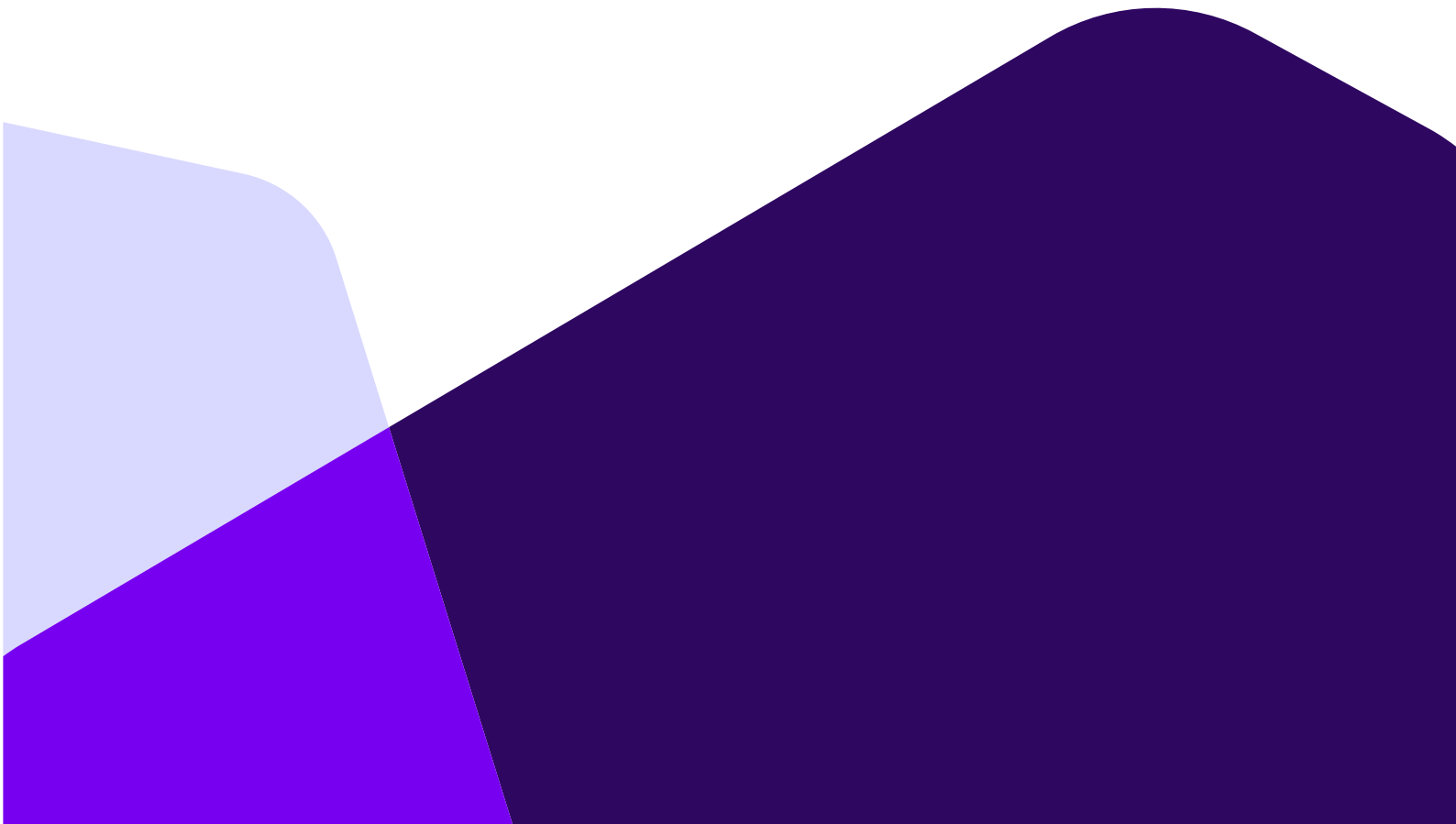


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COVID-19's Impact on Cash Holdings and Managers' Risk Tolerance in Norwegian Industrial Firms



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This thesis is worth 30 study points

Summary

In this master's thesis we study the effects of the COVID-19 pandemic on cash holdings and managers' risk tolerance in Norwegian industrial firms. Using a combination of quantitative and qualitative analysis through a mixed-methods research design we answer the two following research questions:

Research Question 1: *To what degree has cash holdings changed in Norwegian industrial firms during and after the COVID-19 pandemic?*

Research Question 2: *To what degree has the COVID-19 pandemic had an effect on Norwegian managers' risk tolerance?*

Our sample consist of 19.726 firms from the industry sector, and we analyze ten years of publicly available accounting data collected from Proff Forvalt using a combination of regression analysis and descriptive statistics. Additionally, we interview 4 managers to better understand and support our findings.

