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Operational and reputational risk in the European banking industry: The market reaction to operational risk events☆

Philipp Sturm*

Department of Banking, University of Tübingen, Mohlstraße 36, 72074 Tübingen, Germany

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ABSTRACT

In this paper I study the stock market reaction to the announcement of operational losses in European financial companies. Accounting for the effect of the nominal loss amount allows for an examination of the reputational damage caused by operational loss events. The analysis is based on a sample of 136 operational losses stemming from a database of the Association of German Public Sector Banks (Bundesverband öffentlicher Banken, VÖB). All operational loss events affect European financial institutions with settlements reported by the press between January 2000 and December 2009. In line with previous literature, I find a significant negative stock price reaction to the first press announcement of operational losses. Results show that the stock market also reacts negatively to the settlement announcement as losses are confirmed and the loss amount is known. Even after accounting for the nominal loss amount, cumulative abnormal returns are negative following the date of the initial news article and the settlement date indicating damages to the reputation of the firm suffering the operational loss. Multivariate regression results suggest that reputational damages are rather influenced by firm characteristics than characteristics of the operational loss event: companies with a high ratio of liabilities to total assets suffer more severe damages to reputation from operational losses than companies with more equity.

1. Introduction

While operational risk has been receiving significant attention by regulators for more than a decade, incidents such as the exceptional loss at Société Générale of almost five billion Euro in 2008 caused by the trader Jérôme Kerviel once more spurred the interest paid to operational risk by regulators, supervisors, bank executives, and the public. Other prominent examples of operational risk events include the failure of Barings bank in 1995, the 850 million Euro loss due to unauthorized trading at AIB in 2002, the unimaginable Ponzi scheme of Bernard Madoff discovered in 2008 and, most recently, the loss of UBS caused by rogue trading exceeding 1.5 billion Euro in September 2011. Even though these events led to an increased awareness of operational risk and its importance, operational losses keep surfacing and the times of financial crises reveal new deficits of the operational risk management practices in place. The reliance on information technology and automation as well as the increasing complexity of new products in financial services firms are changing their exposure to operational risk. Automation, for example, can help to reduce the likelihood of minor errors in manual processing, but it increases the

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* Tel.: +49 7071 2978208; fax: +49 7071 295882.
E-mail address: philipp.sturm@uni-tuebingen.de

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risk of system-wide failures. In light of these recent developments, it is not surprising that a considerable amount of research is focusing on operational risk and the advancement of risk management tools for banks.

Most operational losses are characterized by an individual coincidence of circumstances involving some kind of failure or problem. Thus, they attract the attention of the media and the public even though financial losses are sometimes relatively small. This increased attention on operational risk events is why they can be especially harmful to firm reputation, in particular if the loss is not caused by an external event (de Fontnouvelle and Perry, 2005). Sometimes the negative consequences in the aftermath of an operational risk event, such as the loss of customers or executive employees, might be more severe than the direct effect from the loss itself. However, while the Basel II accord obliges institutions to quantify operational risk and to account for it when calculating minimum capital requirements they are not required to hold capital for reputational risk.

The multifaceted nature of operational losses makes it difficult to define operational risk and in some cases it is hard to draw the line between operational risk and other types of risk (see Moosa, 2007 for a controversial discussion on the definition of operational risk). However, the following definition of operational risk by the Basel Committee on Banking Supervision has evolved into a consensus definition in literature:

> Operational risk is the risk of losses resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic risk and reputational risk (Basel Committee, 2006, p. 144).

Even though this definition excludes reputational risk, it is widely acknowledged that operational losses also effect the reputation of financial institutions, thus posing a risk exceeding the effect of the direct financial loss itself. Interestingly, the 2006 version of the Basel II accord excludes reputational risk from the definition of operational risk but does not provide a definition of reputational risk. While in a previous Basel Committee publication reputational risk has only been described rather vaguely as "the risk of significant negative public opinion that results in a critical loss of funding or customers" (Basel Committee, 1998, p. 7), the Basel Committee on Banking Supervision includes a full section on reputational risk in its proposed enhancements to the Basel II framework presenting a definition of reputational risk:

> Reputational risk can be defined as the risk arising from negative perception on the part of customers, counterparties, shareholders, investors, debt-holders, market analysts, other relevant parties or regulators that can adversely affect a bank's ability to maintain existing, or establish new, business relationships and continued access to sources of funding (Basel Committee, 2009a, p. 19).

Furthermore, the Committee states that "reputational risk is multidimensional and reflects the perception of other market participants" (Basel Committee, 2009a, p. 19). An alternative definition and a survey of the scarce empirical literature on reputational risk in banking are provided by Walter (2007).

This study aims at providing insights about the magnitude of reputational damage resulting from operational loss events affecting European financial institutions by analyzing the stock market reaction to the announcement of operational losses. Accounting for the nominal loss amount itself, I try to separate the direct effect of the operational loss from the indirect effects on reputation. Previous empirical studies have put their focus on US financial institutions in consequence of the origin of the data used. So far only Gillet et al. (2010) provide event study results for the European banking industry. However, with a small (sub-)sample of 49 operational loss events from European banks empirical evidence for European financial institutions remains relatively scarce. This study presents new data from a Germany-based data provider allowing for a particular focus on the European financial industry. Results suggest that quantifying operational risk (e.g., in order to determine capital requirements) using data based on nominal loss amounts underestimates the full consequences of operational risk events because possible damages to reputation are neglected. Even without more regulatory requirements, additional risk management tools to avoid these events may be advisable considering the cost of reputational damage to shareholders.

This paper is similar to previous literature using event study methodology in that abnormal returns around the announcement date of information on operational losses are assessed. I follow the more detailed approach of Gillet et al. (2010) and identify different event dates for every operational loss, thus accounting for the gradual release of information in the case of a lawsuit, investigation or similar processes.

The remainder of this paper is organized as follows. Section 2 reviews prior literature related to this study and develops the research hypotheses. Section 3 describes the data used for the analysis and outlines the methodology applied. Results are presented and discussed in Sections 4 and 5. Section 6 concludes.

2. Prior literature and research hypotheses

Since the history of operational risk is still young when compared to the ones of credit and market risk, data availability on operational risk is limited. Consequently, empirical research on operational risk is still hindered by the lack of data. However, in a more general (i.e., not banking specific) context there are several studies dealing with aspects closely related to operational risk and reputation such as fraud.

Palmrose et al. (2004) analyze the effect of earnings restatement announcements on stock prices of firms in financial and non-financial industries. The authors consider 403 restatements announced between 1995 and 1999; they find a negative

stock market reaction to the announcement of earnings restatements with a stronger stock market reaction to restatements involving fraud. Murphy et al. (2009) examine the market impact of allegations of a variety of different illegal activities such as fraud, anti-trust violations, bribery, or copyright and patent infringements. Their study comprises 452 events of misconduct between 1982 and 1996 in firms of all sectors. The authors find that allegations of misconduct are accompanied by declines in reported earnings, declines in analysts' earnings estimates, increased stock return volatility, and a loss in firm value. Both studies are different from this paper, because they do not focus on the financial services industry, which implies a much wider concept of operational risk.

Most previous event studies with a particular focus on the operational risk of banks and insurance companies use data from Algorithmics, a Canada-based vendor which is part of the Fitch Group. These data sets are Algo OpData (formally called OpVar), which contains publicly reported loss events, and OpVantage FIRST, a large collection of case studies on operational losses.

Cummins et al. (2006) conduct an event study analysis based on a sample of 492 banking and insurance operational loss events stemming from the OpVar database. Their results show a strong, statistically significant stock price reaction to the announcement of operational losses, which is more pronounced for insurance companies than for banks. The authors attribute the smaller negative impact for banks to a better management of operational risk in the banking sector following the Basel II regulation compared to risk management practices in insurance companies. According to their results, the market value loss significantly exceeds the operational loss amount reported in the news indicating a negative impact on company reputation.

de Fontnouvelle and Perry (2005) analyze the stock market reaction to operational loss events using event study methodology based on the two proprietary data sets of Algorithmics (OpData and OpVantage FIRST). Searching for further loss announcements in online news archives resulted in a collection of 115 operational loss events occurring at financial firms between 1974 and 2004. They find that market values decline at a one-to-one rate with announced loss amounts when losses are caused by external events, but fall by over twice the loss percentage when involving internal fraud. As they do not find evidence that the market reacts more than one-to-one in the case of non-internal fraud announcements, they conclude that losses due to internal fraud have a negative impact on reputation, while externally caused losses have no reputational impact.

Based on a small hand-collected sample of 22 operational loss events Solakoğlu and Köse (2009) study the stock market reaction to operational risk events in the Turkish banking sector. The authors analyze operational loss events between 1998 and 2007 focusing their analysis on two sub-periods (pre-October 2001 and post-October 2001). Interestingly, they find a significant negative stock price reaction to the announcement of operational loss events for the first sub-period, but not for the later sub-period studied. The authors attribute this difference in findings to effective regulation of the banking sector.

