Internal fraud in the banking industry

A cross-bank analysis on operational loss announcements

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Summary

Background & subject discussion: Managerial and regulatory focus in the financial industry has been intensified due to a number of extremely costly and highly publicized events. When fraudulent activities or any improper business practices are revealed it may damage the bank’s reputation. In the end this can have a big impact on anyone who is any kind of stakeholder. Reputational risk and by what mechanism reputational risk is adversely affecting stock prices is therefore of great importance for stakeholders. This study aims at providing insights and a better understanding of reputational risk. We examine the reputational damage in banks resulting from operational losses and analyze the stock market reaction across the banking industry.

Research question: What is the effect of operational loss announcements from internal fraudulent activities on competitors in the banking industry?

Purpose: Our main purpose is to examine if there is a cross-bank reaction that occur from operational loss announcements due to internal fraud. If there is a cross-bank reaction it is in our research interest to investigate in what direction this reaction moves the competitive banks stock price. As previous research states, banks has possible ways of contingent losses and our focus is to examine if there is a way that reputational damage may cause contingency within the market. We also aim to discover if extra ordinary losses in terms of large loss amounts generate any special reactions.

Theoretical framework: The framework is based on theories of reputational risk, reputational damage, financial contagion and financial trust. Reputational risk might explain why the cross-bank reaction should be positive because the bank’s loss of clients should directly benefit its main competitors. Financial contagion could explain if the effects are transmitting within the industry. Theories on financial trust explain how the market acts on doubt inflicted by operational loss announcements.

Method: A quantitative event study with a deductive approach is used. The sample consists of 33 events of operational loss announcements from internal fraud. In the study we perform a sample of 44.880 individual returns represented by the bank where the loss occurred, its three major competitors and its comparative indices. We calculate cumulative abnormal returns over multiple event windows. We use sub-samples to examine how reputational losses affect the cross-bank reaction, impact of the financial crisis and if the size of the amount has any special impact.

Conclusion: The results show a positive cross-bank reaction during the observed period of time. Furthermore, the cross-bank reaction is stronger when a reputational damage is recognized in the bank where the loss occurred. The results show a positive cross-bank reaction during the observed period of time. Furthermore, the cross-bank reaction is stronger when a reputational damage is recognized in the bank where the loss occurred.
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1. Introduction

Since the financial crisis in 2008 we have witnessed an increasing interest in new regulations for the banking industry and the media coverage of banks is more focused than ever on stress tests and capital requirements. Banks themselves open up and describes their risk management in their annual reports and gives detailed descriptions of their current risk levels. In this introductory chapter we will discuss and give a background to operational loss announcements from internal fraudulent activities that lead up to our research question and purpose for our thesis. We also display this thesis research contribution and our delimitations that affect the outcome of this study. In the end of this chapter we present the overall outline of the thesis.

1.1 Background

Over the past decade financial scandals and large lawsuits have seized international headlines and brought increased attention to operational risk. Although banks have faced operational risks throughout the history, the attention of operational risk management has increased noticeably in recent years. Operational risk is the risk of losses resulting from inadequate or failed internal processes, people and systems or from external events (Basel Committee, 2006, p. 144). Managerial and regulatory focus in the financial industry has been intensified due to number of extremely costly and highly publicized events. In recent history several banks have reported large losses due to both internal and external fraudulent activities, where the largest loss announcements exceeded one billion US dollars (Gapper, 2011).

Many of the events that have received attention and media coverage can be categorized as internal fraud. Internal fraud in the context of operational losses in the financial industry can involve anything from employees misappropriating assets to tax evasion. However, some of the largest losses that could be categorized as internal fraud have often been caused by “rogue traders”. A rogue trader is an employee authorized to make trades on behalf of their employer, who makes intentionally unauthorized trades (by not following the employer’s rules and guidelines). Rogue traders often act independently, recklessly and typically trade in high-risk investments, which can create huge losses but also large gains. This kind of activity is often in the grey zone between civil and criminal violation, because the perpetrator is a legitimate employee, but enters into agreements, contracts or transactions without permission (Gapper, 2011).

In several cases rogue traders have initially made large profits for their employers, and bonuses for themselves (Gapper, 2011). This might be the reason why the amounts have reached incredibly high levels before it has been stopped. There are examples where these events have lead severe problems and even bankruptcy of banks (Gapper, 2011). The most famous case is probably Nick Leeson, who in 1995 caused the collapse of Barings Bank, the oldest investment bank in the UK, by hiding an £830m loss. Allied Irish Bank encountered a rogue trader in 2002, who cost the bank a total of $690m. In 2004, a group of currency-options traders at the National Australia Bank lost AUS360m while in 2008 the largest operational loss in history emerged, Société Générale trader Jérôme Kerviel had hidden €4.9bn of losses (Gapper, 2011).

On top of this, research shows that the announced amounts likely understate the effect of operational losses on the financial sector. This is because in addition to inflicting direct financial losses, operational loss events have an indirect impact on a firm via reputational risk
When fraudulent activities or any improper business practices are revealed it may damage the firm’s reputation, thereby driving away customers, shareholders, and other counterparties (de Fontnouvelle & Perry, 2005, p. 1). In the end this can have a big impact on anyone who is any kind of stakeholder, such as a customers or a shareholder. Even if everybody do not personally own bank shares, their mutual funds or pension funds might do.

Even though this kind of events have lead to an increased awareness of operational risk and how important is, operational losses keep surfacing and the times of financial crises reveal new shortfalls of operational risk management. Operational risk have also received attention because of the enhanced emphasis on transparency in firm financial reporting, and rising levels of exposure to operational risk (Cummins et al., 2006, p. 2606) 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. To illustrate, more processes today are automatic, which reduces exposure to the risk occurring from the human factor, but increases the exposure to the risk of system failure.

Most operational loss events are characterized by individual mistakes involving some kind of failure or problem. These losses can be relatively small, but might still attract the attention of the public and the media (Sturm, 2013, p. 192). The negative consequences in the aftermath of such an event can be more severe than the loss itself, through the loss of customers or executive employees (Sturm, 2013, p. 192). Even if it is unusual that the reputational damage exceeds the operational loss, it is problematic that regulators and authorities have ignored this reputational effect.

In terms of regulation banks are obligated through Basel II accords 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 Basel II accords refer to the banking supervision accords: Basel I, Basel II and Basel III, a set of recommendations for regulations in the banking industry issued by the Basel Committee on Banking Supervision. The committee itself does not have any superior authority over the governments and central banks (Bank for International Settlements, 2014). However, its recommendations and guidelines are broadly followed, and well regarded in the international central banking and finance community.

Operational risk can be a very complex concept, because it can be difficult to draw the line between operational risk and other types of risk. However, the definition of operational risk that has become the consensus definition in literature is the Basel Committee’s:

“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).

The definition excludes reputational risk, but it is widely acknowledged that operational losses also affect the reputation of banks. The Basel Committee 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, 2009, p. 19).

The Basel Committee also states: “reputational risk is multidimensional and reflects the perception of other market participants” (Basel Committee, 2009, p. 19).

In the industry reputational risk is seen as an important area for further research, and is considered problematic since it is hard to measure (PwC, 2005, p. 3). Many risk officers at large international banks are also finding it difficult to develop and integrate relevant risk tolerance strategies across their global groups. Banks have also identified reputational risk as the number one threat against their market value (PwC, 2005, p. 7-8). The bottom-line is that the financial industry is like all other businesses; dependent on what their customers think of them. Banks want their customers to think of them as trustworthy and honorable, otherwise they may take their money elsewhere. No one is interested in putting his or her savings, or taking on a loan with an arbitrary partner.

Unlike other companies, banks are heavily regulated. Governments all around the world want the financial sector to be stable. In order to keep stability it is important that companies and private individuals have confidence in the banks. In order to ensure this, regulators try to keep probability of a large bank experiencing severe financial difficulties low, and to keep bankruptcy a highly unlikely event (Hull, 2012, p. 16). The problem lies in the fact that we have seen examples through the history where one single person has caused a 200-year-old institution to collapse due to speculative trading (Gapper, 2011). When considering the shareholders in a bank, take Société Générale as an example, some of the largest shareholders are pension funds and mutual funds (Morningstar, 2015). Banks play an important role in the the economy as a key component of the financial system. Most of us interact with banks every day, whether it is a debit card purchase, an online payment or a loan application. In practice, this means that fraudulent activity from one single person can cause severe financial damage throughout society. This is the main reason why the area of operational and reputational risk research is so important.

A greater understanding of reputational risk and by what mechanism reputational risk is adversely affecting stock prices is of great importance for stakeholders. Regulators and authorities would receive valuable insights and can use those insights to form new regulations in order to minimize these negative effects. Investors and other stakeholders will have more information on how these risks is managed and measured. To be able to understand the effects of operational losses and the nature of reputational risk more knowledge is needed. This study aims to add more knowledge to the field and a better understanding of reputational risk.

1.2 Subject discussion
This study aims at providing insights and a better understanding of reputational risk. We examine the reputational damage in banks resulting from operational loss events and market reaction across the financial sector. We analyze the stock market reaction across the financial sector operational loss announcements. A reputational loss is considered to be the amount a firm’s market value declines by more than the announced loss amount. So if Bank ABC announces a loss of $100m due to a rogue trader, and the market reaction is a declined market value by $115m, the reputational loss is interpret as $15m.
Historically, the focus in risk management research has mainly been on credit and market risk, but the attention of operational and reputational risk has increased dramatically over the past decade (Cummins et al., 2006, p. 2606). For many years regulators and authorities had more or less neglected this aspect of risk management. The fact that the history of operational and reputational risk research is young also means that data availability is limited, in comparison to credit or market risk (Sturm, 2013, p. 192). As the data availability is increasing and new requirements from regulators and authorities is introduced, it is likely that the operational and reputational risk research will continue to grow and develop in the coming years.

The field of operational risk management, tools and measurement techniques started gain interest and attention in the early 2000’s. A few years’ later publications from de Fontnouvelle & Perry (2005) and Cummins et al. (2006) pioneered the field by analyzing effects of operational loss events. The study from de Fontnouvelle & Perry (2005) examine firms stock price reaction to major operational loss events in order to quantify reputational risk. A reputational loss is considered to be the amount that the market value is reduced by in addition to the announced loss. The authors find that market values fall one-for-one with losses caused by external events, but fall by over twice the loss percentage in cases involving internal fraud. It is concluded that there is reputational impact for losses due to internal fraud while externally caused losses have no reputational impact.

de Fontnouvelle & Perry (2005) is closely related to Cummins et al. (2006) who conduct an event study analysis of the impact of operational loss events on the market values of banks and insurance companies. The authors find evidence of negative stock price reaction to announcements of operational loss events. They also find that the reaction is larger for insurance companies than for banks, and that the market value loss significantly exceeds the amount of the operational loss announced. A study from Gillet et al. (2010) also attempts to distinguish operational losses from reputational losses. Again, results show significant, negative abnormal returns at the announcement date of the loss. In cases of internal fraud, the loss in market value is greater that the operational loss amount announced.

These studies had all used data from the same vendor and most of the events in the samples have been US based. So Sturm (2013) focused his study on European financial companies. The data used comes from the German banking association’s (VÖB) database. The author studies the stock market reaction to the announcement of operational losses, accounting for the effect of the nominal loss to examine the reputational damage. Results show significant negative stock price reaction to the first press announcement. The stock market also reacts negatively to the settlement announcement as losses are confirmed and the loss amount is known. What is interesting is that results also suggest that reputational damages are rather influenced by firm characteristics than characteristics of the operational loss event itself.

There are also studies with smaller samples and narrower markets such as Cannas et al. (2009) and Solakoğlu & Köse (2009), who also find significant negative abnormal returns at the announcement date of the operational loss. Most studies also find that losses due to internal fraud have the biggest impact on the magnitude of the reputational damage. Hence we say that most seem to agree on two things; announcement of operational losses is adversely affecting stock prices, and in cases of internal fraud, the loss in market value is greater that the operational loss amount announced. Prior studies have also focused on what kind of impact firm characteristics, or operational loss characteristics have on market reaction.
Prior research have contributed to a better understanding of reputational risk, but it still remains unclear by what mechanism reputational risk is adversely affecting stock prices and how the competitors are affected. All other research has considered the institution subject to the loss in relation the market reaction; no studies have made a cross-bank analysis. If one bank announces an operational loss, there is reason to believe that competitive banks face a positive opportunity to attract new business. On the opposite, following prior research on contagion within financial systems, there is reason to believe that the loss announcement could impose a negative effect on competitive banks as well, i.e. investors take their money elsewhere in fear of customers taking a run on all banks. There is reason to examine if an operational loss in an institution is beneficial for competitive banks, or if these events are contagious throughout the sector. There is also reason to examine if the cross-bank reaction is zero, as an operational loss event at one bank should not alter any probability of future losses at other banks.

This study is closely related to previous research using event study methodology in that abnormal returns around the announcement date of information on operational losses are assessed. In this way our study is anchored in previous research in the sense that we have the same points of departure. The difference is that our study is narrower in that sense that we mainly focus on the market reaction of competitors and internal fraud events. This would add one more piece of the puzzle that can bring new insights of the effects and nature of reputational risk. This information would also be helpful for banks, central banks, regulators and authorities when developing the financial system of the future.

1.3 Research question
The study aims to answer to the following research question:
What is the effect of operational loss announcements from internal fraudulent activities on competitors in the banking industry?

1.4 Thesis purpose
Our main purpose for this thesis is to examine if there is a cross-bank reaction that occur from operational loss announcements due to internal fraudulent activities within the banking industry. If there is a cross-bank reaction it is in our research interest to investigate in what direction this reaction moves the competitive banks stock price. As previous research states, banks has possible ways of contingent losses and our focus is to discover if there is a way that reputational damage may cause contingency within the market.

Beside our main purpose we have drawn up three side purposes for this thesis. One side purpose is to confirm previous research and examine if there is a reputational damage that is caused by the announcement of operational losses derived from internal fraudulent activities. This purpose gives us the opportunity to conduct an analysis in line with previous research in order to validate our event sample further.

We also aim to discover if extra ordinary losses in terms of large loss amounts generate any special reactions. A thesis that covers the banking industry over a timespan that include the financial crisis of 2007-2009 has to evaluate if the extreme volatility that occurred in financial markets at that time has any impact on the cross-bank reaction.
1.5 Research contribution
Even though the history of operational and reputational risk research is young, some research has been done on the effects of operational loss announcements. As said before, all prior research has considered the institution subject to the loss, and has mainly focused on what impact firm characteristics or operational loss characteristics have on market reaction. We have not been able to find any prior studies that have made a cross-bank analysis, and have research the problem from an industry perspective.

Theoretically this study’s contributions include an increasing knowledge about reputational risk in a different setting. The study will also be able to give valuable inputs for researchers who are interested in learning more about the effects and aftermath of operational losses in the financial sector. A cross-bank analysis will also contribute to research on contagion, since any finding that the announcement of a loss at one bank has an negative impact on other banks’ stock prices would be evidence of financial market contagion.

The practical contribution includes increased knowledge regarding the effects of operational losses and the nature of reputational risk. A deeper understanding for this is important for stakeholders, and especially investors, who will receive more information on how these risks is managed and measured in the financial industry. Finally, regulators and authorities will receive valuable information, which will be helpful when enacting new laws and developing regulatory framework.

1.6 Delimitations
For this thesis we have set boundaries that are necessary for the execution of our research purpose and for practical purpose, even though we have tried to limit this constraints and be as open minded as possible while designing and performing our research.

When looking into the effects of operational loss events from internal fraud in the banking industry the optimal would be to include all losses made worldwide in our sample, nevertheless this is not practical. Gathering data is easier if we restrict ourselves to look at losses made in major stock exchanges. Especially as we have conducted a cross-bank analysis for which a sample of competitive banks need to exist, which could be a problem looking at minor stock exchanges where only one or two banks might be listed. Our source for event dates is limited to the database Öffschor by VÖB-Service and we therefore do not include other loss events that might be included in other databases. Öffschor by VÖB-Service is a German financial loss data provider and since it is stationed in Europe it might contain skewedness to European operational loss events.

