks and the relevance of individual risk types along with the possibility to conduct scenario and sensitivity analyses, which is vital for risk management decisions and to ensure an adequate allocation of resources for preventive measures, for instance. One main finding based on the consistently calibrated model is that reputational losses can by far exceed the original operational losses and that the distribution of losses among event types changes and shifts toward internal and external fraud events.

The paper is structured as follows. Section 2 discusses the relation between operational and reputation risk, while Section 3 introduces the model framework. Section 4 contains numerical analyses based on empirical results from the literature, and Section 5 summarizes and discusses implications.

## 2. Operational and reputation risks

### 2.1. Corporate reputation

While there is a substantial amount of literature regarding corporate reputation, the definitions vary. Literature reviews of definitions of reputation are thereby given in, e.g., Fombrun et al. (2000), Rindova et al. (2005), Barnett et al. (2006), Walker (2010), Helm (2011), and Clardy (2012). According to Wartick (2002) and Walker (2010), the definition of corporate reputation from Fombrun (1996) is used most often. Fombrun (1996, p. 72) defines corporate reputation as “a perceptual representation of a company's past actions and future prospects that describes the firm's overall appeal to all of its key constituents when compared with other leading rivals”. Brown and Logsdon (1997) name three key elements of this definition, being (1) that corporate reputation is of perceptual nature, (2) that it is a net or aggregate perception by all stakeholders and (3) that it is comparative vis-à-vis some standard (see also Wartick, 2002). Recently, considering the above mentioned points, Fombrun (2012) proposed a new definition of corporate reputation in which he distinguishes between the stakeholder groups: “A corporate reputation is a collective assessment of a company's attractiveness to a specific group of stakeholders relative to a reference group of companies with which the company competes for resources” (Fombrun, 2012, p. 100).

### 2.2. Reputation risk

Reputation risk is generally defined as a risk of risks. For instance, in their work on Solvency II, the European regulatory framework for insurers, the Comité Européen des Assurances (CEA) and the Groupe Consultatif Actuariel Européen (2007) define

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