Cannas et al. (2009) examine a group of 20 loss events of banks and insurance companies from the OpVar database occurring between 2000 and 2006. The authors focus on losses involving internal fraud, since they are considered more likely to produce reputational effects than other operational losses. Estimating abnormal returns in an event study setting, they find that stock prices react negatively to the announcement of operational losses due to internal fraud. The study concludes with the estimation of a reputational value-at-risk as an approach to quantify the economic capital needed to face reputational effects.

The study of Gillet et al. (2010) tries to separate the effect from the operational loss and the damage to reputation by examining the stock market reaction to operational loss events stemming from the OpVantage FIRST database. The 154 events used for their analysis occurred in companies listed on major European and US stock exchanges between 1990 and 2004. With only 49 losses affecting European institutions the focus of their analysis clearly is on the US. The authors find significant, negative abnormal returns at the announcement date accompanied by increased volumes of trade. In cases involving internal fraud the loss in market value is greater than the operational loss amount announced, which the authors interpret as a sign of reputational damage. However, with respect to reputational damage results for the European subsample differ from overall findings in their study.

To the knowledge of the author, this paper is the first analysis of the stock market reaction to operational loss events using proprietary data from a vendor other than Algorithmics allowing for a reassessment of previous results. Furthermore, the data from ÖffSchOR used in this study is based on information collected by a Germany-based data provider. Thus, when analyzing the European financial industry, it may be preferable over data stemming from the US. Data based on publicly available information will most likely reflect the origin of the information, depending on the public sources included in the screening process when collecting the data. With only one study in previous literature providing empirical evidence on a small subsample of European financial institutions, this paper aims at delivering further results regarding the impact of operational risk events on the reputation of listed European banks.

The discussion of previous literature suggests several hypotheses regarding the stock market reaction to information about operational losses. The first hypothesis tests whether the announcement of information on operational loss events contains relevant information for the stock market at all. If the announcement of information about a loss due to operational risk conveys relevant and unexpected information to the stock market it will affect the value of the firm. Thus, the first hypothesis is:

Hypothesis 1. Announcements of information on operational loss events have a significant negative impact on the stock price of the financial institution incurring the loss.

The second hypothesis focuses on the question of reputational risk associated with operational loss events. There are several reasons why negative (indirect) effects on reputation can result in losses for a company (in addition to the operational loss): (1) Current or future customers might switch to a competitor, (2) managers or employees may leave the company for a more attractive employer, (3) current business partners can revise terms and conditions of cooperation; future business partners might be harder to find, and (4) the loss may trigger other costly events such as management reorganization, regulatory investigations, and lawsuits. For these reasons, operational loss events might change the expectations about the *future* cash flows of the firm and the market value loss exceeds the operational loss. If so, operational losses convey information to the stock market beyond the loss amount itself. This discussion suggests the following hypothesis:

Hypothesis 2. Operational loss events adversely affect firm reputation, i.e. they have a significant impact on stock prices after accounting for the direct impact of the loss amount.

The third hypothesis is concerned with different types of operational loss events. Studying the market reaction to earnings restatements, Palmrose et al. (2004) find that the market reacts more negatively to earnings restatements involving fraud. Thus, the market reaction to operational loss events may differ depending on the event type of the operational loss. Accordingly, the third hypothesis is:

Hypothesis 3. The impact on reputation of operational loss events differs depending on the event type of the loss.

The last hypothesis addressed in this paper deals with the relative size of operational losses. If operational losses adversely affect firm reputation we would intuitively expect larger losses to cause more severe reputational damages. However, prior literature suggests that market participants do not account perfectly for the relative size of operational losses in their (re-)valuation of the company (see Gillet et al., 2010). More precisely, for relatively small losses, the market value loss exceeds the loss amount, while for relatively large losses the market value loss is smaller than the amount of the operational loss. In other words, the market overestimates the negative consequences of relatively small losses and underestimates the consequences of relatively large losses. In order to test whether there is a relation between damages to reputation and the relative size of losses, I suggest the following hypothesis:

Hypothesis 4. The impact of operational loss events on reputation differs depending on the relative size of the loss.

No empirical support for this hypothesis suggests that the market assigns similar reputational penalties to operational losses irrespective of the relative size of the loss amount.

In order to address the questions outlined above, the null hypotheses of no effect on stock prices of the financial institutions is tested in an event study setting.

3. Data and methodology

3.1. Description of data

The empirical analysis is based on a collection of 136 loss events from 36 different financial institutions with loss amounts reported between January 1st 2000 and December 31st 2009. The vast majority of these loss events stems from a proprietary database of publicly reported operational losses (ÖffSchOR) provided by the Association of German Public Sector Banks (Bundesverband öffentlicher Banken, VÖB). The provider of the database collects all operational losses in financial institutions exceeding 100,000 Euro on the basis of publicly available information. ÖffSchOR provides a detailed description of approximately 800 loss events affecting financial institutions. The main reason why the number of observations reduces to 136 loss events in the final sample is that only a minority of the banks included in ÖffSchOR is publicly listed reflecting the characteristics of the European banking sector. Other losses had to be deleted from the sample due to incomplete information (e.g., it was not possible to unambiguously identify the event date in all instances). In consequence of the requirement of being publicly listed, nearly all losses in the final sample affect (rather large) commercial banks.[1] The ÖffSchOR database states the loss amount (in Euro), indicates whether the original loss amount was reported in a foreign currency, and classifies operational loss events according to the Basel II business lines and event type categories. I identify all losses included in ÖffSchOR with loss amounts reported between January 1st 2000 and December 31st 2009 occurring in publicly traded European financial institutions and add (more recent) loss events not (yet) contained in the ÖffSchOR database reported by the daily press. All information on the losses used for the analysis is verified by checking the information from the original sources provided by ÖffSchOR (newspapers, press releases, news websites) by means of LexisNexis. Table 1 reports summary statistics for the sample of 136 loss events.

The minimum loss amount in the data of 0.1 million Euro represents the threshold of losses to be included in the ÖffSchOR database, whereas the maximum of 4.9 billion Euro corresponds to the exceptional trading loss at Société Générale. Similar to the data used in Cummins et al. (2006) the severity distribution of losses in the sample is significantly skewed to the right. Indeed, only 8 out of 136 losses exceed 500 million Euro explaining the relatively low median of 11.53 million Euro compared to the average loss amount of 149.88 million Euro. For comparison, Cummins et al. (2006) report an average loss

[1] Classification based on Bureau van Dijk's Bankscope definitions. Among the few exceptions are Carnegie Investment Bank and Crédit Agricole.

Table 1
Summary statistics for the sample of 136 loss events.

	Mean	Median	Std. Dev.	Min	Max
Operational losses (in million Euro)	149.88	11.53	500.69	0.10	4900.00
Market capitalization (in million Euro)[a]	41,654	38,344	32,488	13	159,906
Total assets (in million Euro)[a]	799,775	782,989	556,236	12	2,583,668
Total liabilities to total assets (%)[a]	95.37	96.47	5.66	43.91	98.55
Price to book value[a]	1.7	1.6	0.8	0.1	5.3
Operational loss/Market cap (%)[b]	0.7	0.1	1.9	0.0	17.2

[a] Market capitalization, total assets, total liabilities to total assets, and price to book value of financial institution affected by the loss are reported as of December 31st preceding the date of the initial news article.
[b] Operational loss divided by the market capitalization of affected financial institution at day [−20] preceding the date of the initial news article.

amount of 69.53 million USD for a sample of 403 publicly reported loss events in the US banking industry. Gillet et al. (2010) document an average loss amount of 277 million USD for a subsample 49 European banks. Thus, the data on operational losses employed in this study seems to be generally comparable to the data used in previous work. However, comparing the loss data with the numbers reported in previous studies is not without problems, because the data reported in prior work stems from different time periods and is denominated in US dollars. Moreover, other sources of data use different thresholds for loss events to be included in the database. Apart from these problems, (average) loss amounts may differ by geographical region even when loss data originates from the same source; examining the losses of two data collections of publicly reported operational losses in different countries, de Fontnouvelle et al. (2003) find that non-US losses are significantly larger than losses occurring inside the US.

Tables 2 and 3 classify all loss events according to the Basel II business lines and event types. While Table 2 reports the number of loss events, Table 3 provides information on loss amounts. Interestingly, the relative frequency distribution of loss events over event type categories as displayed in Table 2 almost identically matches the one reported in Cummins et al. (2006). Gillet et al. (2010) do not provide information about the distribution of losses across event types, but state that operational losses of the "Clients, Products and Business Practices" (CPBP) event type make up 72 percent of their global sample. Thus, operational losses of the CPBP group seem to be the most frequent event type in data collections based on publicly available information in contrast to their relative frequency in internally collected data (see Basel Committee, 2009b, Annex D).