In our cross-bank analysis we look for abnormal returns initiated by an operational loss event from internal fraud. With banks being in general very large and complex industries it is hard to believe that smaller losses will have an impact on the banks and its competitors market value. Both Cummins et al. (2006, p. 2612) and Gillet et al. (2010, p. 225) exclude smaller losses and set their loss limit to $10m. Gillet etal. (2010, 225) explains this with: “Smaller losses were first considered in the sample but were removed as we were confronted to a loss of explanatory power”. With this as a background, we believe that having the same approach to loss limits as Cummins et al. (2006) and Gillet et al. (2010) is the best balance between data availability and explanatory power. Therefore we have set our loss limit to €5m in order to sort out events where we think the loss amount will make no difference in a cross-bank analysis.
Furthermore, in our cross-bank analysis we look for correlated stock price effects between the bank where the loss occurred and the competitive banks. Based on the assumption of four big banks in each country stated in Titcomb (2014) we deselect banks that are out of the top four for each event. Banks are selected based on market value around each event date. We have not categorized the banks based on their line of business, such as retail or investment banking, due to a time limitation.

From previous research (Gillet et al., 2010; Cummins et al., 2006; de Fontnouvelle & Perry, 2005) we learn that there is a clear connection between losses from internal fraud and reputational damage, we therefore include losses from internal fraud and exclude any other form of operational loss from our sample in order to focus on the relationship of reputational damage in one bank and eventual cross-bank effects.

1.7 Outline of the study

Chapter 1 – Introduction
- Presents a background and subject discussion leading up to our research question and purpose for the thesis.

Chapter 2 – Theoretical method
- Scientific approach and perspective along with the quantitative research method represents the research method used in this thesis with related epistemology.

Chapter 3 – Prior research
- Outlines the prior research used in this study to identify key concepts and theories. Starts with a summarizing table that describes main characteristics of each research.

Chapter 4 – Theoretical framework and hypotheses development
- Builds a theoretical framework on key concepts and theories learned from prior research leading up to the hypotheses development.

Chapter 5 - Data & methods
- Reveals the procedure of an event study, selection criteria and the measurements used to determine normal and abnormal returns.

Chapter 6 - Results and analysis
- Each result is first presented and analyzed with a hypothesis test individually and in the end follows a summarizing section.

Chapter 7 – Conclusions
- Gathers the concluding results of the study, reflects on the direction of cross-bank reaction and argue around the theoretical and practical contributions of the thesis. A suggestion for further research is also presented.

Chapter 8 – Criteria of truth
- This chapter discusses the validity and reliability.
2. Theoretical method

This thesis builds upon a quantitative method with a deductive approach. For us this means that we collect prior research and theories to develop this studies hypotheses. Then we gather quantitative data in form of event dates with specific loss amounts and adjusted closing prices from the current market. We do this in order to meet our research question; How are operational loss announcements from internal fraudulent activities affecting competitors in the banking industry? This chapter also presents how the authors look at reality and knowledge.

2.1 Pre-understandings

The pre-understandings of the authors are acquired at Umeå School of Business & Economics. Both authors have studied the Master of Science in Business and Economics with a focus on Supply Chain Management program for seven semesters. The first four semesters include basic courses within subjects such as Economics, Business, Statistics and Law. This is followed by bachelor level studies in Sales & Sales Management, and Supply Chain Management. In addition to these both authors have studied bachelor level accounting. One of the authors has also studied bachelor level finance courses in financial institutions, markets and planning, while the other has additional law studies in tax law. For the seventh semester both authors studied Financial Management, with courses including Financial Statement Analysis & Valuation, Corporate Finance, Investments and Risk Management.

The authors are employed by two of the largest banks in Sweden, to work extra during time off from studies with customer service in retail banking. This, and along with an excellent risk management course were the main reasons behind how we selected our thesis subject. The pre-understandings of the authors should not affect the study's results to any significant extent. However, this does not mean the possibility of that the pre-understandings will affect the result of the study cannot be completely ruled out. We believe that the authors expectations could have effect on the results. If the authors expect or wish the results to be strong and significant, there is a possibility that the authors intentionally or unintentionally skew or amplify the results towards the expected or more striking results.

In order to minimize the risk that expectations or wishing bias the results of the study, we have at all-times done our best not to draw any conclusions unsupported by objective arguments. By doing this presentation we are well aware of our pre-understandings and how they might affect the thesis. Therefore we have mitigated the risk that our results will be affected by our pre-understandings.

2.2 Epistemology

Epistemology refers to the question of how to acquire knowledge that is justified as true beliefs, and also what kind of knowledge is considered adequate for the research (Bryman & Bell, 2003, p. 27). Positivism and interpretivism are the two different epistemological positions, where the first advocates to conventional research and is more common in natural science research. Interpretivism is based on understanding and interpretation and is more common within the field of social science (Bryman & Bell, 2003, p. 29).

In order to examine the cross-bank effect of operational loss announcements we find positivism as the most suitable epistemology. Within the positivism, fact and empirical data
that can be verified through observations are the only factors affecting the result (Patel & Davidson, 1994, p. 23). This is in line with our beliefs and consistent with the research process. The existing empirical body of operational and reputational risk research will act as a foundation for development of hypotheses. Testing hypotheses and statistical relationships from a verifiable measuring method produces interpretable results (Smith, 2011, p. 16). We aim towards an objective interpretative analysis of the results. The study is not based on the social reality and therefore we consider a positivistic position as most suitable.

2.3 Scientific approach and perspective
Ontology or ontological issues refers to what exists and they way individuals perceive reality. There are two main ontological approaches are called objectivism and constructionism. The key in this context is the question of whether social entities can or should be perceived as objective entities that possess for the social actors external reality, or whether they should be regarded as constructions based on social actors perceptions and actions (Bryman & Bell, 2003, p. 33).

Since we will analyze data in terms of financial numbers objectivism is the most valid ontological approach. Our ambition is to generate insights and generalizable results unaffected by context and observation settings. Therefore is objectivism the approach most applicable and natural to the purpose of the thesis.

2.4 Deductive approach
In social science research, there are mainly two different approaches, deductive and inductive approach. The deductive approach represents the most common view of the relationship between theory and practice in the social sciences research (Bryman & Bell, 2003, p. 23). In a deductive approach the researcher start out from the existing theoretical body and generates hypotheses and predictions, which are to be either confirmed or rejected depending on the results (Smith, 2011, p. 3). The inductive approach is used to develop new theories from observations (Smith, 2011, p. 21-22). In other words, the inductive process implies that you draw generalizable conclusions on the basis of your observations, which is not in line with the purpose of this study. The most suitable to answer our question is the deductive approach and its process is described in figure 1.

![Figure 1. The deductive process](image)

(Bryman & Bell, 2003, p. 23)

In order to gain knowledge, we began the process by accumulating theories from scientific articles and books concerning operational and reputational risk in the financial industry. From prior research within the area we built a theoretical framework about operational risk, operational loss announcements, reputational risk and contagion. In an initial stage a framework can contribute to establish variables of interest and influential factors affecting the research problem (Smith, 2011, p. 22). Hypotheses are possible relationships and causal links among concepts of variables (Smith, 2011, p. 33). We then used our framework from theories
and prior research to form our hypotheses about reputational damage/loss in a cross-bank setting. Data was collected through Thomson Reuters Datastream and then processed using Microsoft Excel. After processing the data it is statistically analyzed, and the hypotheses is either rejected or confirmed.

2.5 Quantitative research method
There are two different types of research strategies, quantitative and qualitative (Bryman, 2008, p. 39). The difference between the two has been discussed for decades, and for many researchers quantitative and qualitative research differs in terms of the epistemological foundations and various other questions. However, in Bryman & Bell (2003, p. 40) qualitative research is perceived as a research strategy that places emphasis on words and not quantification in the collection and analysis of data, and generally focuses on how individuals perceive and interpret their own social reality (Bryman & Bell, 2003, p. 40).

In contrast to this, a quantitative research strategy emphasizes quantification in terms of the collection and analysis of data. The research strategy is also characterized by a deductive approach to the relationship between theory and practice, where the emphasis is on testing of theories using scientific research standards and procedures. Generally it holds the idea of the social reality as an external and objective reality (Bryman & Bell, 2003, p. 40). This strategy is consistent with the purpose and research question of the study, and is in line with our views and beliefs on our social reality. Therefore, we find the conduction of a quantitative research method as the adequate method for this thesis.

2.6 Literature search
As an initial step in our literature search, we used student thesis database the DIVA-portal and uppsatser.se for inspiration. The second step was to reread a few chapters in Hull (2012), which was the course literature from our risk management course. We then searched for scientific articles through the databases Emerald And Business Source Premier (EBSCO) and Google Scholar, in order to map the research field of operational and reputational risk. Example of keywords used is; operational risk, reputational risk, operational loss, reputational loss, reputational damage, banking sector, financial industry and contagion. These words, and different combinations of them, were used to find relevant scientific articles.

The search resulted in a number of different articles and research papers, and mainly through these and other relevant articles found through references in these, we processed to gain more knowledge. After we identified the most prominent studies and authors within the field, we reviewed their previous publications to get an idea of foundations and development of the area. We observed that most studies made within operational and reputational risk was based on the US market, and they were mainly focusing on reputational damage in relation to firm characteristics or event characteristics. Through this framework and suggestions on future research and discussions we got interested in looking at the effect of other banks in the sector. We could not find any previous studies, which looked at cross-bank effects of operational loss announcements and reputational damage. In other words, through the process of this literature search we found a research gap, which this thesis aims to fill.
2.7 Source criticism

In order to distinguish the relevant and important sources from the less informative or irrelevant ones we have critically reviewed the literature. This review has been based upon four criteria that have to be met: authentication, independence, freshness and concurrency (Ejvegård, 2003, p. 62-65). This applies to all sources used in our thesis, but is more stringent applied in cases of more important sources. Throughout the study we have aimed to the widest extent possible to make use of primary sources. Unfortunately, it has not been possible in every single case and secondary sources have been used occasionally. These sources have been of descriptive character and of low relevance for the overall study.

Nevertheless, we have mainly used primary sources, which reduce the probability of bias due to interpretations made by other authors, and thereby increasing the overall credibility of the study. Scientific articles regarded as highly relevant throughout the study have all been found using acknowledged and established databases, such as: EBSCO Business Source Premier, Emerald and Elsevier. Also, most of the scientific articles of high relevance used are well cited and have been “peer-reviewed”, i.e. people possessing knowledge about the reviewed subject have reviewed it. This should thus provide a high level of credibility to the study and respond to the authenticity criteria. Since the history of reputational risk is still young, most of the sources used are publications from this century. Therefore the sources should be considered to be up to date, which fulfills the freshness and concurrency criteria.

Older sources have been used, mainly in the research design and methodology section of the study. More recent sources have been supplemented by older and original articles, as in the example of Bryman & Bell (2003), have been supplemented with Smith (2011). Even though Smith (2011) is specifically accounting research literature, the approaches is very much inline with our study. In some cases MacKinlay (1997) and Campbell, Lo & MacKinlay (1997) stand alone without any more recent confirmation. This because all prior research on operational loss announcements still use these as their foundation in constructing an event study.
3. Prior research

Despite that the quantity of research on reputational damage is limited we have listed and described previous papers that significantly contribute to our research subject. The studies are also very much US focused. Below follows a short presentation of previous studies with general findings that has relevance to our research subject. Then follows a short presentation of previous studies with general findings that has relevance to our research subject.

3.1 Operational losses and reputational risk

Losses that originate from failed internal processes, people and systems or from external events are by the Basel committee (2006, p. 144) defined as operational losses. Reputational risk represents a probability of a negative effect derived from the operational loss on a bank in terms of market value and therefore also on future cash flow into the bank. In this section below we describe key studies in the field of operational losses and especially reputational risk.

Using data on 132 cases of fraud from 1978 through 1987 Karpoff & Lott (1993) present evidence that the reputational cost of corporate fraud is large and constitutes most of the cost incurred by firms accused or convicted of fraud. Therefore optimal penalties for corporate fraud require that firms face expected penalties that are in proportion to the total costs of the crime. Fraudulent activities may impose external costs on third parties even when they are not directly affected, because customers of similar firms to the fraudulent firm may take on actions in order to assure quality and/or detect fraud. Further they find proof that analysts or investors do not anticipate bad news about the firm before the announcement of fraud.

de Fontnouvelle & Perry (2005) examine firm’s stock price reaction to major operational loss events in order to quantify reputational risk. A reputational loss is considered to be the amount that the market value is reduced by in addition to the announced loss. The authors find that market values fall one-for-one with losses caused by external events, but fall by over twice the loss percentage in cases involving internal fraud. It is concluded that there is reputational impact for losses due to internal fraud while externally caused losses have no reputational impact.

Cummins et al. (2006) conduct an event study analysis of the impact of operational loss events on the market values of banks and insurance companies. The sample is almost 500 events between 1978 and 2003 that caused operational losses of at least $10m. The authors find evidence of negative stock price reaction to announcements of operational loss events. They also find that the reaction is larger for insurance companies than for banks, and that the market value loss significantly exceeds the amount of the operational loss announced. This means that these losses convey a negative impact on future cash flows, and is described as a reputational loss in de Fontnouvelle & Perry (2005).

Operational risk is studied by Jarrow (2007) in which he specifies an economical and mathematical characterization of operational risk for better estimation of economic capital. Jarrow argues that current methodology for the determination of economic capital for operational risk is overstated. Based on the economic characterization of operational risk in two fundamental types; (i) the risk of a loss due to the firm’s operating technology/system, including failed internal processes and transactions, or (ii) the risk of a loss due to agency
costs, including fraud and mismanagement, Jarrow model the risk on with this partition in mind.

A study from Gillet et al. (2010) also attempts to distinguish operational losses from reputational losses, or reputational damage as Gillet et al. (2010) is referring to. The authors examine stock market reactions to announcement of operational losses. The data consist of 154 events that occurred between 1990 and 2004 in public financial companies. Results show significant, negative abnormal returns at the announcement date of the loss. In cases of internal fraud, the loss in market value is greater that the operational loss amount announced.

Ruspantini & Sordi (2011) discover reputational impact from internal fraud that bank retail branches originate on clients. How this reputational impact is inflicting on the banks business is measured by evaluating the strength and length of the reaction. Results prove that this bring a lack of capability in keeping customers and creating new customer relations. More in depth, the reputational risk impact is of such magnitude that the bank is not able to recover its pre-event reputation level with customers in a one-year horizon.

Fiordelisi et al. (2013) states that reputation is an important asset for any business who bases their commerce on trust. In this paper a large sample of financial firms in Europe and the U.S. between 1994 and 2008 is studied, with the purpose of estimating the reputational impact of announced operational losses. It provides evidence that "fraud" is the event type that generates the most reputational damage.

Sturm (2013) focuses his study on European financial companies and uses a sample of 136 loss events between 2000 and 2009. The data used comes from the German banking association’s (VÖB) database ÖffSchOR by VÖB-Service. The author studies the stock market reaction to the announcement of operational losses, accounting for the effect of the nominal loss to examine the reputational damage. Results show significant negative stock price reaction to the first press announcement. The stock market also reacts negatively to the settlement announcement as losses are confirmed and the loss amount is known. What is interesting is that the author finds results that also suggest that reputational damages are rather influenced by firm characteristics than characteristics of the operational loss event itself.

Fiordelisi et al. (2014) investigates what determines reputational losses in banking. By estimating the reputational risk for a large sample of banks in Europe and U.S. between 2003 and 2008 they can show that there is a probability that reputational damage increases as profits and size of the bank increase. Running an event study like many others to estimate reputational damage and thereafter cumulating an estimate from a multivariate model to assess the determinants of operational losses.

3.2 Contagion
If effects from an announced loss from operational activities in one bank is transferred to other banks contagion is revealed. In following presentation of prior research we highlight studies that focus, one way or another, on contagion within financial markets.