In order to account for the (potentially) gradual release of information on the operational loss I follow the approach of Gillet et al. (2010) and check whether there are multiple event dates for each operational loss (see also Karpoff and Lott, 1993). More precisely, I identify two different event dates for each loss searching the LexisNexis news database:

1. The date of the first news article mentioning the loss, as identified in LexisNexis. The extent of information released on this date ranges from the announcement of a lawsuit or investigation (with the loss amount still being unknown) to a comprehensive report covering details of the loss including the loss amount.
2. The settlement date, as identified in LexisNexis. At this point in time the loss is considered to be definite and all loss amounts are known. Examples for news items in this group include the announcement of a compensation payment in a previously reported lawsuit or the announcement of the fine in an investigation whose beginning was already covered by the news.

If the date of the first news article and the settlement date are the same for a specific loss, the loss event is only included in the first group. Thus, the sample reduces to 73 loss events for the analysis of the stock market reaction to the announcement of the settlement.

The information on the announcement dates of the events (date of first news article in the press and settlement date), the classification into business lines and event type categories as well as the nominal loss amount reported by the news[2] is verified via LexisNexis. If news were announced on a weekend, the news item is assigned to the next trading day. All information on stock prices for the event study analysis is obtained from Thomson Reuters Datastream.

3.2. Methodology

In order to analyze the effect of operational losses on stock prices, I apply standard event study methodology following the set-up of MacKinlay (1997). More precisely, I assess abnormal returns (ARs) around the date of the initial news article and the date of settlement of operational losses. Therefore, the calendar date of each news item is converted to event time by defining the day when the news about the operational loss is released as day [0], i.e. the event day. Abnormal returns are calculated on a daily basis by subtracting expected returns from actual returns. While actual or realized returns can

[2] In cases where a range was reported for the loss amount, the arithmetic mean is calculated.

Table 2
Individual loss events per business line and event type.

Business lines	Internal fraud	External fraud	Employment practices and workplace safety	Clients, products and business practices	Damage to physical assets	Business disruption and system failures	Execution, delivery and process management	Total across event types
Corporate finance	2.9%	1.5%	1.5%	8.8%	0.0%	0.0%	0.0%	14.7%
Trading and sales	6.6%	1.5%	0.7%	11.8%	0.0%	0.0%	0.7%	21.3%
Retail banking	2.2%	5.9%	0.0%	17.6%	0.0%	0.0%	0.0%	25.7%
Commercial banking	0.7%	0.7%	0.0%	2.9%	0.0%	0.0%	0.7%	5.1%
Payment and settlement	0.0%	0.0%	0.0%	2.9%	0.0%	0.7%	0.0%	3.7%
Agency services	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.7%
Asset management	0.7%	3.7%	0.0%	2.9%	0.0%	0.0%	0.0%	7.4%
Retail brokerage	0.0%	0.0%	0.0%	2.9%	0.0%	0.0%	0.0%	2.9%
No business line information	10.3%	0.7%	1.5%	5.1%	0.0%	0.7%	0.0%	18.4%
Total number of events	32	19	5	76	0	2	2	136
Total across business lines	23.5%	14.0%	3.7%	55.9%	0.0%	1.5%	1.5%	100.0%

Table 3
Loss amounts (in million Euro) of individual loss events by business line and event type.

Business lines	Internal fraud	External fraud	Employment practices and workplace safety	Clients, products and business practices	Damage to physical assets	Business disruption and system failures	Execution, delivery and process management	Total across event types
Corporate finance	2.3%	1.1%	0.0%	6.9%	0.0%	0.0%	0.0%	10.3%
Trading and sales	40.1%	3.9%	0.1%	0.9%	0.0%	0.0%	0.0%	45.1%
Retail banking	0.0%	0.1%	0.0%	11.1%	0.0%	0.0%	0.0%	11.3%
Commercial banking	0.9%	3.6%	0.0%	2.0%	0.0%	0.0%	0.1%	6.6%
Payment and settlement	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	2.1%
Agency services	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Asset management	0.0%	13.0%	0.0%	0.4%	0.0%	0.0%	0.0%	13.4%
Retail brokerage	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
No business line information	6.4%	0.0%	0.4%	3.3%	0.0%	1.0%	0.0%	11.1%
Total loss amount (in million Euro)	10,151	4442	99	5454	0	209	29	20,384
Total across business lines	49.8%	21.8%	0.5%	26.8%	0.0%	1.0%	0.1%	100.0%

Table 4
(Adjusted) CAR for all loss events around the date of the initial news article.

N	Window	Mean CAR (%)	*t*-Value	*N*	Window	Mean CAR(Rep) (%)	*t*-Value
136	(0,0)	−1.11	−5.81***	136	(0,0)	−0.26	−1.36*
136	(−1,+1)	−1.25	−3.77***	136	(−1,+1)	−0.39	−1.19
136	(−3,+3)	−1.51	−3.00***	136	(−3,+3)	−0.66	−1.32*
136	(−5,+5)	−1.46	−2.31**	136	(−5,+5)	−0.61	−0.96
136	(−10,+10)	−1.27	−1.45*	136	(−10,+10)	−0.42	−0.48
136	(0,+1)	−1.22	−4.50***	136	(0,+1)	−0.36	−1.35*
136	(−1,+3)	−1.53	−3.59***	136	(−1,+3)	−0.68	−1.59*
136	(−1,+5)	−1.47	−2.91***	136	(−1,+5)	−0.62	−1.23
136	(−1,+10)	−1.66	−2.51***	136	(−1,+10)	−0.81	−1.22

This table displays cumulative abnormal returns (CAR) and cumulative abnormal returns adjusted for the nominal loss amount (CAR(Rep)) for different event windows. CAR(Rep) is adjusted by adding the loss amount divided by the market value at day [0]. To test for statistical significance *t*-statistics based on Brown and Warner (1985) are displayed next to the CAR and CAR(Rep).

* Significance at the 10% level (unilateral test).
** Significance at the 5% level (unilateral test).
*** Significance at the 1% level (unilateral test).

be directly calculated from the stock market data[3] on Thomson Reuters Datastream, I estimate expected returns using the market model (see Brown and Warner, 1985). I choose the FTSEurofirst 100 as the market index and an estimation period of 200 days from day [−220] to day [−21] preceding the event day.[4] The parameters of the market model are obtained from the stock market information in the estimation period using OLS. In order to test for statistical significance, I apply the traditional *t*-test as surveyed by Brown and Warner (1985).[5] Cumulative abnormal returns (CAR) are calculated by aggregating abnormal returns over time for different event windows allowing for the evaluation of stock prices around the event date. Standardized returns (as proposed e.g. by Boehmer et al., 1991) are not reported in the tables in order to maintain the economic information of returns (see Kolari and Pynnönen, 2010).

To measure the effect of operational loss events on the reputation of financial institutions the direct effect of the operational loss has to be accounted for. While Cummins et al. (2006) estimate regression models to examine the effect of operational losses on reputation, Gillet et al. (2010) suggest adjusting average abnormal returns for the direct effect of the operational loss. More precisely, the authors add the return due to the operational loss (i.e., the loss amount divided by the market value of the company) to the abnormal return at the event date. I follow this approach and calculate abnormal returns corrected for the direct effect of the nominal loss amount as:

$$AR_{i0}(Rep) = AR_{i0} + \frac{Loss_i}{Market\ Cap_i} \quad (1)$$

where AR_{i0} is the abnormal return of company i at time 0, $Loss_i$ is the operational loss amount of company i, and Market Cap_i is the market value of the company at day [−20].

When the loss amount is not known at the date of the initial news article, the loss amount as released at the settlement date is used, assuming that the market rationally anticipates the loss amount. The abnormal return corrected for the direct financial operational loss $AR_{i0}(Rep)$ captures the damages to reputation suffered by the company and thus reflects the stock market reaction due to reputational risk. Correspondingly, the expression $CAR_{i0}(Rep)$ denotes adjusted cumulative abnormal returns, i.e. the loss amount divided by the market value of the company is added at day [0]. Cumulative abnormal returns as well as adjusted cumulative abnormal returns are reported with the corresponding significance levels in the following section. The analysis focuses on different symmetric and asymmetric event windows to allow for the possibility of information leakage and/or the arrival of new information following the event as observed by Cummins et al. (2006).

4. Univariate analysis

4.1. Stock market reaction to the initial news article

In line with the findings of previous literature, event study results show that the stock market reacts negatively to the first indication of operational losses in the press even though details on the consequences and the loss amount may still be unknown. Cumulative abnormal returns are significantly negative for a variety of different event windows surrounding the date of first press mention of the loss (see Table 4). For the overall sample of 136 loss events negative cumulative abnormal

[3] Here, the Total Return Index, which is adjusted for dividends and stock splits, was used.
[4] As a robustness check, the analysis was also conducted with an alternative estimation window from day [−125] to [−25]. Results remain qualitatively unchanged.
[5] As a robustness check, test statistics using the standardized cross sectional method proposed by Boehmer et al. (1991) were calculated in order to test for statistical significance of abnormal returns. Significance levels tend to be somewhat lower, but overall, statistical significance and the pattern of returns are confirmed.

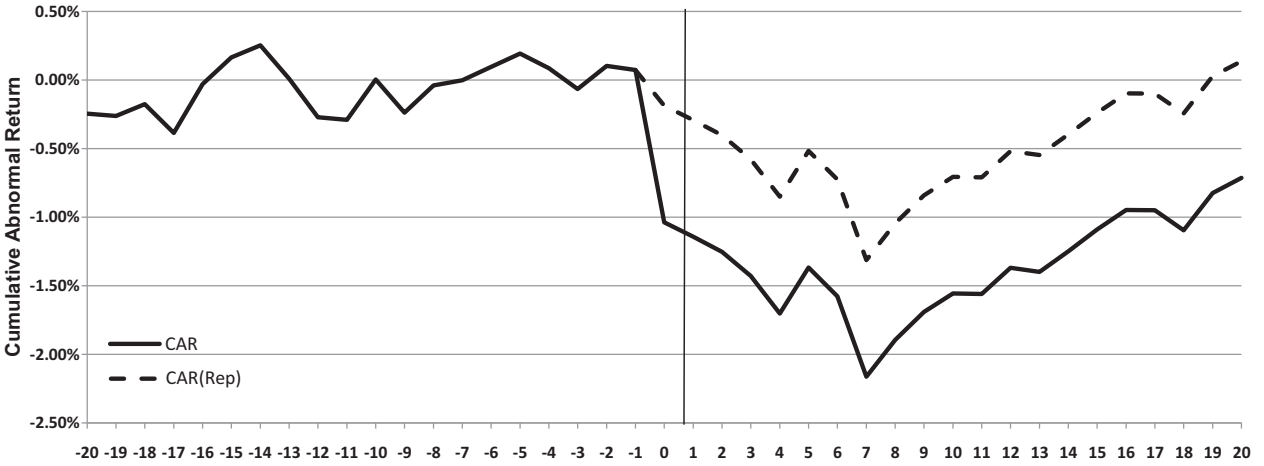

Fig. 1. (Adjusted) CAR for all loss events around the date of the initial news article. This figure displays cumulative abnormal returns from day [−20] to day [+20] around the date of the initial news article. For the dashed line the loss amount divided by the market value is added at day [0] to illustrate the impact of operational losses on reputation.

returns between −1.1 percent and −1.7 percent are observed. Even after adding the nominal loss amount divided by the market value of the affected firm at day [0] cumulative abnormal returns are negative for all event windows. Moreover, they are statistically significant at the 10 percent level over several different event windows providing evidence for damages to firm reputation.

Fig. 1 graphically visualizes the strong stock market reaction (solid line) to the first mention of operational losses in the press by displaying cumulative abnormal returns from day [−20] to day [+20]. The dashed line indicates the impact on firm reputation as the effect of the financial loss is accounted for at day [0] by adding the loss amount divided by the market value. The graphical illustration underlines the immediate negative impact of operational losses on stock prices following the date of the initial information about the loss in the press. The immediate market value loss clearly exceeds the operational loss reported, which is attributed to reputational damage. The observation that cumulative abnormal returns are less pronounced for event windows including more than four days following the event might be due to announcements of corrective action[6] in the aftermath of an operational risk event. Moreover, similar patterns of stock returns, i.e. short-term underreaction followed by overreaction (or price reversal) to negative events, are observed in other empirical studies (see Brown et al., 1988; Corrado and Jordan, 1997; Hong and Stein, 1999; Spyrou et al., 2007).

Table 5 reports cumulative abnormal returns for of all operational losses by event type. At the time of the initial news article 51 operational losses involve internal or external fraud (Panel A). With respect to the uncorrected cumulative abnormal returns the results for this subsample do not differ remarkably from overall findings. I observe significant, negative cumulative abnormal returns for all but one event window. With a significant cumulative abnormal return of −2.14 percent over a [−1,+3] event window the negative stock price reaction for fraud events may be a little more pronounced compared to the stock price decline for the overall sample. However, results for the corrected cumulative abnormal returns for this group are ambiguous. Note that the adjustment for the loss amount of this group is relatively large (1.63 percentage points) indicating that the losses involving fraud are large relative to the market capitalization of the affected financial companies.

Panel B of Table 5 provides the results for the subsample of the "Clients, Products and Business Practices" (CPBP) event type. At the time of the initial news article 76 operational loss events fall into this category. In line with the results for the overall sample, unadjusted cumulative abnormal returns are significantly negative for all event windows. After adding the loss amounts divided by the market value to adjust for the monetary impact of the losses, cumulative abnormal returns are still negative and statistically significant for all reported event windows, indicating negative effects on firm reputation. The small size of CPBP losses (expressed as a percentage of market value) results in a relatively small adjustment of cumulative abnormal returns (0.41 percentage points).

Comparing the results for the event types involving fraud (Panel A) with the results for the CPBP events (Panel B) and the remaining events (Panel C) it seems that operational losses of the CPBP event type cause more severe damages to reputation than other events. When adjusted for the impact of the loss amount, cumulative abnormal returns for the CPBP event type are significantly negative for all event windows, while corrected abnormal returns for the two other groups are mostly not significant.

Table 6 summarizes the results on stock market returns around the date of the initial news article for operational losses by relative size. Not surprisingly unadjusted returns are significantly negative for losses of large relative size (Panel A). After

[6] The detailed descriptions of operational risk events in the ÖffSchOR database provide evidence for corrective action in response to operational risk events. Examples include additional controls, back-up systems, training of staff and disciplinary action against responsible employees among others.

Table 5
(Adjusted) CAR by event type around the date of the initial news article.

N	Window	Mean CAR (%)	*t*-Value	*N*	Event window	Mean CAR(Rep) (%)	*t*-Value
Panel A: Operational losses involving fraud (i.e. of the event types internal and external fraud)							
51	(0,0)	−1.56	−7.03***	51	(0,0)	0.07	0.31
51	(−1,+1)	−1.55	−4.04***	51	(−1,+1)	0.08	0.20
51	(−3,+3)	−1.76	−3.00***	51	(−3,+3)	−0.13	−0.23
51	(−5,+5)	−1.25	−1.70**	51	(−5,+5)	0.38	0.52
51	(−10,+10)	−0.61	−0.60	51	(−10,+10)	1.02	1.00
51	(0,+1)	−1.43	−4.55***	51	(0,+1)	0.20	0.64
51	(−1,+3)	−2.14	−4.30***	51	(−1,+3)	−0.50	−1.02
51	(−1,+5)	−1.77	−3.02***	51	(−1,+5)	−0.14	−0.24
51	(−1,+10)	−1.78	−2.31**	51	(−1,+10)	−0.15	−0.20
Panel B: Operational losses of the CPBP (Clients, Products and Business Practices) event type							
76	(0,0)	−0.85	−3.85***	76	(0,0)	−0.45	−2.01**
76	(−1,+1)	−1.12	−2.90***	76	(−1,+1)	−0.71	−1.84**
76	(−3,+3)	−1.40	−2.38***	76	(−3,+3)	−0.99	−1.69**
76	(−5,+5)	−1.51	−2.05**	76	(−5,+5)	−1.10	−1.50*
76	(−10,+10)	−2.08	−2.04**	76	(−10,+10)	−1.67	−1.64*
76	(0,+1)	−1.07	−3.42***	76	(0,+1)	−0.67	−2.12**
76	(−1,+3)	−1.22	−2.46***	76	(−1,+3)	−0.82	−1.64*
76	(−1,+5)	−1.31	−2.23**	76	(−1,+5)	−0.90	−1.54*
76	(−1,+10)	−1.82	−2.37***	76	(−1,+10)	−1.41	−1.84**
Panel C: Other operational losses							
9	(0,0)	−0.71	−1.42*	9	(0,0)	−0.54	−1.08
9	(−1,+1)	−0.59	−0.68	9	(−1,+1)	−0.42	−0.49
9	(−3,+3)	−1.06	−0.81	9	(−3,+3)	−0.89	−0.68
9	(−5,+5)	−2.24	−1.35*	9	(−5,+5)	−2.07	−1.25
9	(−10,+10)	1.83	0.80	9	(−10,+10)	2.00	0.88
9	(0,+1)	−1.19	−1.69**	9	(0,+1)	−1.02	−1.45*
9	(−1,+3)	−0.70	−0.48	9	(−1,+3)	−0.54	−0.48
9	(−1,+5)	−1.08	−0.82	9	(−1,+5)	−0.91	−0.69
9	(−1,+10)	0.42	0.24	9	(−1,+10)	0.59	0.34

This table displays cumulative abnormal returns (CAR) and cumulative abnormal returns adjusted for the nominal loss amount (CAR(Rep)) for different event windows. CAR(Rep) is adjusted by adding the loss amount divided by the market value at day [0]. To test for statistical significance *t*-statistics based on Brown and Warner (1985) are displayed next to the CAR and CAR(Rep).