Allen & Gale (2000) investigate contagion within financial institutions. They aim to specify micro economic fundamentals for financial contagion. They focus on intersecting interbank claims, more precisely interbank deposits. Contagion is described as the balancing power of liquidity. Deficiency of liquidity in one region is not always associated with effects in other
regions, therefore banks choose to hold interregional claims on other banks as insurance against liquidity shocks. Results show that when a liquidity crisis hits one region, the value of interbank claims drops, which could then lead to a liquidity crisis in another region.

**Cowan & Power** (2001) examines how asset quality problems within First Executive Corporation affect cross firm stock price reactions. First Executive a large life insurance company failed in 1991 on a huge loss in junk-bond investments. A concern for regulators of insurance is the possibility that a large collapse of large insurer will be contagious. The authors created a sample of life and health insurance companies listed on stock exchanges at the same time horizon as the collapse of First Executive. From their sample they made an event study with stock-market data around a five-day event window and tested the average stock-price reaction using a multivariate regression model. The result suggests that the announcement of their failure had significantly negative stock-price reactions in their cross-insurance company analysis.

**Gropp & Moerman** (2004) examine the risk of within country and across country contagion by con-incidence of extreme shocks among large banks in Europe. Introducing a new methodology that focuses on identifying direction of contagion from one bank to another, with an approach that is related to the conviction that tail observations for financial data is different from the behavior of other observations (extreme value theory). The definition of contagion they use is transition of an idiosyncratic shock from one bank to another. This paper serves a first step in enabling market-based indicators to measure how vulnerable banks and banking systems are to contagion. Gropp & Moerman do not describe the channel in which contagion transmit, but imagines that it goes through money markets, payment systems, equity links and “pure contagion”. Evidence of tight links between banks within countries and connections through major banking systems in Europe is shared.

**Hasman** (2013) does an extensive literature review with following point of departure, over the last 25 years more than two-thirds of the International Monetary Fund (IMF) have gone through a financial crisis in their banking system. A bank crisis is expensive and takes a lot of assets in claim. Through better regulation, policymakers try to achieve greater stability in financial markets. Since the last financial crisis, regulators have put more effort on making macro-prudential supervision decrease volatility. In an effort to discuss contagion in the banking sector, Hasman compare existing theoretical and empirical literature.

### 3.3 Relevant concepts and understandings linked to our thesis

We recognize the research above as prominent for our research purposes and draw inspiration from the presented methodologies, theories, results and conclusions. For our study it is vital to rely on the conclusion made among others by Karpoff & Lott (1993) and Sturm (2013) that the stock markets do not adjust the stock price for bad news before the announcement of an operational loss of fraud. To clarify, the market does not anticipate the loss and there is high probability to capture any stock reaction in the event windows we set for this thesis.

As for methods used, it is most common to apply an event study methodology, where cumulative abnormal returns are calculated over different event windows. Essentially all research within the area follows the event study approach of McKinlay (1997), which leads us to believe that choosing an event study methodology brings credibility to our thesis, as it is performed by de Fontnouvelle & Perry (2005), Cummins et al. (2006), Gillet et al. (2010), Fiordelisi et al. (2014) and Sturm (2013).
Furthermore, de Fontnouvelle & Perry (2005) bring evidence of a more than one-for-one market reaction when the operational loss event is involving internal fraud. Cummins et al. (2006) find that the market value loss significantly exceeds the amount of the operational loss announced. This means that these losses convey a negative impact on future cash flows. Gillet et al. (2010) find that in cases of internal fraud, the loss in market value is greater that the operational loss amount announced. Fiordelisi et al. (2013) provides evidence that “fraud” is the event type that generates the most reputational damage. And several other articles provide evidence of operational losses stemming from fraudulent activities is generating reputational losses or damage.

As it is in one of our interests to examine a reputational reaction it strengthen our belief that the operational loss events involving internal fraud produce a stronger reaction. With the previous research as background, we interpret it as investors may view externally caused losses as one-off occurrences, but view losses caused by internal fraud as indicators that further losses are more likely to occur in the future. Alternatively, investors may fear more direct future losses due to losses in customers, business partners, etc. This means that there is a possibility that the affected bank’s loss of clients could directly benefit its competitors. No prior research has examined cross-bank reactions stemming from operational, reputational risk, or reputational damage. As we see it, we have three possible outcomes: a positive cross-bank reaction, a negative cross-bank reaction and no or zero cross-bank reaction. Based on these potential outcomes we have formed hypotheses, which we will explain in section 4.4.

### 3.4 Gathering of prior research

Below in table 1 follows a brief gathering of studies that we find of use for our study. They are all linked to our objective and purpose. Most previous studies in the field of operational and reputational risk of financial institutions use data from Algo OpData (aka OpVar) and/or OpVantage First, databases currently owned by IBM. One exception, however, is a study using the ÖffSchOR by VÖB-Service a German database with the same type of events as Algo OpData and OpVantage.

<table>
<thead>
<tr>
<th>Authors</th>
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<tr>
<td>Cummins et al. (2006)</td>
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<tr>
<td>Gillet et al. (2010)</td>
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<tr>
<td>Study</td>
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<tr>
<td>Ruspantini &amp; Sordi (2011)</td>
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<td>Fiordelisi et al. (2014)</td>
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<td>-</td>
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4. Theoretical framework & hypothesis development

In this chapter we will go through the main concepts and theories that we rest this thesis on. We do this in order to analyze the results properly. First we present reputational risk and how it is connected to operational risk and how it is defined. Thereafter we explain the reputational damage that derives from reputational risk. After having addressed the reputational aspects of this thesis we will go through a segment that briefly explains financial trust and its fundamentals. Last in the segment of theories and concepts is contagion within the financial sector and banking industry. These four mentioned theories and concepts represent the basis that we build our theoretical framework on. The theoretical framework is then followed by a presentation of our hypotheses and its development. The theoretical framework and prior research shape our hypothesis.

4.1 Reputational risk

If one bank makes a loss derived from e.g. misplaced or misjudged credit commitments, the loss may not inflict any reputational loss. In case customers interpret this loss as a sign of lack of internal control in the bank, this might ensue a reputational risk with severe reputational damage as result.

Unlike many other risks that demand surveillance by the banks, reputational risk is not triggered by any repetitive factor. In this way there is a probability that any loss caused by any event can for the bank transmit to a reputational risk. Following definition explain the hardship of dealing and monitoring reputational risk:

"Reputational risk is the possibility that negative exposure regarding an institution's business practices, whether true or not, will cause a decline in the customer base, costly litigation, or revenue reductions" (Board of Governors of the Federal Reserve System, 2004).

In terms of risk management and ability to quantify risk, reputational risk is one of the more vague risks. It is hard to measure as well as there is a problem in understanding what mechanism drives this risk. Recent work is often targeting market and credit risk when the purpose of research is defining and quantifying risk in the banking sector.

In many aspects reputational risk is closely related to operational risk (Walter, 2009, p. 76), operational risk is according to Basel II (Basel Committee, 2006, p. 144) associated with internal fraud, clients, internal processes and external events such as external fraud and force majeure. With backwash from the financial crisis in 2008 the Bank for International Settlements (BIS) Basel Committee has suggested that in order for banks to better operate in an unstable market they should hold regulatory capital for operational risk (de Fontnouvelle & Perry, 2005, p. 4), but not for reputational risk. Regulators pull apart reputational risk from operational risk (Walter, 2009, p. 76), which do not indicate that banks view reputational risk less severe. Stated by bank executives in an inquiry by PwC (2005, p. 7-8) reputational risk is the biggest threat to their banks market value, makes efforts in trying to quantify reputational risk valuable.

4.1.1 Reputational damage

Market value, or the stock price of any company listed on financial exchange markets is supposed to reflect the sum of all future generated cash flows discounted to present value. In
case of a loss from an event that reduces the expected cash flows, market value should react negative. If investors think that signals from the loss is just the beginning of more losses or that it has direct negative impact on future cash flows they will probably liquidate their positions in the bank. de Fontnouvelle & Perry (2005, p. 5) list various paths by which reputational risk can turn into reputational damage for a bank:

- Customers seek other partners in their business
- Harder to attract new customers
- Forfeit of employees or managers that can lead to increasing hiring costs
- Growth of costs associated with funding on credit and/or equity markets
- Higher costs due to fines or other penalties

With the problem of identifying driving factors for reputational risk, banks unwillingly sits on top of an unknown hazard that can lead to serious issues of survival. In a single stroke reputational damage can wipe out billions of dollars in shareholder value from one single operational loss event (Gillet et al., 2009, p 224).

4.2 Financial trust
In markets all over the world transactions is defining the playground, to get what you want you let go of something else. Fundamental for this transaction is trust, in the financial market people let go of assets in exchange for promises. These promises are worth nothing but the paper they are written on if there is no trust (Sapienza & Zingales, 2012, p. 124). Given the opportunity to invest, deposit assets or taking a loan, any transaction will involve certain amounts of trust. Partaking in transactions that inflict others (banks) in control over our money demands the expectation of actions others make is beneficial for our needs. Saying that we trust our bank, we imply that we think that the bank will take actions for our benefit (Gambetta, 2000, p. 217). A key component in trust is mutual confidence, for us to act on basis of trust we must accept that regardless of our ability to monitor actions taken for our sake, the counterpart will have our authority to act on our behalf. Each transaction of commercial nature has different degrees of trust built in, which leads to an credible argument that much of the economic backwardness in global markets can be explained by the lack of mutual confidence (Arrow, 1972, p. 357).

If investors lack information to assess risk on the stock exchange they will develop doubt about their decision-making, reconsider their options and act on that doubt. Mistrust sprung from doubt and any new information obtained by the investor will be judged and possibly disregarded based on lack of trust. If the investor trusts others the probability of the investor buying stock increases with 50 percent. (Guiso et al., 2008, p. 2558).

4.3 Contagion
The logic behind contagion in financial markets is the same as with spread of disease. One firm get affected by an incident that affect their business and this incident cause other firm’s problem in a related way. This incident can be of both positive and negative nature. The probability of contagion within the banking sector has increased with the growing global economy as a result of more correlated business regions. If a banking crisis hits one region, other regions suffer a loss because their claims in the troubled region fall in value. (Allen & Gale, 2000, p. 2).
This is very similar to the definition of contagion among banks that Gropp & Moerman (2004, p. 408) uses:

“We define contagion as one bank being hit by an idiosyncratic shock, which is transmitted to other banks.”

Difference between banks in terms of demand and supply of liquidity varies randomly but for the market it remains constant (Allen & Gale, 2000, p. 3). Banks are also differentiated by what character of business they do best; some are better at raising funds while others are better at lending them (Allen & Gale, 2000, p. 5). To solve this problem banks with liquidity surpluses provide banks with shortage of liquidity through deposits on an interbank market. During the span of maturity on these deposits the process is reversed as the bank with shortage in the beginning now might have a surplus and the stream of liquidity redirects to a new bank with shortage. This system works as long as the total amount of liquidity is large enough. These crossholdings that occur are well functioning in redistributing liquidity, but do not increase the total amount of liquidity. If the demand for liquidity is greater than the supply of short assets, banks stand no choice but to liquidate their long assets or liquidating their deposits in other regions (Allen & Gale, 2000, p. 4). When this happens the supplies of liquidity do not increase, it only denies liquidity for banks that face a shortage. Which could lead to bank runs and as a result the bank being put out of business. This is how a financial crisis in one bank can contage other banks through their cross holdings of deposits (Allen & Gale, 2000, p. 5). Contagion can transmit through multiple channels and one could imagine money markets, payment systems and equity links (Gropp & Moerman, 2004, p. 408).

Gropp & Moerman (2004) uses different market based indicators to show how vulnerable banks and banking systems may be to contagion. He suggests that the measure of contagion he presents has the advantage of being able to identify the direction of contagious influence among banks. Overall, the paper shows that there may be tight links among banks within countries, as well as links connecting the major banking systems in Europe. Gropp & Moerman (2004) do not detect a major difference between the strength of links among euro area versus non-euro area countries (Gropp & Moerman, 2004, p. 453).

Measure of contagion within banks can be used to discover which bank’s that is of systemic importance both within countries and abroad. It is possible to accurately measure contagion among any bank pair, as long as the probabilities of an idiosyncratic shock hitting the two banks are quite similar (Gropp & Moerman, 2004, p. 452).

Gropp & Moerman (2004, p. 453) presents results that may provide a basis to obtain a better understanding of the extent to which European banking systems have become interconnected and how banking problems could spread across borders. Recent studies have shown that there is a reputational damage inherent with operational losses due to internal fraudulent activities. We aim to discover how this reputational damage affects the rest of the financial sector by examining the cross-bank reaction.

If customers respond to an operational loss announcement in a way that they distrust the banks with their business a run on the bank can initiate a shortage of liquidity. Given the fact stated by Cowan and Power (2001, p. 171) that retail financial customers are capable of recognizing a risk factor and react correspondingly, stock markets could interpret a loss announcement in one bank as negative impact on other banks.
### 4.4 Hypothesis development

For our study we develop a hypothesis in order to examine data and generate a succeeding analysis. In order to develop a good hypothesis we try to meet two criteria, testable and falsifiable. Our hypothesis will be put up against evidence we find for validation and that evidence can prove our hypothesis wrong. We state the null-hypothesis (H₀), which is the beginning of a normal approach in the deductive research process of developing a hypothesis. Key for null-hypothesis is that it does not assume any connection among different samples. (Smith, 2011, p. 49-50). From preceding research we know that there are directions in which financial contagion transfer (Allen & Gale, 2000; Gropp & Moerman, 2004) and with evidence of reputational damage from operational loss events (de Fontnouvelle & Perry, 2005; Gillet et al., 2009; Sturm, 2013) we state alternative hypotheses and anticipate for them to be sequential.

**H₀:** An announcement of an operational loss from internal fraudulent events does not affect competitive banks stock prices, i.e. abnormal returns among competing banks following the event are zero.

Sequential with preceding research on reputational damage from operational loss events and financial contagion we predict that the financial market will interpret operational loss events in a bank as a sign of declining future cash flows into the bank with spillover effects on competitive banks. Prior event studies on operational loss announcements have provided empirical evidence of accruing reputational damage (Fiordelisi et al., 2011; de Fontnouvelle & Perry, 2005). We will make a cross-bank analysis and we think that we will find evidence that prove marks of cross-bank reactions on the stock market derived from reputational damage caused by operational loss announcements from internal events.

**H₁:** If a bank announces an operational loss from internal events, effects will diffuse to competitive banks, i.e. abnormal returns among competing banks following the event is different than zero.

Furthermore we will use theories on trust to phrase an alternative hypothesis, based on the assumption that one operational loss from internal events does not come alone. If investors predict that more losses will occur, consequently customers in lack of trust will seek new business partners and the bank, which announced the operational loss, will lose more business due to customer mistrust. We therefore assume that abnormal return on competitive banks stock price will respond positive.

**H₁a:** Competitive banks to a bank that announce an operational loss from internal events will gain a positive abnormal return on its stock price following the event.

There is reason to examine that the lack of trust on one bank is contagious to other banks. If it is, the abnormal return on stock prices for competitive banks should be negative.

**H₁b:** Announcements of operational loss from internal events in one bank will create a negative abnormal return on all comparable banks stock price following the event.
5. Data & methods

In this chapter, the practical approach of the study is explained. We have used an event study, which is considered a standard approach to detect any abnormal returns around an event. In this thesis we gather 33 events of operational loss announcements from internal fraud after filtration and shortfalls. The sample consists of 44,880 individual returns represented by the bank where the loss occurred, its three major competitors and its comparative indices. The gathering process of this data is revealed and the equations and statistical aspects that we treat our data to get results are displayed. The potential biases, problems and errors that surrounds event studies is reported and discussed.