* Significance at the 10 percent level (unilateral test).
** Significance at the 5 percent level (unilateral test).
*** Significance at the 1 percent level (unilateral test).

adjusting for the relative size of losses cumulative abnormal returns are still significantly negative for several different event windows surrounding the event date reaching a low with a CAR(Rep) of −1.59 percent over a [−1,+4] event window (not reported). In contrast, (unadjusted) abnormal returns are not significant for losses of small relative size with the exception of the abnormal return on the event day (Panel B).

4.2. Stock market reaction to the announcement of settlement

The subsample for the analysis of the stock market reaction to the settlement announcement consists of 73 operational loss events with a settlement date different from the date of the initial news article. While the first press article may only be the first strong indication of an operational loss, all uncertainty about the loss is resolved at the settlement date as final loss amounts are known and losses are considered to be definite. Even if the announcement of settlement does not provide new information to investors, the news item reporting the settlement may be regarded as bad press affecting the reputation of the company.

Table 7 presents cumulative abnormal returns and adjusted cumulative abnormal returns for different event windows around the settlement date. When not adjusting for the loss amount I find significantly negative cumulative abnormal returns for all event windows ranging from −0.63 percent to −2.05 percent. Even after correcting for the direct impact of financial losses, adjusted cumulative abnormal returns are negative and statistically significant for several different event windows. That is, the market value loss exceeds the operational loss, which I attribute to negative impacts on firm reputation.

Fig. 2 illustrates the negative stock price reaction to the announcement of settlement (solid line) by reporting cumulative abnormal returns from day [−20] to day [+20] around the settlement date. The impact on firm reputation is indicated by the dashed line, as the effect of the financial loss is accounted for at day [0] by adding the loss amount divided by the market value. The price reversal observed after the negative stock price reaction to the initial news article (see Fig. 1) is much less pronounced after the settlement date (see Fig. 2), when losses are confirmed and have to be considered as definite.

Table 8 summarizes the results on stock market returns around the settlement date for operational losses by event type. At the time of settlement 30 operational losses are categorized as internal or external fraud events. The corresponding results

Table 6
(Adjusted) CAR by relative loss size around the date of the initial news article.

N	Window	Mean CAR (%)	*t*-Value	*N*	Event window	Mean CAR(Rep) (%)	*t*-Value
Panel A: Operational losses with large relative size (median level: 0.09% of market cap)							
68	(0,0)	−1.86	−6.36***	68	(0,0)	−0.17	−0.58
68	(−1,+1)	−2.46	−4.87***	68	(−1,+1)	−0.77	−1.53*
68	(−3,+3)	−2.38	−3.08***	68	(−3,+3)	−0.69	−0.90
68	(−5,+5)	−2.45	−2.53**	68	(−5,+5)	−0.76	−0.79
68	(−10,+10)	−1.42	−1.06	68	(−10,+10)	0.27	0.20
68	(0,+1)	−2.12	−5.14***	68	(0,+1)	−0.43	−1.05
68	(−1,+3)	−2.66	−4.08***	68	(−1,+3)	−0.97	−1.49*
68	(−1,+5)	−2.75	−3.57***	68	(−1,+5)	−1.07	−1.38*
68	(−1,+10)	−2.44	−2.41**	68	(−1,+10)	−0.75	−0.74
Panel B: Operational losses with small relative size (median level: 0.09% of market cap)							
68	(0,0)	−0.36	−1.50*	68	(0,0)	−0.35	−1.44*
68	(−1,+1)	−0.03	−0.07	68	(−1,+1)	−0.02	−0.04
68	(−3,+3)	−0.65	−1.01	68	(−3,+3)	−0.64	−0.99
68	(−5,+5)	−0.47	−0.59	68	(−5,+5)	−0.46	−0.57
68	(−10,+10)	−1.12	−1.01	68	(−10,+10)	−1.10	−0.99
68	(0,+1)	−0.31	−0.91	68	(0,+1)	−0.30	−0.87
68	(−1,+3)	−0.40	−0.74	68	(−1,+3)	−0.39	−0.72
68	(−1,+5)	−0.19	−0.29	68	(−1,+5)	−0.17	−0.27
68	(−1,+10)	−0.88	−1.05	68	(−1,+10)	−0.87	−1.03

This table displays cumulative abnormal returns (CAR) and cumulative abnormal returns adjusted for the nominal loss amount (CAR(Rep)) for different event windows. CAR(Rep) is adjusted by adding the loss amount divided by the market value at day [0]. To test for statistical significance *t*-statistics based on Brown and Warner (1985) are displayed next to the CAR and CAR(Rep).

* Significance at the 10 percent level (unilateral test).
** Significance at the 5 percent level (unilateral test).
*** Significance at the 1 percent level (unilateral test).

Table 7
(Adjusted) CAR for all loss events around the settlement date.

N	Window	Mean CAR (%)	*t*-Value	*N*	Window	Mean CAR(Rep) (%)	*t*-Value
73	(0,0)	−0.63	−2.70***	73	(0,0)	0.22	0.92
73	(−1,+1)	−0.95	−2.35***	73	(−1,+1)	−0.10	−0.26
73	(−3,+3)	−1.93	−3.13***	73	(−3,+3)	−1.09	−1.76**
73	(−5,+5)	−2.05	−2.64***	73	(−5,+5)	−1.20	−1.55*
73	(−10,+10)	−1.95	−1.82**	73	(−10,+10)	−1.10	−1.03
73	(0,+1)	−0.67	−2.03**	73	(0,+1)	0.18	0.53
73	(−1,+3)	−1.60	−3.07***	73	(−1,+3)	−0.76	−1.45*
73	(−1,+5)	−1.47	−2.38***	73	(−1,+5)	−0.63	−1.01
73	(−1,+10)	−1.97	−2.43***	73	(−1,+10)	−1.12	−1.39*

This table displays cumulative abnormal returns (CAR) and cumulative abnormal returns adjusted for the nominal loss amount (CAR(Rep)) for different event windows. CAR(Rep) is adjusted by adding the loss amount divided by the market value at day [0]. To test for statistical significance *t*-statistics based on Brown and Warner (1985) are displayed next to the CAR and CAR(Rep).

* Significance at the 10 percent level (unilateral test).
** Significance at the 5 percent level (unilateral test).
*** Significance at the 1 percent level (unilateral test).

are reported in Panel A. Uncorrected abnormal returns do not differ qualitatively from overall findings. Cumulative abnormal returns are negative and statistically significant for most of the event windows around the settlement date. Naturally, the return adjustment (0.96 percentage points) for the direct impact of losses brings cumulative abnormal returns closer to zero. After the adjustment abnormal returns remain significantly negative for three event windows. The stock market reaction to the announcement of settlement for the 39 CPBP event type losses is quite similar (see Panel B). Unadjusted cumulative abnormal returns are negative and statistically significant for all but two of the event windows. After accounting for the return adjustment (0.81 percentage points) there is only little evidence for reputational damage provided by a significantly negative cumulative abnormal return over the [−10,+10] event window. Adding the loss amount divided by the market value even yields a positive and statistically significant adjusted abnormal return at day [0]. At the time of settlement only four events remain in the group of other operational losses. Consequently mean abnormal returns are rather volatile and not statistically significant with the exception of the abnormal return not corrected for the direct impact of the loss on the event day. Comparing the results over different event types does not reveal any remarkable differences.

Results on stock returns around the settlement date for operational losses by relative loss size are provided in Table 9. For operational losses with large relative size (Panel A) cumulative abnormal returns around the settlement date are significantly negative reaching as low as −2.72 percent over a [−5,+5] event window. The adjustment for the large relative size of losses results in significantly positive cumulative abnormal returns corrected for the loss amount over event windows of less

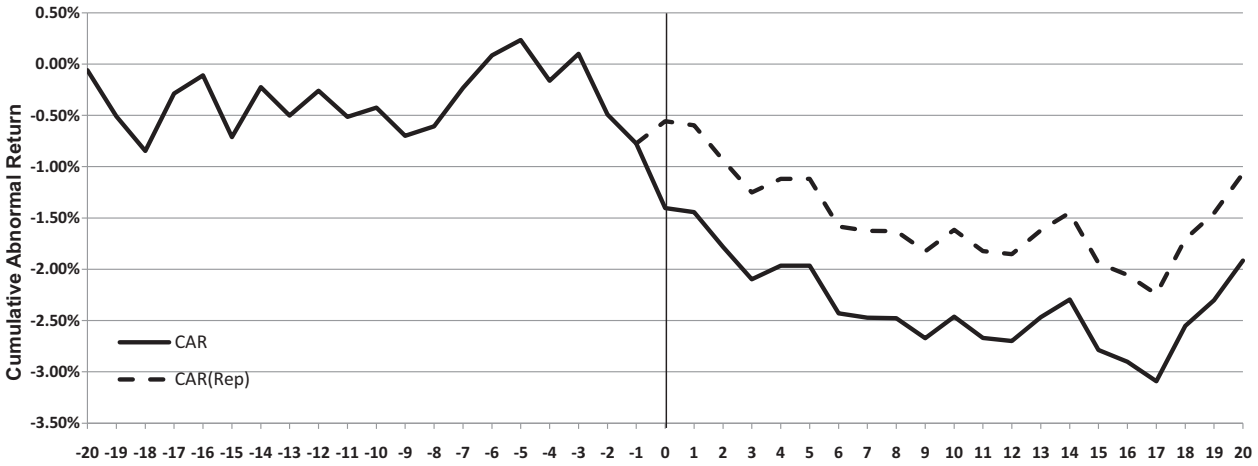

Fig. 2. (Adjusted) CAR for all loss events around the settlement date. This figure displays cumulative abnormal returns from day [−20] to day [+20] around the settlement date. For the dashed line the loss amount divided by the market value is added at day [0] to illustrate the impact of operational losses on reputation.

Table 8
(Adjusted) CAR by event type around the settlement date.

N	Window	Mean CAR (%)	*t*-Value	*N*	Event window	Mean CAR(Rep) (%)	*t*-Value
Panel A: Operational losses involving fraud (i.e. of the event types internal and external fraud)							
30	(0,0)	−1.15	−3.00***	30	(0,0)	−0.19	−0.49
30	(−1,+1)	−0.90	−1.36*	30	(−1,+1)	0.06	0.09
30	(−3,+3)	−2.58	−2.55***	30	(−3,+3)	−1.62	−1.60*
30	(−5,+5)	−2.95	−2.33**	30	(−5,+5)	−1.99	−1.57*
30	(−10,+10)	−0.48	−0.27	30	(−10,+10)	0.48	0.27
30	(0,+1)	−0.79	−1.47*	30	(0,+1)	0.17	0.31
30	(−1,+3)	−2.17	−2.54***	30	(−1,+3)	−1.21	−1.41*
30	(−1,+5)	−2.39	−2.37***	30	(−1,+5)	−1.43	−1.42
30	(−1,+10)	−2.37	−1.79**	30	(−1,+10)	−1.41	−1.07
Panel B: Operational losses of the CPBP (Clients, Products and Business Practices) event type							
39	(0,0)	−0.19	−0.56	39	(0,0)	0.63	1.89**
39	(−1,+1)	−1.00	−1.74**	39	(−1,+1)	−0.19	−0.33
39	(−3,+3)	−1.59	−1.80**	39	(−3,+3)	−0.77	−0.88
39	(−5,+5)	−1.49	−1.34*	39	(−5,+5)	−0.67	−0.61
39	(−10,+10)	−3.18	−2.08**	39	(−10,+10)	−2.37	−1.55*
39	(0,+1)	−0.62	−1.31*	39	(0,+1)	0.20	0.42
39	(−1,+3)	−1.30	−1.74**	39	(−1,+3)	−0.48	−0.65
39	(−1,+5)	−0.87	−0.98	39	(−1,+5)	−0.05	−0.06
39	(−1,+10)	−1.83	−1.58*	39	(−1,+10)	−1.01	−0.88
Panel C: Other operational losses							
4	(0,0)	−0.87	−1.35*	4	(0,0)	−0.62	−0.96
4	(−1,+1)	−0.66	−0.59	4	(−1,+1)	−0.41	−0.37
4	(−3,+3)	−0.37	−0.22	4	(−3,+3)	−0.12	−0.07
4	(−5,+5)	−0.60	−0.28	4	(−5,+5)	−0.35	−0.16
4	(−10,+10)	−0.73	−0.24	4	(−10,+10)	−0.48	−0.16
4	(0,+1)	−0.23	−0.25	4	(0,+1)	0.02	0.02
4	(−1,+3)	−0.29	−0.20	4	(−1,+3)	−0.04	−0.03
4	(−1,+5)	−0.37	−0.22	4	(−1,+5)	−0.12	−0.07
4	(−1,+10)	−0.29	−0.13	4	(−1,+10)	−0.04	−0.02

This table displays cumulative abnormal returns (CAR) and cumulative abnormal returns adjusted for the nominal loss amount (CAR(Rep)) for different event windows. CAR(Rep) is adjusted by adding the loss amount divided by the market value at day [0]. To test for statistical significance *t*-statistics based on Brown and Warner (1985) are displayed next to the CAR and CAR(Rep).

* Significance at the 10 percent level (unilateral test).
** Significance at the 5 percent level (unilateral test).
*** Significance at the 1 percent level (unilateral test).

Table 9
(Adjusted) CAR by relative loss size around the settlement date.

N	Window	Mean CAR (%)	*t*-Value	*N*	Window	Mean CAR(Rep) (%)	*t*-Value
Panel A: Operational losses with large relative size (median level: 0.09% of market cap)							
49	(0,0)	−0.63	−1.97**	49	(0,0)	0.63	1.97**
49	(−1,+1)	−0.95	−1.71**	49	(−1,+1)	0.31	0.56
49	(−3,+3)	−2.36	−2.80***	49	(−3,+3)	−1.11	−1.31*
49	(−5,+5)	−2.72	−2.57***	49	(−5,+5)	−1.46	−1.39*
49	(−10,+10)	−2.06	−1.42*	49	(−10,+10)	−0.81	−0.55
49	(0,+1)	−0.66	−1.47*	49	(0,+1)	0.59	1.31*
49	(−1,+3)	−1.89	−2.65***	49	(−1,+3)	−0.63	−0.89
49	(−1,+5)	−1.77	−2.10**	49	(−1,+5)	−0.52	−0.61
49	(−1,+10)	−1.85	−1.68**	49	(−1,+10)	−0.60	−0.54
Panel B: Operational losses with small relative size (median level: 0.09% of market cap)							
24	(0,0)	−0.64	−1.92**	24	(0,0)	−0.63	−1.88**
24	(−1,+1)	−0.97	−1.46*	24	(−1,+1)	−0.95	−1.44*
24	(−3,+3)	−1.06	−1.05	24	(−3,+3)	−1.05	−1.04
24	(−5,+5)	−0.68	−0.54	24	(−5,+5)	−0.67	−0.53
24	(−10,+10)	−1.71	−0.97	24	(−10,+10)	−1.69	−0.97
24	(0,+1)	−0.69	−1.46*	24	(0,+1)	−0.67	−1.25
24	(−1,+3)	−1.02	−1.37*	24	(−1,+3)	−1.01	−1.18
24	(−1,+5)	−0.86	−0.85	24	(−1,+5)	−0.85	−0.84
24	(−1,+10)	−2.21	−1.67**	24	(−1,+10)	−2.19	−1.66**

This table displays cumulative abnormal returns (CAR) and cumulative abnormal returns adjusted for the nominal loss amount (CAR(Rep)) for different event windows. CAR(Rep) is adjusted by adding the loss amount divided by the market value at day [0]. To test for statistical significance *t*-statistics based on Brown and Warner (1985) are displayed next to the CAR and CAR(Rep).

* Significance at the 10 percent level (unilateral test).
** Significance at the 5 percent level (unilateral test).
*** Significance at the 1 percent level (unilateral test).

than three days and brings corrected cumulative abnormal returns for longer event windows closer to zero. As a result, only two of the symmetric event windows indicate damages to reputation as corrected cumulative abnormal returns are still significantly negative. Not surprisingly the stock market reaction to the announcement of settlement is less abrupt for operational losses of small relative size (Panel B). However, cumulative abnormal returns are statistically significant negative for several different event windows and even fall below 2.2 percent for some of the longer event windows. Naturally, the small relative size of losses results in a very small adjustment of cumulative abnormal returns when accounting for the loss amount. In consequence, corrected cumulative abnormal returns remain statistically significant negative for several different event windows after the adjustment.

Overall, the results from the event study suggest the following implications. First, nominal loss amounts which are typically recorded in internal and external loss collections,[7] may significantly underestimate the risk associated to operational losses because losses due to reputational damage are neglected. Second, even if not triggered by more stringent regulatory requirements, further improving the risk management mechanisms to avoid losses from operational (and reputational) risk, may be in the shareholders' best interest because reputational losses can be extremely costly.