5.1 Data

The empirical analysis is based on a sample of 33 loss events from 25 different banks with loss amounts reported from 1995 to 2013. Data have been collected mainly from two sources, the ÖffSchOR database by VÖB-Service and Thomson Reuter Datastream. Operational loss data have been collected from a database of publicly reported operational losses called ÖffSchOR by VÖB-Service, short for Öffentliche Schadefälle OpRisk. The database is provided by the Association of German Public Sector Banks (Bundesverband öffentlicher Banken, VÖB). It includes operational losses in financial institutions exceeding an amount of €100,000, based on publicly available information. ÖffSchOR provides a detailed description of 2190 loss events ranging from 1980 to 2015 in financial institutions all over the world.

Prior studies on operational loss announcements mostly use a database provided by The Fitch Group called OpVantage or OpVar, currently owned by IBM. Although, the most recent study (Sturm, 2013) use the same database we have access to, which means we use the same data as used in a published article. We argue that this contributes to greater credibility to our sample and our study.

One thing that can have caused errors in the sampling process is that the database and all functions and information are in German. None of us are German-speaking. We were provided with an excel sheet where all the functions were translated by VÖB-Service. Beyond that, we have used Google translate for translation. However, we argue that this have had very little effect on the data collection. No events have been left out because we failed to translate some information. Nevertheless, there is a small chance that Google Translate have given us completely wrong information. We have tried to reduce this by translating from German to both English and Swedish. In addition, we have translated certain words separately, and then whole sentences or paragraphs.

Historical financial stock data and index data have been collected using Thomson Reuter Datastream, which is a well recognized source for the collection of financial data and information. Prior research on operational loss announcements also uses Thomson Reuter Datastream for collecting historical financial data. In the next sections we provide a more detailed description the collection and processing of the data, as well as the practical processing has been performed in Microsoft Office Excel.

5.1.1 Collection and processing of operational loss data

As mentioned, we have access to the ÖffSchOR database by VÖB-Service, which is where we have collected all of our operational loss data. The data have been filtered according to our selection criteria and delimitations. This means that we search for all events that are caused by
internal fraudulent activities, the affected institution is defined as a bank and the loss amount is exceeding €5m. The database includes 112 events that match these criteria. This data have been downloaded and exported to Microsoft Excel for further processing. We then manually exclude any event caused in a bank that is not publicly traded and listed on a Stock Exchange market included in our list of Stock Exchange Markets in appendix 3. This excludes 69 events from our sample.

Besides name of the bank and loss amount, the database provides us with a detailed description of the event and a date of occurrence. If the date of occurrence is hard to define, the ÖffSchOR database by VÖB-Service will use the last day of the month, in the month of date occurrence. If the month of occurrence is too difficult to define the database will use 31st of December as “occurrence date”. In order to back up the occurrence date the database provides sources from media and news sites that have reported the event, from first mention in the press to when the amount is specified and the event is considered settled. All of these event dates are double-checked using search in LexisNexis news database. This means that we follow the same approach when defining event dates as used in Gillet et al. (2010) and Sturm (2013). If we are completely unable to find any event date through the sources provided in the database, or from our searches in LexisNexis database the event is excluded from our sample. Because of this seven events have been excluded from the sample.

Other types of data losses we suffered are due to incomplete data. The ÖffSchOR database is continuously being updated, which leaves room for incomplete information. Three events were excluded after the first filtering in the database because of incomplete data in terms of bank name, loss amount or no date specified at all.

Table 2. Summery of losses

<table>
<thead>
<tr>
<th>Mean</th>
<th>Median</th>
<th>Std Dev.</th>
<th>Max</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>407</td>
<td>61.2</td>
<td>1 120</td>
<td>6 320</td>
<td>7.6</td>
</tr>
</tbody>
</table>

After this process it remains a total of 33 events ranging from 1995 to 2013 in our sample. A list of our sample is provided in appendix 1. A short summery of the loss amounts is provided in table 2.

Table 3. Geographical distribution of events

<table>
<thead>
<tr>
<th>N</th>
<th>Africa</th>
<th>Asia</th>
<th>Europe</th>
<th>North America</th>
<th>South America</th>
<th>Oceania</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>0</td>
<td>2</td>
<td>22</td>
<td>8</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

In table 3, you can see that our sample is heavily weighted towards European banks. This is probably due to data collection for the database is made easier thanks to its geographical position and the fact that they in general speak the same language. We do not see this as something that have affected the result of the study since there is no evidence in prior studies showing differences due to geographical position.

5.1.2 Collection and processing of stock price data
The collection of historical stock price data has been made via Thomson Reuter Datastream, a database of financial information we are able to access through the university. The data we
have collected is first and foremost historical stock prices of the banks that were operating and registered in the same country as the bank causing the event, during the time of the event. To exemplify, if Nordea experience a loss event on 15th of March 2015, we use Thomson Reuter Datastream to collect all the stock prices from the three largest publicly traded banks in Sweden, e.g. Handelsbanken, SEB, Swedbank, 260 trading days prior to the event date and ten days after the event date. Size of the bank is measured by market value at the event date.

In each event we examine the cross-bank reaction by examine the reaction in the three largest banks, excluding the bank where the loss occurred. This is mainly because of two reasons. First, it is a common phenomenon that countries have four big banks (Titcomb, 2014). By not taking all into consideration, we look at banks that can be considered at the same level, and have other similarities. None, of the events in our sample have been caused by a bank outside the top four in its country, in terms of market value. Secondly, it would be difficult to analyze an event in a country where they have a very large amount of publicly traded banks, e.g. USA. Also, it makes it easier and more intuitive for comparison of different countries.

The first 250 trading days is included in order to estimate beta and alpha for expected returns. We use logarithmic returns and calculate beta using index return for the same period. We use S&P 500 for all American events, and FTSEurofirst 100 for all European events, this is how both Gillet et al. (2010) and Sturm (2013) use market indices. For events in other parts of the world we use specific indices: for Japan market we use Nikkei 225 Index, in South Korea we use KOSPI 200, for the Israeli market we use Tel Aviv 100 Index, Canadian market we use S&P/TSX Index and for the Australian market we use S&P/ASX 200 Index. These have been picked based on that they are considered standard indexes for each country. All data from indexes are also collected from Thomson Reuter Datastream.

5.2 Event study
There is no single research method that will be superior under all circumstances. The selection of research method is dependent on numerous factors, e.g. research question, data access and objective of the research (Smith, 2011, p. 53). Our objective is to contribute with more knowledge and new insights about operational and reputational risk, by analyzing the cross-bank impact of operational loss announcements. This means that we measure the effects of an economic event on the value of firms, which can be achieved by constructing an event study. More specific, an event study aims at measuring the impact of a specific event on the value of a firm using financial market data (MacKinlay, 1997, p. 13).

Even though the history of operational and reputational risk is young; event study methodology have a long history. The first articles using an event study methodology were published in the early 1930s. Even if the level of sophistication has increased, the methodology of today is essentially the same as it was in the late 1960’s. The event study has a wide range of applications, and is commonly used in finance and accounting research. Its strength is, given rationality in the market, that the impact of an event is reflected immediately in stock prices. The fact that it can be used to obtain the effects of any type of event makes the methodology very versatile. Therefore, event studies are commonly used in various other research areas, such as management, economics, law, and political science (MacKinlay, 1997, p. 13).

We argue that an event study is the best-suited methodology for this thesis, since we aim to measure the effects of an economic event. It is in line with out beliefs, views, research
approach and epistemology. Furthermore, it is a well-proven and accepted methodology within the field of research, where essentially all previous research has used it. Consequently, we argue that it is the most suitable and the most natural methodology to answer our research question.

5.2.1 Procedure for an event study
According MacKinlay (1997) there is no unique structure when designing an event study. However, there is a general flow analysis. This flow is translated into seven steps in Campbell, Lo & MacKinlay (1997, p. 151-152), which in this section are to be discussed briefly before going in to more details. The steps are as follows:

1. Event definition
   In this study event would be defined as either the date of the first news article mentioning the loss date or the settlement date. So for each loss, we use one event date, defined as the first date where the loss is mentioned and an amount have been specified. We use several event windows ranging from ten days prior to ten days after the event date.

2. Selection criteria
   We look at publicly traded banks that are, or were listen on a major Stock Exchange during the time of the loss announcement. The operational loss announced has to exceed €5m in order to be selected in our sample. The events have occurred during the time horizon of 1995-2013.

3. Normal and abnormal return measurement
   To determine if operational loss announcements in one bank have impact on other banks stock prices normal and abnormal returns need to be calculated. When calculating normal returns, we estimate expected returns using the market model. The abnormal return is calculated as the difference between actual return and expected return.

4. Estimation procedure
   The parameters of the normal performance are estimated using estimation window, which is set before the event window. We use a 250 trading days estimation window on daily data, excluding the days of the event window. The primary null hypothesis that will be tested is if the actual return is equal to the expected return. Then, by aggregating abnormal returns over time for different event windows we calculate cumulative abnormal returns (CAR).

5. Testing procedure
   A statistically significant abnormal return indicates a response of the event on returns. We apply a traditional t-test in order to test for statistical significance. The significance levels that are used are one percent, five percent and ten percent.

6. Empirical results
   Presentation of the basic empirical results and diagnostics.
7. Interpretation and conclusions
We present a discussion on the results and an analysis based on key theories and concepts. The conclusion is then created from the interpretation of the results and analysis.

5.3 Event & event window definition
The initial step when conducting an event study is to define what is studied, how the authors chose to define the event, and clarify which period of time around the event is of interest. The latter is often referred to as event window (MacKinlay, 1997, p. 17). In this section we go more into detail, in order to explain and motivate our choices about how we choose to define an event, and how we have chosen event window.

5.3.1 Event definition
The event in our study is not as easily define as one might think. Essentially, one could argue that an operational loss announcement should be considered an event. In other words, when the information about what has happened and a total loss amount is publicly available. Unfortunately, the reality is a bit more complex. In reality it is rarely the case that an institution announces an operational loss out of nowhere, with a specified amount and a plan of action to tackle the aftermath. Established and accepted event study literature such as MacKinlay (1997), Campbell, Lo & MacKinlay (1997), and Kothari & Warner (2004) do not mention any specific criteria for how to define an event in studies as our or similar. This is also not discussed in much detail in the first studies from the early 2000’s. However, more recent studies within the area have addressed this issue, where usually several events are identified for every operational loss announcement.

In order to account for the potentially gradual release of information, Gillet et al. (2010, p. 225) identify three events for each loss, which are referred to as “press date”, “recognition date”, and “settlement date”. The press date is the date when the first press cutting mentioning of the operational loss event. Recognition date is the date when the company itself announces the loss (the event or the amount). The settlement date is defined as the date when the loss is considered to be definite and the total loss amount is known. If a loss is announced through the media, as the first mentioning in the press, the “press date” is kept and no event is retained for “recognition date”. Gillet et al. (2010, p. 226) apply this to their sample, which almost triples the number of events that are analyzed. Sturm (2013, p. 195) follows the approach of Gillet et al. (2010), but identify only two instead of three different event dates for each loss: the date of the first news article mentioning the loss, and the settlement date.

The biggest difference between our study and previous studies on operational loss announcements is that our main purpose is to examine the cross-bank reaction. This means that using several event dates might dilute results, since there is no reason to assume that the cross-bank reaction would be as strong as the banks where the event occurred. Therefore we use one event date, defined as the first date where the loss is mentioned and an amount have been specified, in order to quantify for reputational damage. With this definition we argue that we will be able to capture the effects caused by the event. Also, searching through databases for extra events is extremely time consuming, which makes it not worth if it may dilute our results.
5.3.2 Event window

The second part of this initial step is to define over what period of time we will be examining stock price reactions. It is customary to define the event window to be larger than the specific period of interest, which allow for analysis of days surrounding the event (MacKinlay, 1997, p. 13). In this way, effects from information leakage or effects of messages that occur after the stock market closes on the announcement day are captured (MacKinlay, 1997, p. 13-14). Another key point is to keep the event window relatively short, since the probability of other factors affecting the observed stock prices grow with time horizon. Also, long-horizon studies generally have low power to detect abnormal returns (Kothari & Warner, 2004, p. 18).

No previous studies use longer event windows than 20 days prior the event, and 20 days after the event. The more recent one usually do not use more than 15 days prior and after (Gillet et al., 2010; Sturm, 2013). In that sense there is not much variety in how prior research use event windows. However, the amount of event windows applied varies. While Gillet et al. (2010) uses five different combinations of 15 days prior, and 15 days after, Sturm (2013) uses nine different combinations ranging from 10 days prior and 10 days after. All studies do not clarify exactly how many event windows that are used in calculations, such as de Fontnouvelle & Perry (2004). However, all prior studies state that they, as a robustness check, calculate abnormal returns over a wide variety of event windows (de Fontnouvelle & Perry 2004; Cummins et al., 2006; Gillet et al., 2010; Sturm, 2013).

With both the event study literature and the prior research within the area as a background, we use event windows ranging from 10 days prior the event, and 10 days after. This in order to allow for the possibility of information leakage prior to the loss events and to allow sufficient time for the market to fully respond after an event. This is in line with both the most recent research of Sturm (2013), and the fact that long-horizons can be problematic (Kothari & Warner, 2004, p. 18). In terms of number of event windows applied to every event, we argue that four is sufficient and will be able to capture the reaction and increase robustness of the results. The event windows used are (-10, +10), (-5, +5), (-1, +10) and (-1, +5).

We define an event window as the time $\tau = -10$ days prior to the event and $\tau = 10$ days after the event. Hence, the length of the event window is $\tau_{10} - \tau_{+10}$ days, and the event window interval is (-10, +10). It is customary to use $\tau = 0$ as the date of the event (de Fontnouvelle & Perry, 2003, p.12). Finally, it is important that the event window and estimation window does not overlap, otherwise returns around the event affects the estimation parameters of the market model. Estimation window will be discussed more in section 5.4.2.

5.4 Selection criteria

After the event and event window have been identified, it is important to determine the selection criteria for the inclusion of a given firm in the study. In our study, the most important factor to take into account is the amount of data available. As mentioned in the introduction, since the history of operational risk and reputational risk is still young, data availability is limited. In order to gather a sufficient amount of events we are not able to put very hard restrictions on our sample. As a result, we will not use any geographical restrictions and a long time horizon over which the events have occurred.

In order to be able to analyze the events we use historical stock price data collected from Thomson Reuter Datastream. If these are not available no measurement of impact can be done. Hence, we only select publicly traded banks that are, or were listed on a major Stock
Exchange at the time of the event, list of Stock Exchange Markets are included in appendix 3. Prior research have mostly been focused on major US Stock Exchanges, or major European Stock Exchanges, and some a combination of the two. In order the access daily return data, prior research have only selected publicly traded institutions.

In terms of restrictions regarding loss amount there are a few factors to take into consideration. First, the amount has to be sufficiently large enough to have a material impact on the firm. On the other side, the amount restriction needs to be held relatively low, to be able to gather a sufficient amount of events given that data is limited. The danger of not focusing on larger losses is that smaller losses are less likely to be reported and less likely to be identified if they are reported (Cummins et al., 2006, p. 2612). Prior research have used different levels of losses the most recent, Sturm (2013, p. 194), have a threshold of losses exceeding $100,000. While both Cummins et al. (2006, p. 2612) and Gillet et al. (2010, p. 225) use a threshold of losses exceeding $10m. Gillet et al. (2010, p. 225) explains this with: “Smaller losses were first considered in the sample but were removed as we were confronted to a loss of explanatory power”. With this as a background, we believe that having the same threshold as Cummins et al. (2006) and Gillet et al. (2010) is the best balance between data availability and explanatory power.

In terms of selection of the competing banks, for each event we select three competing banks. These are the three largest banks (excluding the bank where the loss occurred) in the country where the bank causing the event is based. The effect on these three banks represents the cross-bank reaction, i.e. they represent the banking industry for that specific event. We base this on the four big banks phenomenon (Titcomb, 2014); in several countries it is a common phenomenon that four big banks dominate the banking industry. Secondly, it would be difficult to analyze an event in a country where they have a very large amount of publicly listed banks, such as in the US.

To summarize the selection criteria; we look at publicly traded banks that are, or were listen on a major Stock Exchange during the time of the loss announcement. The operational loss announced has to exceed £5m in order to be selected in our sample. The events have occurred during the time horizon of 1995-2013. The competing banks are selected based on market value at the time for each event.