5. Multivariate analysis of stock returns

After assessing the impact of operational losses on stock returns and separating the direct effect of the operational loss from damages to reputation, the following analysis focuses on explaining what drives reputational damages caused by operational loss events. Therefore several characteristics of loss events and firm characteristics are included as explanatory variables in a regression model with cumulative abnormal returns adjusted for the impact of the loss amount on the left hand side. As for the characteristics of the loss event the following indicator variables are included: *internal fraud*, *external fraud*, and *CPBP*. These variables equal one if losses belong to the event type category and zero otherwise. *Other* is the category not included in the regressions. For the analysis of the stock market reaction to the initial news article, the variable *knowledge of loss amount* indicates whether loss amounts are known on the event date (one if yes, zero otherwise). With respect to firm characteristics the variable *total assets* is a proxy for firm size, *price to book value* controls for the value vs. growth characteristic of firms, and the ratio of *total liabilities to total assets* is a measure of financial leverage. Finally, the variable *time*, which equals the number of days between January 1st 1990 and the event date, is included in the regression to control for a potential time trend. All regressions are estimated using Eicker–Huber–White heteroskedasticity-robust standard errors. Low VIF values for all independent variables (below 5) suggest that multicollinearity is not causing problems. Results of the analysis of stock market returns around the date of the initial news article are presented in Table 10, results of the analysis of returns around the settlement date in Table 11.

[7] The use of internal and external loss data is required when using the Advanced Measurement Approach (AMA) to quantify operational risk.

Table 10
Regression analysis of stock market returns around the date of the initial news article.

	CAR(Rep) (0)	CAR(Rep) (−3,+3)	CAR(Rep) (−5,+5)	CAR(Rep) (−10,+10)	CAR(Rep) (0,+1)	CAR(Rep) (−1,+3)	CAR(Rep) (−1,+5)	CAR(Rep) (−1,+10)
Internal fraud	1.4893	2.1853	2.7312	−2.3371	1.6480*	1.6123	1.6180	−1.5203
(yes = 1/no = 0)	(1.57)	(1.43)	(0.97)	(−1.14)	(1.81)	(1.23)	(0.89)	(−0.82)
External fraud	−0.0045	−1.3428	−0.2947	−2.9129	0.2994	−3.3498	−3.1799	−4.4960
(yes = 1/no = 0)	(−0.00)	(−0.53)	(−0.07)	(−0.72)	(0.23)	(−1.51)	(−0.98)	(−1.07)
CPBP (yes = 1/no = 0)	−0.1178	−0.4417	0.4076	−4.3424**	0.1176	−0.5625	−0.5354	−2.5725*
	(−0.15)	(−0.31)	(0.14)	(−2.52)	(0.15)	(−0.49)	(−0.31)	(−1.66)
Knowledge of loss amount	−0.2953	0.530589	0.700555	−0.8453	0.320772	0.604384	2.0647*	1.1993
(yes = 1/no = 0)	(−0.44)	(0.51)	(0.59)	(−0.52)	(0.47)	(0.62)	(1.87)	(0.72)
Total assets (in bn. Euro)	0.0011	−0.0002	−0.0018	−0.0014	−0.0004	−0.0007	−0.0022	−0.0043*
	(1.31)	(−0.12)	(−0.93)	(−0.61)	(−0.42)	(−0.50)	(−1.25)	(−1.68)
Total liabilities to total	−0.2628*	−0.2937**	−0.4248***	−0.5957***	−0.1930	−0.1991	−0.3350***	−0.3462**
assets (%)	(−1.82)	(−2.45)	(−4.81)	(−3.26)	(−1.30)	(−1.43)	(−3.39)	(−2.53)
Price to book value	0.5191	0.9743	−0.0319	−1.1979	0.5348	0.3356	−0.6121	−1.6224
	(0.84)	(1.07)	(−0.03)	(−0.89)	(0.89)	(0.39)	(−0.73)	(−1.29)
Time (days since January 1st	−0.0003	−0.0003	0.0000	0.0003	−0.0001	0.0000	−0.0001	0.0002
1990)	(−0.82)	(−0.38)	(−0.05)	(0.24)	(−0.21)	(−0.02)	(−0.11)	(0.17)
Constant	24.900*	27.267**	40.595***	61.723***	17.449	18.567	34.008***	39.103**
	(1.89)	(2.25)	(3.6)	(3.13)	(1.25)	(1.39)	(3.03)	(2.60)
R^2	0.1522	0.1336	0.1713	0.1400	0.1335	0.1393	0.2072	0.1421
Prob(*F*-statistic)	0.2151	0.0388	0.0000	0.0010	0.4796	0.0887	0.0000	0.0001
N	136	136	136	136	136	136	136	136

This table shows results based on OLS regressions of CAR adjusted for the impact of loss amounts on loss event and firm characteristics. The independent variables are defined as follows: internal fraud, external fraud and CPBP are indicator variables for the event type of the loss. Knowledge of loss amount indicates whether the loss amount was known at the time of the initial news item. Total assets is the book value of total assets, total liabilities to total assets is the ratio of total liabilities to total assets (in percent), and price to book value equals the market value compared to the book value of a firm on the event date. Time is equal to the number of days between January 1st 1990 and the event date. *t*-Values are given in parentheses. All regressions are estimated using Eicker–Huber–White heteroskedasticity-robust standard errors.

* Significance at the 10 percent level.
** Significance at the 5 percent level.
*** Significance at the 1 percent level.

Table 11
Regression analysis of stock market returns around the settlement date.

	CAR(Rep) (0)	CAR(Rep) (−3,+3)	CAR(Rep) (−5,+5)	CAR(Rep) (−10,+10)	CAR(Rep) (0,+1)	CAR(Rep) (−1,+3)	CAR(Rep) (−1,+5)	CAR(Rep) (−1,+10)
Internal fraud	−0.4181	2.8984	4.7572	2.2736	−0.3920	2.6560	4.4596	2.8511
(yes = 1/no = 0)	(−0.37)	(1.29)	(1.22)	(0.91)	(−0.39)	(1.08)	(1.13)	(0.74)
External fraud	−1.5108	−5.3574	−3.1449	4.4863	−2.3548	−4.6901	−4.7842	−0.8885
(yes = 1/no = 0)	(−0.95)	(−1.45)	(−0.51)	(0.96)	(−1.62)	(−1.22)	(−0.79)	(−0.15)
CPBP (yes = 1/no = 0)	0.0369	1.3419	3.8223	−0.8326	−0.6974	1.7229	4.1451	2.7837
	(0.04)	(0.63)	(0.95)	(−0.35)	(−0.94)	(0.69)	(1.00)	(0.68)
Total assets (in bn. Euro)	−0.0001	−0.0026	−0.0016	0.0025	0.0002	−0.0029	−0.0025	−0.0013
	(−0.10)	(−1.10)	(−0.48)	(0.88)	(0.13)	(−1.28)	(−0.81)	(−0.57)
Total liabilities to total	−0.3487***	−0.2616***	−0.2326***	−0.6113***	−0.3634***	−0.3374***	−0.2527***	−0.4631***
assets (%)	(−18.22)	(−3.81)	(−2.75)	(−8.50)	(−14.07)	(−5.30)	(−3.25)	(−7.09)
Price to book value	0.7663*	1.4104	0.6332	1.0679	0.7627	1.1251	0.4735	0.7985
	(1.97)	(1.47)	(0.55)	(0.80)	(1.23)	(1.52)	(0.50)	(0.88)
Time (days since January 1st	0.0006*	0.0008	0.0001	−0.0006	0.0010**	0.0012	0.0013	0.0009
1990)	(1.91)	(0.83)	(0.10)	(−0.40)	(2.31)	(1.48)	(1.19)	(0.79)
Constant	29.085***	18.735*	17.694	56.213***	28.423***	24.214***	14.289	35.624***
	(10.15)	(1.93)	(1.36)	(4.83)	(7.01)	(2.80)	(1.23)	(3.52)
R^2	0.4844	0.3277	0.1733	0.1973	0.4040	0.3781	0.2507	0.2256
Prob(*F*-statistic)	0.0000	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000
N	73	73	73	73	73	73	73	73

This table shows results based on OLS regressions of CAR adjusted for the impact of loss amounts on loss event and firm characteristics. The independent variables are defined as follows: internal fraud, external fraud and CPBP are indicator variables for the event type of the loss. Total assets is the book value of total assets, total liabilities to total assets is the ratio of total liabilities to total assets (in percent), and price to book value equals the market value compared to the book value of a firm on the event date. Time is equal to the number of days between January 1st 1990 and the event date. *t*-Values are given in parentheses. All regressions are estimated using Eicker–Huber–White heteroskedasticity-robust standard errors.

* Significance at the 10 percent level.
** Significance at the 5 percent level.
*** Significance at the 1 percent level.

Results of the analysis of stock returns around the first press date show that coefficients of the event type variables are not significant with few exceptions in single regressions for some event windows (Table 10) and not significant for any of the event windows in the analysis of stock returns around the settlement date (Table 11). Thus, damages to reputation seem to be largely unaffected by event characteristics. As the coefficient of the variable *knowledge of loss amount* is not significant in the regressions with only one exception, investors apparently assign similar reputational penalties independently of whether loss amounts are known at the time of the first announcement or not (see Table 10). With respect to company characteristics, the coefficient of the variable *total liabilities to total assets* is significantly negative (at the 10 percent level or better) for all of the symmetric event windows and several of the asymmetric windows in the analysis of stock returns around the date of the initial news article (Table 10).

In the analysis of stock returns around the settlement date the coefficient of the variable *total liabilities to total assets* is significantly negative (at the 1 percent level) for all event windows (Table 11). Thus, financial firms with a high level of liabilities suffer more severe damages to reputation from operational loss events than companies with more equity. A possible explanation for this finding is that the reasons for reputational damage cited above are exacerbated by financial distress. In contrast, according to the regression results presented, other firm characteristics, in particular the price to book value of firms and firm size (in terms of *total assets*), do not affect the impact of operational losses on reputation. In sum, multivariate regression results emphasize the importance of the findings from the previous section because the regressions show that banks with a low equity cushion are the ones most sensitive to reputational damage.

In order to control for the potential influence of event characteristic in more detail, several other variables were included in the regression models. Alternative models estimated for the analysis of stock returns around the first press date included a variable counting the *number of losses in the same company*, a dummy variable indicating whether the loss is the *first loss within one year* (one if yes, zero otherwise) and a dummy variable for *relative size* (one if relative loss size above median, zero otherwise). The regressions for the analysis of stock returns around the settlement date also contained a variable counting the *days elapsed since first press date*. Results (not reported) show that coefficients of these additional variables turn out to be insignificant and, more importantly, overall results as presented above (Tables 10 and 11) are not sensitive to these changes. While this seems to be in line with the overall finding that event characteristics do not explain reputational damage, the nature of data used for this analysis may cause some problems for two of the additional variables above. The ÖffSchOR database collects information on operational losses from public sources. However, no claim can be made that all publicly reported losses are contained in the data, which in turn may lead to inaccuracy of the variables *number of losses in the same company* and *first loss within one year*.

6. Conclusion

This paper studies the impact of operational losses on the reputation of European financial companies by examining the stock market reaction to information on operational loss events. More precisely, I assess cumulative abnormal returns around the date of the initial news article and the settlement date of operational losses. Correcting for the impact of the loss amount allows for an analysis of damages to reputation due to operational losses. The analysis is based on a new data set from a German data provider allowing for a specific focus on the European financial industry. Results show significant negative abnormal returns following first indications of the loss in the press. The negative stock market reaction to the announcement of settlement is somewhat more pronounced. Even after accounting for the direct financial impact of operational losses I observe significant negative cumulative abnormal returns, providing evidence for the negative impact of operational losses on firm reputation. In contrast to previous literature, I do not find that reputational damages differ by event characteristics.[8] However, multivariate regression results suggest that financial companies with a high liabilities to assets ratio suffer more severe reputational damages from operational loss events than companies with more equity. Furthermore, damages to reputation caused by operational loss events seem to be largely unaffected by firm size and the value-growth characteristic of firms.

Overall, results show that capital requirements for operational risk based on nominal loss amounts which are typically recorded in internal and external loss collections, may significantly underestimate the risk associated to operational losses because losses due to reputational damage are neglected. This is particularly critical, because damages to reputation are more pronounced for banks with high leverage (i.e., a low equity cushion). Results also suggest that even if regulation neglects the reputational losses associated to operational risk, improving the risk management mechanisms in place to avoid such losses may be money well spent from a shareholder value perspective because reputational losses (even though hard to quantify for a single event) can be extremely costly.

Provided the necessary data is available, future research may conduct similar analyses for other financial instruments such as bonds, credit default swaps and equity swaps. While Plunus et al. (2009) are currently working on the analysis of

[8] There are several potential reasons why the results for European banks differ in some respects from the findings for the US. First, the present study suggests that company characteristics may play a role. Beyond the characteristics included in this study, it is possible that differences in the ownership structure of firms have an influence on how investors react to operational risk events (e.g., small investors might overestimate the impact of events with a lot of media attention). Second, recent empirical findings of the corporate governance literature provide evidence that the tone of the news has an impact on stock returns (see Carretta et al., 2011). Following this line of argument, differences in media reporting might explain part of the differences in results.

bonds, swaps have not been considered in a similar setting so far. Over the long run, deficits in (operational) risk management and changes in bank reputation will be reflected in the credit rating of banks. Thus, for a more long-term perspective future research may also look at rating downgrades to examine the effect of operational risk and damages to bank reputation.

References

Basel Committee on Banking Supervision, 2009. Proposed Enhancements to the Basel II Framework, Consultative Document, January.
Basel Committee on Banking Supervision, 2009. Results from the 2008 Loss Data Collection Exercise for Operational Risk, July.
Basel Committee on Banking Supervision, 2006. International Convergence of Capital Measurement and Capital Standards. A Revised Framework. Comprehensive Version, June.
Basel Committee on Banking Supervision, 1998. Risk Management for Electronic Banking and Electronic Money Activities, March.
Boehmer, E., Musumeci, J., Poulsen, A., 1991. Event-study methodology under conditions of event-induced variance. Journal of Financial Economics 30, 253–272.
Brown, K., Harlow, W.V., Tinic, S., 1988. Risk aversion, uncertain information, and market efficiency. Journal of Financial Economics 22, 355–385.
Brown, S., Warner, J., 1985. Using daily stock returns: the case of event studies. Journal of Financial Economics 14, 359–399.
Cannas, G., Masala, G., Micocci, M., 2009. Quantifying reputational effects for publicly traded financial institutions. Journal of Financial Transformation 27, 76–81.
Carretta, A., Farina, V., Martelli, D., Fiordelisi, F., Schwizer, P., 2011. The impact of corporate governance press news on stock market returns. European Financial Management 17, 100–119.
Corrado, C., Jordan, B., 1997. Risk aversion, uncertain information, and market efficiency. Review of Quantitative Finance and Accounting 8, 51–68.
Cummins, D., Lewis, C., Wei, R., 2006. The market value impact of operational loss events for US banks and insurers. Journal of Banking and Finance 30, 2605–2634.
de Fontnouvelle, P., Perry, J., 2005. Measuring Reputational Risk: The Market Reaction to Operational Loss Announcements. Working Paper. Federal Reserve Bank of Boston.
de Fontnouvelle, P., DeJesus-Rueff, V., Jordan, J., Rosengreen, E., 2003. Using Loss Data to Quantify Operational Risk. Working Paper. Federal Reserve Bank of Boston.
Gillet, R., Hübner, G., Plunus, S., 2010. Operational risk and reputation in the financial industry. Journal of Banking and Finance 34, 224–235.
Hong, H., Stein, J., 1999. A unified theory of underreaction, momentum trading, and overreaction in asset markets. Journal of Finance 54, 2143–2184.
Karpoff, J., Lott, J., 1993. The reputational penalty firms bear from committing criminal fraud. Journal of Law and Economics 36, 757–802.
Kolari, J., Pynnönen, S., 2010. Event study testing with cross-sectional correlation of abnormal returns. Review of Financial Studies 23, 3996–4025.
MacKinlay, C., 1997. Event studies in economics and finance. Journal of Economic Literature 35, 13–39.
Moosa, I., 2007. Operational risk: a survey. Financial Markets, Institutions & Instruments 16, 167–200.
Murphy, D., Shrieves, R., Tibbs, S., 2009. Understanding the penalties associated with corporate misconduct: an empirical analysis of earnings and risk. Journal of Financial and Quantitative Analysis 44, 55–83.
Palmrose, Z., Richardson, V., Scholz, S., 2004. Determinants of market reactions to restatement announcements. Journal of Accounting and Economics 37, 59–89.
Plunus, S., Gillet, R., Hübner, G., 2009. Reputational Damage on the Bond Market: Evidence form Operational Losses in the Financial Industry. Working Paper No. 200909/02.
Spyrou, S., Kassimatis, K., Galariotis, E., 2007. Short-term overreaction, underreaction and efficient reaction: evidence from the London Stock Exchange. Applied Financial Economics 17, 221–235.
Solakoğlu, N., Köse, A., 2009. Operational risk and stock market returns: evidence from Turkey. In: Gregoriou, G. (Ed.), Operational Risk Toward Basel III: Best Practices and Issues in Modeling, Management, and Regulation, Wiley Finance Series. Wiley & Sons, Hoboken, pp. 115–128.
Walter, I., 2007. Reputational risk and conflicts of interest in banking and finance: the evidence so far. Journal of Financial Transformation 21, 39–54.