5.5 Measurement of normal and abnormal returns

We have carried out a verity of calculations in order to answer the research question in this thesis. The calculations have been performed using software such as Microsoft Office Excel and StatPlus. The formulas used for the calculations included in the study are those that follow in this section. The methodology approach used is the one of MacKinlay (1997), “Event Studies in Economics and Finance”, which supports the calculations carried out in this study.

5.5.1 Market model

In order to determine if the return is to be considered normal or abnormal, actual returns have to be compared to a benchmark. Therefore, it is important to specify a model that will generate the assumed “normal” returns, i.e. the expected return that would have been the actual return if the event did not occur.
There are numerous of approaches available when calculating the normal return of a security. Most commonly used in event studies are the Capital Asset Pricing Model (CAPM), the Constant Mean Return Model and the Market model. The CAPM is an economic model that can be seen as an equilibrium theory, where the expected return of an asset is determined by its covariance with the market portfolio (Sharpe, 1964; Lintner 1965). The constant mean return model and the market model are statistical models, which mean that they do not depend on any economic arguments. They follow statistical assumptions concerning the behavior of asset returns (MacKinlay, 1997, p. 17).

The constant mean return model simply assumes that the average return is constant over time. Although its simplicity, Brown & Warner (1985, p. 395) find that it often gives results comparable to those of more sophisticated models. The market model is similar but has a potential advantage over the constant mean return model. The market model assumes that returns of a security and the market portfolio have a linear relationship. By removing the portion of the return that is related to variation in the market's return, the variance of the abnormal return can be reduced. This can lead to an increased ability to detect effects of the event (MacKinlay, 1997, p. 17).

Prior studies on effects of operational loss announcements have used different models to estimate normal returns. de Fontnouvelle & Perry (2005) uses a one-factor-model, and Cummins et al. (2006) uses a three-factor model. The more recent studies from Gillet et al. (2010) and Sturm (2013) both use the market model. With prior research within the area, and with older event study methodology research such as MacKinley (1997) and Brown & Warner (1985) as a foundation we have chosen the market model to estimate normal returns. The market model is expressed as:

$$R_{i,\tau} = \alpha_i + \beta_i R_{m,\tau} + \varepsilon_{i,\tau}$$

Equation 1. Market model

Where:

- $R_{i,\tau}$ = Security $i$'s return at time $\tau$
- $R_{m,\tau}$ = The market portfolio's return at time $\tau$
- $\alpha_i$ = Security $i$'s return, which can not be explained by the index return
- $\beta_i$ = Beta coefficient for security $i$, also known as volatility or systematic risk
- $\varepsilon_{i,\tau}$ = Residual and statistical error term

The market model assumes a stable linear relationship between the stock return and the market return. In order to calculate the abnormal return around the event, we first have to calculate the expected return. The expected return is calculated based on historical stock price data and are produced with a simple regression, where return for a stock is the dependent variable and the market return, $R_m$, is the independent variable (MacKinlay, 1997, p. 15-18). We estimate $\alpha_i$ and $\beta_i$ using a simple regression in order to use these in the market model for estimating expected returns.

### 5.5.2 Estimation window

The estimation window, or estimation period, is the time horizon of historical data used to estimate the expected return if the event would not have occurred. More specifically, a beta
coefficient ($\beta$) is calculated using regression analysis, which describes a stocks returns tendency to respond to fluctuations in the market (Berk & DeMarzo, 2011, p. 383). With an estimated $\beta$-value the market model can be used to calculate the expected return for a stock if the event never occurred. In order to determine whether an abnormal return has occurred, which indicates a reaction caused by the event, we calculate the difference between the expected return and the actual return. The estimation window, as shown in figure 2, is the period before an event window ($T_0$ to $T_1$).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure2.png}
\caption{Timeline of an event study}
(MacKinlay, 1997, p. 20)
\end{figure}

The estimation window used in this study is based on the standard length in the event study literature such as Binder (1985) and MacKinlay (1997). This means that for each event, we estimate $\beta$-value using ordinary least squares (OLS) regressions over 250-trading-day periods. The estimation window ends eleven days prior to the announcement. In general, the estimation window and the event window do not overlap so that the parameters of the market model are not influenced by the event (MacKinlay, 1997, p. 20). If the event window is included in the estimation period it can lead to the event having large influence on estimated expected returns. Hence, both the expected return and the abnormal return would capture the impact of the event. This would be problematic since the event study methodology assumes that the event impact is captured by the abnormal returns (MacKinlay, 1997, p. 20).

### 5.5.3 Actual return

Stock price data have been collected using Thomson Reuter Datastream. Actual returns have been calculated for both the estimation window and the event window. We use logarithmic returns. Furthermore, actual return calculations have been done using the formula as shown in equation 2.

\[
R_{i,\tau} = \log \left( \frac{P_{i,\tau}}{P_{i,\tau-1}} \right)
\]

Equation 2. Actual return

Where:

- $P_{i,\tau}$ = Closing price for security $i$, at time $\tau$
- $P_{i,\tau-1}$ = Closing price for security $i$, at time $\tau$-1 (the day before)

### 5.5.4 Expected return

As already mentioned, the expected return can be defined as the return that would have been generated if the event never occurred, all else equal (MacKinlay, 1997, p. 15) Expected return will be calculated as shown in equation 3.
\[ E(R_{i,\tau}) = \hat{\alpha}_i + \hat{\beta}_i R_{m,\tau} \]

Equation 3. Expected return

Where:
\( E(R_{i,\tau}) \) = Expected return for security \( i \), at time \( \tau \)
\( R_{m,\tau} \) = The market index return, \( R_m \), at time \( \tau \)
\( \hat{\alpha}_i \) = Estimated alpha value for security \( i \)
\( \hat{\beta}_i \) = Estimated beta value for security \( i \)

In order to calculate the expected return \( \hat{\beta} \) and \( \hat{\alpha} \) have to be calculated for all stocks. To calculate \( \hat{\beta} \), we have conducted a linear regression, as shown in equation 4.

\[ \hat{\beta}_i = \frac{\sum_{\tau=0}^{T_1} (R_{i,\tau} - \bar{R}_i)(R_{m,\tau} - \bar{R}_m)}{\sum_{\tau=0}^{T_1} (R_{m,\tau} - \bar{R}_m)^2} \]

Equation 4. Calculation of beta

Where:
\( \bar{R}_i \) = Mean return for security \( i \), at time \( \tau \)
\( \bar{R}_m \) = Mean return for market index, \( R_m \), at time \( \tau \)

After the \( \hat{\beta}_i \) have been calculated, we have to calculate the \( \hat{\alpha}_i \). Using the formula in equation 5 does this.

\[ \hat{\alpha}_i = \bar{R}_i - \hat{\beta}_i \bar{R}_m \]

Equation 5. Calculation of alpha

5.5.6 Abnormal return
The definition of an abnormal return is essentially the difference between the actual return and the expected return of a security. In this study we assume that the impact caused by the event is captured by abnormal return, i.e. any finding of abnormal return is assumed to be caused by the event. This is described in equation 6, where the abnormal return is the difference between the actual return and the expected return (MacKinlay, 1997, p. 19).

\[ AR_{i,\tau} = R_{i,\tau} - E(R_{i,\tau}) \]

Equation 6. Abnormal return

5.5.7 Loss adjusted abnormal return
In order to examine if there is a reputational damage in the bank where the loss occurred, we need to adjust for loss amount. We use the approach of Gillet et al. (2010) and Sturm (2013),
which is illustrated in equation 7. We divide the loss amount with the market value at day [-11]. We then add this adjustment on day [0], which is allowing for analysis of the reputational effect.

\[ Loss \text{ Adj } AR_{i,\tau} = AR_{i,\tau} + \frac{Loss_i}{Market\ Value_{i,\tau-11}} \]

Equation 7. Loss adjusted abnormal return

Where:

\( AR_{i,\tau} \) = Abnormal return for security \( i \), at time \( \tau \)
\( Loss_i \) = Loss amount for the event of security \( i \)
\( Market\ Value_{i,\tau-11} \) = Market Value for security \( i \), at time \( \tau - 11 \) (day [-11])

5.5.8 Cumulative abnormal return (CAR)

The cumulative abnormal return (CAR) is the sum of all abnormal returns calculated over an event window for each stock (MacKinlay, 1997, p. 22). How CAR is calculated is shown in equation 8. This allows us to see the aggregated abnormal return for each individual stock over the event window. Since this information would be too extensive to present in a study like this, we calculate CAAR for simplification.

\[ CAR_{i,\tau} = \sum_{\tau=T_1+1}^{T_2} AR_{i,\tau} \]

Equation 8. Cumulative abnormal return (CAR)

5.5.9 Cumulative average abnormal return (CAAR)

To calculate the cumulative average abnormal return (CAAR), we have summarized all cumulative abnormal returns (CAR) over the period of interest for every stock. This calculated using the formula in equation 9, which allow us to see the average abnormal return from day -10, -9…0…9, 10.

\[ CAAR_{\tau} = \frac{1}{N} \sum_{\tau=T_1+1}^{T_2} CAR_{i,\tau} \]

Equation 9. Cumulative average abnormal return (CAAR)

Where:

\( N \) = Total number of banks for the current selection.
5.6 Statistical aspects

In order to answer the research question we will test whether operational losses in banks due to internal fraud have an impact on competitive banks stock prices. We will test for either negative or positive effects depending on what mean CAAR of each sample shows. Furthermore, we use sub samples of the biggest losses, events occurring before financial crisis of 2007 – 2008, and in events where we can identify that a reputational damage have occurred.

The study's main purpose is to identify these effects. Tests of different sub samples of operational loss announcements will be conducted in order to answer the thesis research question and research purpose. We test for significance on three different levels, one percent, five percent and ten percent. The hypotheses used are consistent through the sample and different sub samples. To clarify, the null hypothesis states that the actual return is equal to the expected, i.e. no positive or negative excess returns are generated.

5.6.1 Test for statistical significance

In order to identify if abnormal returns differ from zero with some statistical significance, test statistics need to be applied. We use a t-test which compare the means of our sample against $AR = 0$, for this purpose we run a two sample t-test assuming unequal variances in StatPlus. This approach is used by Cummins et al. (2006). Equation 10 illustrates the applied test.

$$ t = \frac{CAAR - H_0}{\hat{S}_{CAAR}} \sqrt{\frac{1}{N}} $$

Equation 10. T-test

Where:

$\hat{S}_{CAAR} = \text{the standard deviation of } CAAR$, and is calculated using the formula illustrated in equation 11.

$$ \hat{S}_{CAAR} = \sqrt{\frac{\sum_{\tau=T_0+1}^{T_1} (CAAR_{i,\tau} - \overline{CAAR})^2}{N - 1}} $$

Equation 11. Estimation of standard deviation of CAAR

To test our hypothesis that an operational loss announcement have impact on competitive banks in the same country we have chosen to use a one-tail test with a one percent, five percent and ten percent significance level. We use p-value to describe the probabilities, for example, a p-value of 0.025 is significant at the five percent level, but not at the one percent level. Consequently, the risk of rejecting $H_0$, when it is true (Type I error), is 2.5 percent at the one percent significance level.

Another very important aspect of t-test is that there is some evidence that during times of high
volatility, as in the financial crisis of 2007–2008, too many companies tend to show significantly abnormal returns using t-test. This makes it more difficult to accurately determine whether the returns are truly abnormal or not (Jovanovic & Fox, 2010; Chen, 2014). Our sample has a time horizon ranging from 1995-2013, which includes times of high volatility. On the other side, the vast majority of our sample is not focused during 2007-2008. In addition, prior studies such as Gillet et al. (2010) and Sturm (2013), have applied t-test’s, and been published after the crisis of 2007 and 2008. We argue that this shows that t-test still is considered a valid way of testing for statistical significance.

5.6.2 Type I and type II errors

In statistical hypothesis testing, there is always a risk of error, these are referred to as type I and type II errors (Andersson et al., 2007, p. 340-342). Type I errors occur when the null hypothesis is rejected, even though it is true. The risk of type I errors can be reduced by increasing the sample size, which lowers the probability of rejecting a true null hypothesis (Andersson et al., 2007, p. 342). As stated before, operational loss data is limited, which means that increasing sample size may not be possible. Our sample includes 33 events. The sample size is based on event study methodology and prior research, and we believe it is a sufficient amount to mitigate the risk of type I error.

Type II error is the opposite of type I error. To clarify, this means that a type II error fails to reject the null hypothesis, although the alternative hypothesis is the true. In other words, it confirms an idea that should have been rejected (Andersson et al., 2007, p. 342). The risk of type I error can be calculated, while the risk of Type II error is usually unknown. Finally, it is important to emphasize that while a larger sample size can reduce the risk of type I error it can increase the risk for type II error.

5.7 Potential biases

In quantitative research, the risk of the human factor affecting the processing of data and in the end the result of the study cannot completely be eliminated. In order to avoid biases caused by the human factor and reduce errors, we have both been involved and double-checked every step throughout the whole process. Stock price and indices data has been verified by randomly selected sample. We have randomly selected banks and indices, and randomly selected different day's closing prices.

The returns, or stock price data in this study is what so-called “prices adjusted”. This is what Thomson Reuter Datastream call closing price that is adjusted for splits and dividends. This means that stock prices can have extreme movements during the trading day without it being captured in our calculations. Nevertheless, we assess this as a very small problem, the operational losses in our sample is so large that daily prices should be able to capture a market reaction. Also, A study on market reaction on an hour basis would not be possible with the data we have access to.

We have chosen to examine three other publicly traded banks in the same country as the bank causing the event. These are picked on being closets in terms of market value in that specific country. We have not categorized banks in different types of banks, such as retails banks, mortgage banks or investments banks. We only use market value. This means that we might have included banks that not necessary are similar to the bank causing the event. However, we do believe that this problem has a high impact on the final results. This because most banks in our sample are major banks, i.e. they have departments that handle almost all areas
of banking. We also categorize by country, which means that we do not examine whether a loss in a bank in country A have effect on a bank in Country B, only inside country A. This might not be a problem in most cases because even if it affects banks in another country the event probably affects the countries within as well.

The study’s measurement period ranges from 1995-2013. This means that we have included years of the financial crisis of 2007 and 2008, where the stock market had a strong downward trend, especially the financial sector. The period also includes years of high economic growth and therefore we believe that the total measurement period reflect economic cycles, although rather extreme. We have mitigated this by using sub-samples and comparing abnormal returns in different times. Finally, it is important to note that there always is a possibility of other events, outside of the operational loss itself, has influence on stock prices.

5.8 Problems with event studies

A problem with event study methodology is the use of beta. The market model depends on an estimate of each stock’s beta, which is assumed to be constant over all days in the event window. There is empirical evidence that beta is not constant through time. In addition, this also means that the past is assumed to be a perfect predictor of the future, i.e. the beta does not take account for macroeconomic changes, such as interest rates or business cycles (Wells, 2004, p. 66). In this study we have chosen to not take these macroeconomic factors into consideration. Hence, we assume all abnormal returns over an event window are caused by the event.

This means that it can be problematic to use large event windows, since increasing the event period means that you increase the risk of other factors affecting stock returns. A known problem with event studies is long event windows (Wells, 2004, p. 67). We use event windows of ten days prior and ten days past the event, a total of 21 days, we also use five days prior and five days past the event date. We believe this leaves little room for other big events affecting the returns.

A way to improve quality of the study and statistical analysis is using a large sample size (Wells, 2004, p. 67). The usage of a to small sample size can cause bias in all kind of research, not only in event studies or quantitative research. Simply put, one or a few observations that might not be representative for the whole population can have too much of an impact on the final results. Strong (1992, p. 548) argues that the sample size effect is the one factor that potentially has the greatest impact on event studies outcomes. We use a sample of 33 operational loss events caused by internal fraud. This might me considered small since most prior studies use sample sizes exceeding 100 events. Most of these studies have access to more extensive data than we do. Also, using such a large sample with the data we have access to would be too extensive and time consuming within our time frame.

In event studies it is assumed that the event date can be identified with certainty. When collecting event dates from different publications it can be very difficult to identify the exact date. When the announcement is published one cannot be certain if the market was informed, i.e. the information leaked. The usual method of handling this problem is to expand the event window, but there is a cost to expanding the event window. Another way can be to identify two or three different event dates. This has been done in prior research, but would be too time consuming for us and is not parity with the potential increase in quality.
6. Results & analysis

The result is based on of 33 unique events in major equity markets over the time-period 1995-2013. Four different samples are investigated using four different event windows to statistically attempt to answer the hypothesis and alternative hypotheses. The hypotheses are composed to examine both the cross-bank reaction and direction. The chapter is structured to first present the results for the full sample followed by an analysis and hypothesis test, and then each sub sample follows. Thereafter a brief summarizing results segment is provided before the discussion of the results is presented.

6.1 Presentation of results

For our cross-bank analysis we have put together a full sample and three sub-samples, foremost as an attempt to bring depth to our raised question. Trying to investigate spillover effects on competitive banks from events of operational loss in one bank is an intriguing task. Regardless of market moving events that are beyond our capability to take account for is the assumption that one bank is the other bank alike, which do not hold, but we have not been able to structure our research in a way that could fragmentize the banks more properly and therefore our sub-samples is focused around:

1. Reputational loss effect, which events do hold for a reputational loss in the bank where the loss occurred.

2. Biggest loss, the loss amounts travels in a wide range and we look at the extraordinary losses that exceeds €200m

3. Before and after the financial crisis, since our period of events ranging from 1995 until 2013 we eliminate the events that took place under the financial crisis 2007-2009 where multiple factors might have biased our results.

The main objective for this thesis has been to investigate if the competitive banks stock price reacts in an abnormal way due to an operational loss from internal events in one bank. We can see that in our samples there are relevant observations of abnormal market returns from null. We use the same hypothesis for all of our samples. Our null hypothesis (H_0) states that the actual returns of the banks in our sample deviate zero from the expected return generated from the market model. The alternative hypothesis to (H_0) is (H_1) that there is deviation from zero in terms of actual returns against expected return. We have used (H_1) to form two sub hypothesis, where (H_1a) is a positive deviation of the abnormal returns generated by the competitive banks and (H_1b) is a negative deviation in the same returns.

The results of our study will be presented using figures and tables. The figures show the cumulative average abnormal return (CAAR) for the sample and different sub-samples. All figures show the event window of ten days prior and ten days past the event, i.e. day [-10] to day [+10]. We use tables to present values and different event windows used to test for statistical significance.

The results and analysis of the events will be presented for the full sample and then as sub-samples. We have three categories of sub-samples, these are the biggest losses, losses before and after the financial crisis of 2007-2008, we also use a subsample of the events where we can identify a reputational loss. This means that we have a sub-sample of events where we
find that the loss in market value during the event window exceeds the loss amount. After each category, the results will be analyzed separately.

We will consistently use the same hypotheses for all categories in the study. The hypothesis is that there is a difference between the actual return and expected return. The null hypothesis is thus that there is no difference between the actual return and the expected return. This can be expressed as:

\[ H_0: AR_i,t = 0, \text{ that is, } R_t = E(R_t) \]
\[ H_1: AR_i,t \neq 0, \text{ that is, } R_t \neq E(R_t) \]

In order to test the hypothesis we apply t-test on all sub-samples, where we use significance levels of one percent, five percent and ten percent. When results are statistical significant this is shown by * for significance at ten percent, ** for five percent and *** for one percent. We display tables for all tests with t-values and p-values.

6.2 Results: Full sample

In the first step we look at the full sample. We start by checking if our sample is representative in terms of the results of previous research. To clarify, since there is previous research on banks where the loss occurred using the same database as we do, we should get similar results. This means that we look at the direct effect of the 33 banks that caused the events. We also display loss adjusted abnormal returns for the loss amount in order to examine the effect of reputational damage. And of course, what we are primarily interested in, i.e. how the competitive banks react to operational loss announcements.

![Figure 3. Full sample](image-url)
Figure 3 graphically visualizes the stock market reaction (solid black line) of the banks where the loss occurred, by displaying CAAR from day $[-10]$ to day $[+10]$. 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 grey line represents the overall effect at of the three largest banks in terms of market capitalization in each country, excluding the bank where the event occurred.

We test for significance over several event windows. Table 4 shows that the banks where the loss occurred show significant negative abnormal returns over all event windows. Table 5 displays the reputational impact, which is significant in two out of four event windows.

<table>
<thead>
<tr>
<th>N</th>
<th>Event Window</th>
<th>Mean CAR %</th>
<th>p-Value</th>
<th>t-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>(-10, +10)</td>
<td>-1.03</td>
<td>0.08</td>
<td>-1.38*</td>
</tr>
<tr>
<td>33</td>
<td>(-5, +5)</td>
<td>-1.00</td>
<td>0.05</td>
<td>-1.70**</td>
</tr>
<tr>
<td>33</td>
<td>(-1, +10)</td>
<td>-2.65</td>
<td>0.01</td>
<td>-4.25***</td>
</tr>
<tr>
<td>33</td>
<td>(-1, +5)</td>
<td>-1.95</td>
<td>0.01</td>
<td>-2.97***</td>
</tr>
</tbody>
</table>

* Significance at the 10% level
** Significance at the 5% level
*** Significance at the 1% level

Table 5. Loss adjusted CAAR for banks where the loss occurred

<table>
<thead>
<tr>
<th>N</th>
<th>Event Window</th>
<th>Mean CAR %</th>
<th>p-Value</th>
<th>t-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>(-10, +10)</td>
<td>0.27</td>
<td>0.38</td>
<td>0.31</td>
</tr>
<tr>
<td>33</td>
<td>(-5, +5)</td>
<td>-0.41</td>
<td>0.24</td>
<td>-0.71</td>
</tr>
<tr>
<td>33</td>
<td>(-1, +10)</td>
<td>-1.26</td>
<td>0.02</td>
<td>-2.03**</td>
</tr>
<tr>
<td>33</td>
<td>(-1, +5)</td>
<td>-1.29</td>
<td>0.02</td>
<td>-2.29**</td>
</tr>
</tbody>
</table>

* Significance at the 10% level
** Significance at the 5% level
*** Significance at the 1% level

Table 6 show results from testing the cumulative abnormal returns for the competing banks. Significant positive abnormal returns are identified over three out of four event windows.

Table 6. CAAR full sample competitive banks

<table>
<thead>
<tr>
<th>N</th>
<th>Event Window</th>
<th>Mean CAR %</th>
<th>p-Value</th>
<th>t-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>99</td>
<td>(-10, +10)</td>
<td>0.71</td>
<td>0.04</td>
<td>1.73**</td>
</tr>
<tr>
<td>99</td>
<td>(-5, +5)</td>
<td>0.43</td>
<td>0.11</td>
<td>1.21</td>
</tr>
<tr>
<td>99</td>
<td>(-1, +10)</td>
<td>1.21</td>
<td>0.04</td>
<td>1.70**</td>
</tr>
<tr>
<td>99</td>
<td>(-1, +5)</td>
<td>0.69</td>
<td>0.08</td>
<td>1.38*</td>
</tr>
</tbody>
</table>

* Significance at the 10% level
** Significance at the 5% level
*** Significance at the 1% level

6.2.1 Analysis: Full sample
The analysis is based on a sample of 33 operational loss events with three competitive banks in each event. A total of 70 banks are represented in the analysis and the data collection consists of over 40,000 individual adjusted closing share prices. We begin the analysis with the bank where the loss occurred. For the full event window of 21 trading days we can ensure significance at the ten percent level. Throughout our analysis in which we alter the length of the event window we get significant results, although at different levels. This is also shown in
Figure 3, we can see that there are stronger negative abnormal returns for the event windows starting from day [-1].

This is in line with the findings of previous research, such as de Fontnouvelle & Perry (2005), Cummins et al., (2006), Gillet et al., (2010) and Sturm (2013), who all find strong evidence of negative cumulative abnormal returns due to operational loss announcements. These negative cumulative average 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). As in prior research, our results clearly show that the stock market reacts negatively to operational loss announcements in the press. However, abnormal returns are based on estimates of expected return, i.e. an estimated beta value based on the returns for 250 trading days before the event window. This means that expected returns does not take account for the operational loss itself.

When adjusting for the loss amount previous literature on reputational risk and operational loss announcements find strong evidence that the loss in market value exceeds the operational loss amount (de Fontnouvelle & Perry, 2005; Cummins et al., 2006; Gillet et al., 2010; and Sturm, 2013). In our sample we cannot provide the same evidence, when adjusting the cumulative abnormal return for the operational loss amount on day 0 more or less smoothens out the negative cumulative abnormal returns. When the CAR is adjusted for the operational loss amount the significance for the sample of banks were the loss occurred decreases. If the CAAR adjusted for the operational loss amount is negative a reputational loss is identified which is in line with what previous research presents. Our mean CAR for the banks where the loss occurred are negative over three out of four event windows, showing tendencies of reputational damage. This suggests that there are reputational losses derived from operational loss events and that the market is pricing in this loss around the loss announcement day. These findings are in line with previous research on reputational risk that provides relevance and credibility to our sample when performing a cross-bank analysis.

Conducting a cross-bank analysis provides us with insights in how banks react to an operational loss event in a competing bank. Figure 3 show that the cross-bank reaction seems to be that positive cumulative average abnormal returns are being generated. In table 6, we find positive mean CAR across all four event windows. Out of these we can say that three out of four are statistically significant, at least at the ten percent level.

A general explanation for this implied positive cross-bank effect could be that reputational damage is being generated, i.e. that capital is in some way being transferred from the bank where event occurred to its competitors. Based on our results (see Table 5) and theories on reputational risk, we find that reputational damage is being generated. This loss in value has to go somewhere, which could benefit the affected bank’s main competitors in terms of investors changing their positions and customers depositing their money elsewhere.

Potential explanations can also be found in theories on financial trust. From chapter 4 we learn that financial trust is crucial for banks and that if investors lack information to assess risk on the stock exchange, doubt about their investment rise and makes the investor re-examine its investment decision (Guiso et al., 2008, p. 2558). The consequences of investors and customers acting on that doubt could be an explanation of the positive cross-bank reaction. On the other hand, the overall reaction is not very strong, which is illustrated by mean CARs below one percent. Also, when observing the movement of CAAR over the event window, we can observe both negative and positive trends.
As the line that represents 0% CAAR is the same as the expected return that takes account for historical prices of the stock but also for each stock market indices, the deviation from zero is a clear market reaction on the operational loss event. In the beginning of our event window, from day [-10] until day [-2], the curves that represents competitive banks and the banks where the loss occurred moves in a similar way. This inflicts that the banking industry has a very tight connection in its movement in relation to its indices. At the event date, day [0], the cross-bank reaction is close to zero, followed by a slightly positive reaction the following day.

As in the case of contagion theory we do not find any real tendencies of the negative effect of the bank where the loss occurred are being transmitted throughout the banking industry. However, in figure 3, we can read that during day [+1], [+2] and [+3] we find a somewhat negative trend, which have a similar movement as in the line describing the banks where the loss occurred. This might be explained by a sudden move to competitors in the event date day [0], which later turns into a fear of this negative effect being transmitted in the industry, i.e. contagion.

The bank where the loss occurred is affected well and truly in a negative way, which the negative CAARs point out. The competitive banks benefit from the event as their CAAR is trending positive for the remaining of the event window. In what seems to be the aftermath of the operational loss event the cross-bank reaction is clearly positive from day [+4] to day [+10]. In figure 3, we can observe a big difference between the bank where the loss occurred and the line representing its competitors. Even after adjusting for the loss itself there is a significant difference, which supports the explanation of that a reputational damage could be directly beneficial for its competitors.

### 6.2.2 Testing hypothesis: Full sample

In table 7, all of our event windows show significance, except event window [-5], [+5] where we lack significance. We can reject the null hypothesis (\(H_0\)) for three out of four event windows and conclude that the alternative \(H_1\) is true. Our mean CAR is positive for all event windows and we can thereby accept \(H_{1a}\) as true and reject \(H_{1b}\).

<table>
<thead>
<tr>
<th>Event window</th>
<th>(H_0 (AR = 0))</th>
<th>(H_1 (AR \neq 0))</th>
<th>(H_{1a} (AR &gt; 0))</th>
<th>(H_{1b} (AR &lt; 0))</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10, +10 **</td>
<td>Reject (AR ≠ 0)</td>
<td>Accept (AR ≠ 0)</td>
<td>Accept (AR &gt; 0)</td>
<td>Reject (AR &gt; 0)</td>
</tr>
<tr>
<td>-5, +5</td>
<td>Reject (AR ≠ 0)</td>
<td>Accept (AR ≠ 0)</td>
<td>Accept (AR &gt; 0)</td>
<td>Reject (AR &gt; 0)</td>
</tr>
<tr>
<td>-1, +10 **</td>
<td>Reject (AR ≠ 0)</td>
<td>Accept (AR ≠ 0)</td>
<td>Accept (AR &gt; 0)</td>
<td>Reject (AR &gt; 0)</td>
</tr>
<tr>
<td>-1, +5 *</td>
<td>Reject (AR ≠ 0)</td>
<td>Accept (AR ≠ 0)</td>
<td>Accept (AR &gt; 0)</td>
<td>Reject (AR &gt; 0)</td>
</tr>
</tbody>
</table>

* Significance at the 10% level
** Significance at the 5% level
*** Significance at the 1% level

### 6.3 Results: Reputational damage sample

In this study we interpret a loss in market value that exceeds the operational loss amount over the event window as reputational damage. This can be expressed as reputational damage is being generated when:
\[ MV_{i,\tau-10} - Loss_i > MV_{i,\tau+10} \]

Equation 12. Reputational damage

Where:

\( MV_{i,\tau} \) = Market Value for security \( i \), at time \( \tau \)

\( Loss_i \) = Loss amount for bank \( i \)

A reputational damage can be identified in 23 out of 33 events, i.e. in almost 70% of the events. Figure 4 shows the difference in CAR for this sub-sample in comparison to the full sample. We examine the competing banks, which gives us 69 observations with positive mean CAR over all event windows as shown in table 8. Result show significant positive abnormal returns over two out of four of the event windows.

Figure 4. Reputational loss sample

Table 8. CAAR competitive banks where reputational damage been identified

<table>
<thead>
<tr>
<th>N</th>
<th>Event Window</th>
<th>Mean CAR %</th>
<th>p-Value</th>
<th>t-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>69</td>
<td>(-10, +10)</td>
<td>0.9</td>
<td>0.02</td>
<td>2.25**</td>
</tr>
<tr>
<td>69</td>
<td>(-5, +5)</td>
<td>0.12</td>
<td>0.14</td>
<td>1.05</td>
</tr>
<tr>
<td>69</td>
<td>(-1, +10)</td>
<td>0.62</td>
<td>0.07</td>
<td>1.48*</td>
</tr>
<tr>
<td>69</td>
<td>(-1, +5)</td>
<td>0.36</td>
<td>0.16</td>
<td>0.99</td>
</tr>
</tbody>
</table>

* Significance at the 10% level
** Significance at the 5% level
*** Significance at the 1% level

6.3.1 Analysis: Reputational damage sample

When analyzing the sub-sample where we have been able to identify reputational damage at the bank where the loss occurred, we find significant positive abnormal returns on two out of four event windows for the competing banks. We also find positive mean CAR over all event windows. This indicates a positive cross-bank reaction when one of the competitors is
experiencing a reputational loss due to internal fraud. However, mean CARs are still below one percent, which means that this positive trend is relatively weak.

The diagram shows that the sub-sample has rather strong positive reactions already at day [-8]. A possible explanation of this is the theories on financial trust by Guiso et al. (2008, p. 2558), i.e. if investors lack information to assess risk they will develop doubt about their decision-making, reconsider their options and act on that doubt. In this case, it might be some information leakage, or rumors about the loss causing doubt, which might lead to investors transferring capital to one the competitors. In this way investors are able to maintain their exposure to the financial sector at a lower risk if this doubt is perceived as increased risk.

The days just before the event date seem to be stable, i.e. zero abnormal returns are being generated. At the event date, day [0], there is a positive reaction followed by negative abnormal returns for the next couple of days, indicating that there is some turmoil in the financial sector for the days around the event date. This is explained by contagion theory, i.e. investors fear that there is a risk of a bank being affected by an incident in one of its competitors. Gropp & Moerman (2004) show that there often is tight links among banks within the same country. This means that an initial reaction after the event date might be that investors fear that this loss will be contagious in the banking industry. However, it is important to emphasize that it might explain why we find negative abnormal returns right after the event, but it is not strong and there is no sign of financial contagion over any of the event windows.

After day [+3] we have a strong positive trend. And looking over the 21-day window, from day [-10] to day [+10], we find a positive reaction. This can be explained by theory on reputational damage or reputational loss. de Fontnouvelle & Perry (2005) explains that the cross-bank reaction should be positive because the bank’s loss of clients should directly benefit its main competitors. This explains why we see a positive cross-bank reaction when we can identify a reputational loss in the bank where the loss occurred.

This idea is also supported when comparing with the full sample. The full sample is driven largely by sub-sample, which is two thirds of the full sample. Therefore it is not surprising that we see similar movements when comparing with the full sample. However, the sub-sample clearly has a stronger positive effect over the 21-day event window. It is important to emphasize that mean CAR is still below one percent. Results show significant positive cumulative average abnormal returns in two out of four event windows. We do have positive mean CAR over all event windows, which strengthen the idea of a positive cross-bank effect when one of its competitors is experiencing a reputational loss due to internal fraud.

6.3.2 Testing hypothesis: Reputational damage sample
In table 9, two of our event windows show significance, two event windows [-5], [+5] and [-1], [+5] lack significance. We can reject the null hypothesis (H0) for our full event window and conclude that the alternative H1 is true. Our mean CAR is positive for all event windows and we can thereby accept H1a as true and reject H1b.
Table 9. Testing hypothesis reputational loss sample

<table>
<thead>
<tr>
<th>Event window</th>
<th>$H_0 (AR = 0)$</th>
<th>$H_1 (AR \neq 0)$</th>
<th>$H_{1a} (AR &gt; 0)$</th>
<th>$H_{1b} (AR &lt; 0)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10, +10 **</td>
<td>Reject (AR $\neq$ 0)</td>
<td>Accept (AR $\neq$ 0)</td>
<td>Accept (AR $&gt;$ 0)</td>
<td>Reject (AR $&gt;$ 0)</td>
</tr>
<tr>
<td>-5, +5</td>
<td>Reject (AR $\neq$ 0)</td>
<td>Accept (AR $\neq$ 0)</td>
<td>Accept (AR $&gt;$ 0)</td>
<td>Reject (AR $&gt;$ 0)</td>
</tr>
<tr>
<td>-1, +10 *</td>
<td>Reject (AR $\neq$ 0)</td>
<td>Accept (AR $\neq$ 0)</td>
<td>Accept (AR $&gt;$ 0)</td>
<td>Reject (AR $&gt;$ 0)</td>
</tr>
<tr>
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<td>Accept (AR $\neq$ 0)</td>
<td>Accept (AR $&gt;$ 0)</td>
<td>Reject (AR $&gt;$ 0)</td>
</tr>
</tbody>
</table>

* Significance at the 10% level  
** Significance at the 5% level  
*** Significance at the 1% level

6.4 Results: Biggest losses

In the subsample of the biggest losses, defined as loss amounts exceeding €200m, is displayed in figure 5. The fluctuations in CAAR are stronger relative the full sample. Table 10 shows that we have 30 observations with both negative and positive mean CAR over different event windows. We also have significance for both positive and negative abnormal returns.

Table 10. CAAR competitive banks biggest losses

<table>
<thead>
<tr>
<th>N</th>
<th>Event Window</th>
<th>Mean CAR %</th>
<th>p-Value</th>
<th>t-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>(-10, +10)</td>
<td>0.99</td>
<td>0.12</td>
<td>1.17</td>
</tr>
<tr>
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<td>(-5, +5)</td>
<td>1.01</td>
<td>0.06</td>
<td>1.66*</td>
</tr>
<tr>
<td>30</td>
<td>(-1, +10)</td>
<td>-1.01</td>
<td>0.06</td>
<td>1.59*</td>
</tr>
<tr>
<td>30</td>
<td>(-1, +5)</td>
<td>-0.96</td>
<td>0.02</td>
<td>2.18**</td>
</tr>
</tbody>
</table>

* Significance at the 10% level  
** Significance at the 5% level  
*** Significance at the 1% level

6.4.1 Analysis: Biggest losses

The sample biggest losses gather the ten largest losses, which include 30 competitive banks to the bank where the loss occurred; the data collection consists of over 8000 individual adjusted closing share prices. As this sample is much smaller than prior samples it is more exposed to randomness. In the biggest loss sample of competitive banks we provide no statistical significance for the full event window of 21 trading days. In alternative event windows we...
have significance in both [-5], [+5] window at the 10% level and in the [-1], [+5] window at the 5% level. There is irregularity in these numbers of significance that likely occurred from the relatively small data sample. This is illustrated in figure 5, more extreme values for CAAR generates large fluctuations for this sub-sample. Whereas, the overall cross-bank reaction is positive and the line is almost kept above zero for all days.

As seen in figure 5 the line that represents the sample of the biggest losses diverge from the one that represents the full sample. It shows no positive reaction around day 0. On the contrary it exhibit a negative reaction for a six day range around the event day. The negative cross-bank reaction from day [-2] until day [+3] diverges from the result of the full sample, which reacts in a adverse way. This could be explained as what Gropp & Moerman (2004, p. 408) call contagion within the financial sector. Where the shock from a loss event in one bank transmit to other banks within the same market. This finding is the first observed tendency of financial contagion. With support from de Fontnouvelle & Perry (2005, p. 32) who states that any finding of an operational loss at one bank having adverse impact on other banks stock prices can be interpreted as financial market contagion.

The explanation of losses exceeding €200m causing financial market contagion lacks statistical significance, but interestingly it has an opposite reaction to the full sample at day [0], illustrated by the different curves intersect in figure 5 at the event date. This indicates that the biggest losses are causing a different cross-bank reaction than smaller losses. Theories and prior research on reputational risk have not found any evidence of the amount having impact on reputational damages at the bank causing the event. The magnitude of loss in firm value seems to have other explanations.

Both de Fontnouvelle & Perry (2005) and Sturm (2013) find no impact on reputation from the loss amount. Gillet et al., (2010) find that the amount have negative impact in terms of proportion to the bank’s net profit, but no evidence of the loss amount itself. Cummins et al., (2006) find that there often is an exaggeration of the consequence of a small loss, while the impact of large losses are underestimated. This is the opposite to how our sub-sample show the cross-bank reaction, where we see stronger reactions when examining the biggest losses.

### 6.4.2 Testing hypothesis: Biggest losses

Table 11 shows a wide range of results for different event windows. Two of our event windows show significance, two event windows [-10], [+10] and [-1], [+10] lack significance. We can reject the null hypothesis (H₀) in all of our event windows and conclude that the alternative H₁ is true but only with significance in two windows. Our mean CAR is different from zero for all event windows and we can thereby accept H₁ as true. For two event windows ([−10], [+10] and [−5], [+5]) we have positive mean CAR and thereby accept H₁a as true and reject H₁b. The other two event windows ([−1], [+10] and [−1], [+5]) we have negative mean CAR and thereby reject H₁a as false and accept H₁b as true.

<table>
<thead>
<tr>
<th>Event window</th>
<th>H₀ (AR = 0)</th>
<th>H₁ (AR ≠ 0)</th>
<th>H₁a (AR &gt; 0)</th>
<th>H₁b (AR &lt; 0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10, +10</td>
<td>Reject (AR ≠ 0)</td>
<td>Accept (AR ≠ 0)</td>
<td>Accept (AR &gt; 0)</td>
<td>Reject (AR &gt; 0)</td>
</tr>
<tr>
<td>-5, +5</td>
<td>Reject (AR ≠ 0)</td>
<td>Accept (AR ≠ 0)</td>
<td>Accept (AR &gt; 0)</td>
<td>Reject (AR &gt; 0)</td>
</tr>
<tr>
<td>-1, +10</td>
<td>Reject (AR ≠ 0)</td>
<td>Accept (AR ≠ 0)</td>
<td>Reject (AR &lt; 0)</td>
<td>Accept (AR &lt; 0)</td>
</tr>
<tr>
<td>-1, +5</td>
<td>Reject (AR ≠ 0)</td>
<td>Accept (AR ≠ 0)</td>
<td>Reject (AR &lt; 0)</td>
<td>Accept (AR &lt; 0)</td>
</tr>
</tbody>
</table>

* Significance at the 10% level
6.5 Results: Before and after the financial crisis

When examine the impact of financial crisis we exclude all events that occurred from august 2007 to last of December 2009. Figure 6 displays the difference between the sample with and without the evens occurring during the financial crisis.

![Figure 6. Events before and after the financial crisis](image)

Table 12 show that the sample contains 66 observations and that we again find both negative and positive abnormal returns over different event windows. Also, we have significance on both positive and negative abnormal returns.

<table>
<thead>
<tr>
<th>N</th>
<th>Event Window</th>
<th>Mean CAR %</th>
<th>p-Value</th>
<th>t-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>66</td>
<td>(-10, +10)</td>
<td>0.50</td>
<td>0.09</td>
<td>1.35*</td>
</tr>
<tr>
<td>66</td>
<td>(-5, +5)</td>
<td>0.12</td>
<td>0.34</td>
<td>0.42</td>
</tr>
<tr>
<td>66</td>
<td>(-1, +10)</td>
<td>-0.41</td>
<td>0.1</td>
<td>1.25*</td>
</tr>
<tr>
<td>66</td>
<td>(-1, +5)</td>
<td>-0.56</td>
<td>0.02</td>
<td>2.26**</td>
</tr>
</tbody>
</table>

* Significance at the 10% level
** Significance at the 5% level
*** Significance at the 1% level

6.5.1 Analysis: Before and after the financial crisis

It would be irresponsible not to look into what potential impact the financial crisis of 2007-2009 had on the full sample. We have eliminated the events that took place from September 2007 until December 2009 in order to create this sub sample. In both event windows that cover each end around the event day we see positive mean CAR with significance at the 10 % level for the event window [-10], [+10] days and no significance for the [-5], [+5] window. When the event window is skewed towards the end of the event window mean CAR is negative for both [-1], [+10] and [-1], [+5] windows and they show significance at the 10% level respectively the 5% level.
This is illustrated in figure 6, where we can see that competitive banks move in a positive trend up until day [-2], which indicates that the market's expectations about future cash flows is positive. This positive trend could be interpreted as there is an built in expectation about the event having a positive cross-bank reaction. As the theory on reputational damage by de Fontnouvelle & Perry (2005, p. 5) point out, there is a threat that customers in one bank flee to its competitors when hit by an idiosyncratic shock. For the market this could be an opportunity in positive returns for competitive banks and therefore be the underlying factor that push the CAAR for the sample in the beginning of the event window.

If we compare the sample where event during the financial crisis have been excluded with the full sample, the biggest difference is from day [-6] to day [0]. When excluding these events the expectations, or the initial cross-bank reaction, is more positive. Other than that, we observe similar movements in the sub-sample as in the full sample. Removing the events that took place in the timespan of the financial crisis does not point us in any other direction than to follow the results we gained from the full sample. The financial crisis is therefore only affecting the initial phase and not the outcome for the samples looking at the full event window.

6.5.2 Testing hypothesis: Before and after the financial crisis
In table 13, three of our event windows show significance, one event window [-5], [+5] lack significance. We can reject the null hypothesis (H₀) in all of our event windows and conclude that the alternative H₁ is true but only with significance in three windows. Our mean CAR is different from zero for all event windows and we can thereby accept H₁ as true. For two event windows ([-10], [+10] and [-5], [+5]) we have positive mean CAR and thereby accept H₁a as true and reject H₁b. The other two event windows ([-1], [+10] and [-1], [+5]) we have negative mean CAR and thereby reject H₁a as false and accept H₁b as true.

Table 13. Before and after the financial crisis

<table>
<thead>
<tr>
<th>Event window</th>
<th>H₀ (AR = 0)</th>
<th>H₁ (AR ≠ 0)</th>
<th>H₁a (AR &gt; 0)</th>
<th>H₁b (AR &lt; 0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10, +10 *</td>
<td>Reject (AR≠ 0)</td>
<td>Accept (AR≠ 0)</td>
<td>Accept (AR &gt; 0)</td>
<td>Reject (AR &gt; 0)</td>
</tr>
<tr>
<td>-5, +5</td>
<td>Reject (AR≠ 0)</td>
<td>Accept (AR≠ 0)</td>
<td>Accept (AR &gt; 0)</td>
<td>Reject (AR &gt; 0)</td>
</tr>
<tr>
<td>-1, +10 *</td>
<td>Reject (AR≠ 0)</td>
<td>Accept (AR≠ 0)</td>
<td>Reject (AR &lt; 0)</td>
<td>Accept (AR &lt; 0)</td>
</tr>
<tr>
<td>-1, +5 **</td>
<td>Reject (AR≠ 0)</td>
<td>Accept (AR≠ 0)</td>
<td>Reject (AR &lt; 0)</td>
<td>Accept (AR &lt; 0)</td>
</tr>
</tbody>
</table>

* Significance at the 10% level  
** Significance at the 5% level  
*** Significance at the 1% level

6.6 Summarized results
In the first step we examine abnormal return for the bank where the loss occurred. We look at 33 different events including 70 different banks, in 14 countries. We use four event windows for every sample. The bank where the loss occurred have significant negative mean CAARs over all event windows. We also adjust for the loss by adding the loss divided by market value at day [0]. In three out of four event windows we have positive mean CARs, in two of them are significant at the five percent level.

We focus on presenting the thesis primary results. We look at the cross-bank effect of an operational loss announcement, by examining the full sample, a sample of events where we can identify a reputational damage, a sub-sample of the biggest losses and a sample where we have excluded events occurring during the financial crisis of 2007-2008.
Results show that out of 16 different event windows there are 12 with positive mean CARs. None of those are significant at the one percent level, three are significant at the five percent level and four are significant the ten percent level. Results also show that out of 16 event windows, four do have negative CARs and three out of these show statistical significance.

6.7 Discussion
In order to prevent our own ideas and interpretations influencing the analysis of the study, this section has been dedicated to a discussion of our own reflections that have emerged throughout the process of the analysis.

Initially we checked our sample by performing a similar analysis as used in previous research on reputational risk and reputational damage, i.e. analyzing the banks where the loss event occurred. We found strong evidence of negative abnormal returns surrounding the event date, and semi-strong when adjusting for the loss amount. These results are inline with prior studies. Therefore we feel confident that our sample is representative, and that we managed to identify correct event dates. This was an important step because our sample of events is smaller than most prior studies, i.e. we want to ensure it was representative for a larger population. With this as a background, we feel confident with our current sample size.

According to our results, the cross-bank reaction over a 21-day event window is positive. This implies a beneficial effect for banks if a competing bank in the industry is suffering an operational loss due to internal fraud. Even if mean CAR generally is rather low, i.e. somewhere between zero and one percent, we observe that the cross-bank reaction exits the event window with positive CAR in all sub-samples.

We do believe this shows that there is a positive cross-bank effect, but it is not very strong. On the other hand, if we assume that it is the reputational damage in the bank where the loss occurred that is being transferred to the other actors in the industry, it is not very surprising that abnormal returns are between zero and one percent. To explain, when adjusting for the loss at the bank where the loss occurred we still find negative abnormal returns, which indicates a reputational damage. If this loss is assumed to be divided into three, and equally spread among the banks we are using in the cross-bank analysis, abnormal returns should not be very high.

When analyzing the sub-sample where we can identify a reputational loss have occurred, it is not surprising that the cross-bank reaction is stronger. We believe this is due to mainly two things. The first is what we discussed in the paragraph above, i.e. that one might assume it is the part that the “damaged” bank lost in reputation that is being distributed within the industry. This means that when we use a sample where we can define reputational damage has occurred, we have simply removed observations that are zero. Thus a similar movement is created, but with stronger reaction since the full sample can be interpreted as diluted. Secondly, there might be a problem with event date uncertainty. By using a sample where we find a loss in market value that exceeds the loss amount, gives us some kind of verification of actual event has been captured in the event window. This means that this sub-sample is in some way a concentrated version of the full sample.

Our study suffers from problems with event date uncertainty. We only use one event date, where previous studies often use two or three. Our definition is the first time the loss is being mentioned in the press with a specified amount. This means that there is a possibility of the
market had an extreme reaction the first time the loss was mentioned, but no amount was specified. Later on when the amount had been specified, the market value increased since the market expected an even bigger loss. There is also a problem when preforming the cross-bank analysis, since we do not know if any of these banks experienced any other kind of turmoil during the event window. To exemplify, if Nordea experience an operational loss we did not search in news databases on what happened in SEB, Swedbank and Handelsbanken in order to rule out any kind of other events. This means that there is a probability of the cross-bank reaction reflecting a lot of other things. This is problematic since our research approach assumes that all abnormal returns during the event window is a direct effect of the event itself and nothing else.

This might not be a big problem when analyzing very large sample sizes. Our full sample is based on 99 observations, which we feel is sufficient but far from very large. This means that the study might have problems with other events causing abnormal returns. This should not be a to big of a problem when analyzing the full sample, but might have impact on sub-samples with less observations. Therefore, we have to be more cautious when analyzing smaller sub-samples, such as the sub-sample of biggest losses. However, we do feel it is important to discuss trends and tendencies we are able to identify, even if we lack statistical significance.

What we find interesting in the biggest losses sub-sample is that we see a strong negative reaction just around the event date. An alternative explanation could be that these larger losses are given substantially more media coverage than smaller losses, causing more turmoil or doubt in the financial industry. In addition, it is often said that the public has a negative and suspicious opinion about the financial sector and banking industry. Also, this kind of extreme losses in banks tend to add fuel to this fire on the debate against massive bonuses and the ethical aspects of banking. Not to forget, this sub-sample is based on fewer observations than the other ones, which can be an explanation of a bit more extreme movements in CAR over the event window.

We also know that abnormal returns are more likely to be generated in times of high volatility. In order to check how events that occurred during these times have impact on the results of the study, we use a sub-sample that excludes events during the financial crisis. We know that the financial crisis of 2007 and 2008 had huge impact on the banking industry, causing firms such as Lehman Brothers into bankruptcy. Consequently, other banks such as Bank of America, JP Morgan Chase and Deutsche Bank among others, experienced massive losses in terms of market value during this period. For our study this means that we have estimated beta on historical returns during a period of extreme conditions, which is affecting beta value and expected return calculations.

What we find interesting and a bit surprising when comparing the samples is how similar same movements are from the event date, day [0], and forward. The financial crisis does not seem to have had any impact what so ever on how banks respond to an operational loss announcement at a competitor. The difference in movement for the days before the event indicates that there might be some difference in what the market expects to happen, or expect the cross-bank reaction to be. We do not believe that there is only one problem, i.e. that beta has been estimated during period of extreme conditions. If that hade been the case, the two samples would not have been moving in such a similar way after day [0]. Therefore we have to interpret this difference as the financial crisis brought some kind of pessimistic views or expectations deviating from the “normal”.
Overall we find very few examples of any financial market contagion. Even though we have read reports where CEOs of banks have been blaming competitors for bringing down their stock prices with their losses. As we said earlier in this section, we do see tendencies of financial contagion around the days right after the event. This means that we maybe should have also used event windows such as three days period, three days after, one day before and three days after, and so on. Because even if we cannot prove it, some events looked like they were contagious, but only to one of the other banks. We know that in some countries there are very tight links between banks. This could be a potential explanation for this observation.

We do feel like the use of different event dates would increase the quality of the study. Further, maybe we should have categorized banks in different groups, e.g. retail banks, mortgage banks, investment banks etc. In some cases there are four big banks, in some there is not. For example, Deutsche Bank is substantially bigger than the fourth largest bank of Germany. There is also the possibility of losses affecting markets across country borders and losses can occur in another country than where the bank is registered and has its headquarters.

Despite these deficiencies of the study, we argue that with the support of the hypothesis tests of different event windows and various sub-samples the results we have produced point in a clear direction. Overall, the cross-bank reaction is positive. This indicates that an operational loss at a competing bank is beneficial rather than contagious for the other actors within the industry. However, this positive cross-bank effect is rather small.
7. Conclusion

An event study over the years (1995-2013) has been conducted to examine cross-bank reactions to operational loss announcements from internal fraud, and reputational damage. The base sample consists of 33 events and 44,800 daily returns. The study provides evidence of a positive cross-bank reaction, with tendencies of stronger results in case where reputational damage is identified.

7.1 Main conclusion
We conducted this study in order to answer the research question: What is the effect of operational loss announcements from internal fraudulent activities on competitors in the banking industry?

The results show a positive cross-bank reaction during the observed period of time. Furthermore, the cross-bank reaction is stronger when a reputational damage is recognized in the bank where the loss occurred. Over a 21-day event window we observe mean cumulative average abnormal returns of 0.71 percent for the full sample, and 0.9 percent for the sample where reputational damage have been recognized. These results show that when reputational damage is recognized, the positive cross-bank reaction tend to be stronger.

Based on the positive cross-bank reaction there is no strong evidence of financial contagion within the banking industry. As the negative impact of the operational loss announcement, from internal fraud in the bank where the loss occurred, should inflict a negative cross-bank reaction. Given that contingency in the banking industry is evident. However, loss amounts exceeding €200m show tendencies of negative financial market contagion for the days around the event date. Although, this statement lack statistical significance and the cross-bank reaction for a 21-day event window is positive. Thus, the results show no real evidence of operational losses due to internal fraud causing financial contagion in the banking industry.

The main purpose for this thesis to examine if there is a cross-bank reaction due to an operational loss announcement from internal fraudulent activities is thereby fulfilled.

7.2 Direction of cross-bank reaction
One of our subsidiary purposes was to establish the direction the eventual cross-bank reaction took. In this case it shows that the cross-bank reaction is positive. Throughout all of our samples the cross-bank reaction is positive in terms of mean CAR for the full event window. This reaction is higher in the subsample with reputational losses and in the full sample. It shows less significance in the sub samples with the biggest losses and where we take account for the financial crisis. Although it is showing positive mean CARs.

Another of our side purposes was to confirm previous research on reputational risk and reputational damage by examining if operational losses due to internal fraud have impact on firm reputation, expressed as the banks loss in market value exceeds the events loss amount.
We find strong evidence of negative abnormal returns for the bank where the loss occurred around the event date. Also, we have been able to identify that in 23 out of 33 events the loss in market value exceed the events loss amount. Results also show evidence of negative abnormal returns even after adjusting for the loss amount. This is inline with results from previous research within the area, which hereby are able to confirm.

The second side purpose was to examine if there was any differences depending on size of the loss or if the financial crisis of 2007 – 2008 had any special impact. What we learn from the results from the biggest losses sample is that there exists a tendency of financial contagion in a limited event window around the event date. This might derive from that a large loss attracts more speculation and attention in the market. This is nothing we have significance on and we are therefore careful not to jump into any deeper conclusions about the limited tendency in financial contagion that is present in this sample.

As mentioned before in our thesis it is almost reckless of us not to examine eventual impact of the latest financial crisis on our sample. The results from excluding events in the timespan of the financial crisis are pretty much in line with that of our full sample. We do observe tendencies of pessimistic expectations days before the event date, but we cannot provide evidence for this statement. Results show that this sample does no diverge drastically from the full sample, indicating that there is no reason to believe that the financial crisis had any major impact on the overall results.

7.3 Theoretical & practical contribution

The results show a positive cross-bank reaction. Thus, investors are provided a practical contribution, with which it should be possible to generate excess returns by investing in competing banks when one is suffering from operational losses due to internal fraud. Financial supervisory authorities can use the results of this study as a basis for discussions on impact and magnitude of operational losses in the banking industry. In addition, it can also be useful when discussing possible legal and regulatory changes.

The study has helped to expand the empirical body of work regarding operational loss announcements, reputational risk and reputational damage. The theoretical contribution of this study is therefore that it widens the knowledge in this field of research. Furthermore, it strengthens the results of previous research that provide evidence of operational loss announcements as a source of reputational damage. Finally, the results contribute to ongoing research on financial contagion, as we find no real evidence contagion operational loss announcements are no source for financial market contagion.

7.4 Societal & ethical issues

All kind of research is to some extent affected by trends, by the researchers ideological beliefs, and biased by interests they are often not aware of (Kuhn, 1962, p. 125). Business students are no different. Yet, we strive to resist all these influences and adopt an objective perspective. Consequently, it is important to consider the societal and ethical implications that the study might have.

In terms of societal aspects the banking industry plays an important role in society and is a core component in the financial system. The backside is that the actions of banks will have societal consequences. This became evident during the financial crisis, where Governments hade to bailout banks. Still, regulatory frameworks face numerous challenges that caused the
crisis, where rules still are not tight enough (Lagarde, 2015). A big problem we still are facing is the culture of compensation. Today, it is still preferable to have short-term gains rather than sustainable profits, which induces greater risk-taking and short-termism (Lagarde, 2015).

The financial crisis has exposed several weaknesses and provided many lessons. An overarching lesson is that building sustainable and comprehensive growth is dependent on effort. It requires supervisors and regulators to work on managing risks, it requires developing resilience and it requires realignment between corporate culture and societal objectives (Lagarde, 2015). Our aim is to add a piece to the puzzle of reputational risk. If this can help to develop new tools for how this risk can be measured and managed in a more efficient way it would be beneficial for society.

As for ethical aspects, we argue that the data used is objective quantitative data. Therefore personal opinions or beliefs should not affect the results. There is always a risk of human error, and there is a possibility of mistakes and misunderstandings. In order to mitigate this we have strived to be as transparent as possible throughout the research process. Both data providers Thomson Reuter Datastream and VÖB-Service have been used in previous established publications. Thomson Reuter Datastream are we able to access through Umeå University. Data provided by the Association of German Public Sector Banks (Bundesverband öffentlicher Banken, VÖB). We are allowed access to their database ÖffShOR (Öffentliche Schadenfälle OpRisk) completely free of charge. One could argue that this might imply that we are expected to, or feel that we are expected to, deliver something in return, which might be considered an ethical problem.

We strive to maintain a high quality and high ethical standards in our research by being as transparent as possible. To clarify, we have signed a contract with VÖB-Service GmbH where we have agreed to not use the data for any commercial purposes, referencing the database and company by name, and they may use this thesis for marketing purposes. There are no further commitments between VÖB-Service and us. We believe that transparency is key to maintain high ethical standards. By describing all steps in our research process, the study's deficiencies and our agreement with VÖB-Service, we argue that the reader is given a good opportunity to assess the reliability of our results.

7.5 Future research

We have performed a cross-bank analysis on operational loss announcements due to internal fraudulent activities. The result shows a positive cross-bank reaction, but is not entirely evident. Since we find significant negative abnormal returns over some event windows we would suggest a more extensive study on cross-bank effects of operational losses that could confirm and strengthen our results. Such a study should use a larger sample of events, use several different event dates, and test for statistical significance over even more event windows. There are other operational loss databases that we are not able to access, which is allowing for a cross-bank analysis of a larger sample.

Future research on reputational damage could also focus on effects from intentional infringements that result in massive fines for financial institutions, instead of as now when the focus is around operational losses. During the last couple of years we have seen some of the largest banks in the world violating sanctions and responsible for currency manipulation. It would also be interesting to examine if reputational damage has anything to do with ethical aspects or if it is strictly associated with expectations of future cash flows.
8. Criteria of truth

In the performance of a quantitative study, it is important that we as authors relate scientifically to the problems we intend to study. To ensure that the results are correct and that they are trustworthy it is important to have high validity and reliability in the results that are being presented. By the selection of well known theories and models as well as methods, and by gathering the information on how to perform an event study we believe that these criteria is fulfilled. In this thesis we have aimed at producing both high reliability and validity.

8.1 Validity

In order to assess the reliance of the study and if the results are correct, aspects of the studies validity has to be taken into consideration (Ejvegård, 2009, p. 80). Essentially, this mean that the measuring methods applied in the study accurately has measured what was intended to measure (Ejvegård, 2009, p. 80; Bjereld et al., 2002, p. 109). Validity is mainly divided in to two different types, namely external and internal validity. The first treats the generalizability of the study. The latter, the internal validity treats the instruments used for measurements in the study, which should be anchored in theory. (Bjereld et al., 2002, p. 109). For our study, this means that the internal validity addresses how accurate our measurements of abnormal returns are.

To ensure a high validity in the study we have used models that are well recognized and well tested. The approach, models and measurement instruments have been applied and tested in previous well recognized and published research, which all is described in Chapter 5. Hence, we argue that it should be considered to be valid. However, the concept of event studies is by no means entirely flawless or free of error. There are aspects of the methodological concept of event studies that are, and should be criticized. For example, problems with the beta and the market model have been broadly debated (Wells, 2004, p. 66). It is assumes that history is a perfect prediction of the future and that a stocks beta is to be constant over time, despite the fact that empirical studies show the opposite. Also, macroeconomic variables such as interest rates and economic conditions have been shown to affect the beta. Although, that event studies is associated with a number of problems and risks, it is still widely used and almost exclusively used in all research on operational loss announcements. Hence, we found it as the most suitable approach for our research.

In terms of external validity, or the study's generalizability, it can be a problem that we have selected and examined a smaller sample of events, due to the time frame and data availability. This might decrease the generalizability of study, since the risk of individual observations have to strong of an impact on the over all results increases. Although, there is a trade-off between internal and external validity: to increase the internal validity the external validity often has to decrease (Smith, 2011, p. 35-36). This means that we have been able to spend more time on investigation of each firm in order to reduce errors, such as picking irrelevant event dates or “wrong” competing banks. Even though we use a smaller sample we apply similar test for bank where the event occurred in order to check if we get similar results. We argue that his increases the generalizability of the study and the external validity is to be considered acceptable since we examine a representative sample.
8.2 Reliability
Questions regarding reliability relate to whether the study would produce the same result if it were to be repeated. In other words, it is important that the study is correctly executed, e.g. a study that uses valid methods will still generate incorrect results if it is not properly conducted (Bjereld et al., 2002, p. 111). In order to achieve a high reliability it is of great importance that no random or temporary conditions interfere with the results (Bryman & Bell, 2003, p. 48).

For the results of our study there is a probability of human error affecting the reliability. By using data from ÖffSchOR Database by VÖB-Service and Thomson Reuter Datastream, which both is considered reliable sources, we argue that the risk of this is low. We use a smaller sample and have been cautiously processed the data and calculations. All steps have been double checked, and both authors have been involved throughout the process. Therefore, we argue that a replication of the data process would produce the same result. In order to ensure the reliability we have also reviewed how researchers practically performed the studies within the research area. By using an already tested research design we argue that the reliability of the study is to be considered high. Finally, by describing every step in the research process, we enable for a convenient way to replicate our study in order to evaluate the correctness of the results.

8.3 Replication
In order to assure that results are reliable and valid, the criterion of replication has to be fulfilled. Replicability is associated with reliability, and has to be fulfilled so that other researchers are able to replicate the study. A reason for replication could be that the results seem strange compared to other similar studies (Bryman & Bell, 2003, p. 48). By being transparent and describing every step in the process we consider the replication criteria to be fulfilled. Therefore we argue that there should not be any problem of replicating the study and get similar results.
References


### Appendix 1 – List of events

<table>
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<th>Event No.</th>
<th>Name of the bank</th>
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Appendix 3 - List of Stock Exchange Markets

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