As opposed to previous studies, which find that firms tend to increase their cash holdings in times of uncertainty as a precautionary motive, we find an increase in cash holdings as a result of increased cash flow. This indicates to us that the COVID-19 pandemic has not been as bad for Norwegian firms as we initially thought. We also find no evidence suggesting that managers have adjusted their risk profile towards potential futures crises, further mitigating the negative effects of the COVID-19 pandemic we expected to find.

Table of contents

Summary	2
List of Tables	5
List of Figures	5
Preface	7
1 Introduction	8
2 Literature Review	10
2.1 The Literature Search	10
2.2 Theoretical Framework	13
2.2.1 What Are Cash Holdings and Why Are Cash Holdings Important	13
2.2.2 Motives to Hold Cash	13
2.2.3 Financial Theories and Cash Holding Policies	14
2.2.4 How the COVID-19 Pandemic Affected the Norwegian Economy	17
2.3 Hypotheses and Sub-Research Questions	19
2.3.1 How a Crisis Affects Cash Holdings	19
2.3.2 How a Crisis Affects Risk Tolerance	27
3 Research Methodology	30
3.1 Strategy and Design	30
3.2 Study 1	31
3.2.1 Sample and Data	31
3.2.2 Tools, Models, and Variables for Analysis	32
3.3 Study 2	37
3.3.1 Sample, Data and Method for analysis	37
3.4 Quality Criteria and Research Ethics	38

4 Results	40
4.1 Study 1	40
4.2 Study 2	43
5 Discussion	48
5.1 Theoretical Contribution	48
5.1.1 Study 1	48
5.1.2 Study 2	50
5.2 Managerial Contribution	53
5.3 Weaknesses and Future Studies	53
6 Conclusion	56
7 References	57
Appendix A	63
Appendix B	64
Appendix C	75
Appendix D	76
Appendix E	77

List of Tables

2.1. Keywords and Associated Alternative Terms Used in the Literature Search Process_____	10
3.1. Variables, Their Definition and Expected Effect on Cash Holdings_____	34
4.1. Regression Analysis Results_____	40
4.2. Changes in Financial Accounts from 2018 to 2022_____	43

List of Figures

2.1. Combination of Keywords Used to Create Search Strings_____	11
2.2. The Stages of the Literature Search Process_____	12
2.3. The Trade-Off Theory_____	15
2.4. The Pecking Order Theory_____	16
2.5. The Expected Relationship Between Firm Size and Cash Holdings_____	20
2.6. The Expected Relationship Between Cash Flow and Cash Holdings_____	22
2.7. The Expected Relationship Between Debt Leverage and Cash Holdings_____	23
2.8. The Expected Relationship Between Debt Maturity and Cash Holdings_____	23
2.9. The Expected Relationship Between Research and Development and Cash Holdings_____	24
2.10. The Expected Relationship Between Dividends and Cash Holdings_____	25
2.11. The Expected Relationship Between Stock Returns and Cash Holdings_____	26
2.12. The Expected Relationship Between Interest Rates and Cash Holdings_____	26
2.13. The Relationship Between the Underlying Motives to Hold Cash, Changes in Financial Accounts, and Risk Tolerance_____	29
3.1. Mixed Method Research: Explanatory Sequential Design_____	31
3.2. Linear Regression Model_____	33
3.3. The Annual Average Value of Oslo Stock Exchange Main Index from 2013 to 2020_____	35
3.4. The Annual Average Policy Rate from 2013 to 2022_____	35

3.5. Changes in Oslo Stock Exchange Main Index in 2020	36
3.6. Panel Regression Model for Cash Holdings	36
4.1. Median Cash Holdings from 2013 to 2022	41
4.2. Median Value of Cash from 2013 to 2022	44
4.3. Median Cash Flow from 2013 to 2019	44
4.4. Median Debt from 2013 to 2022	45
4.5. Median Research and Development Expenditures from 2013 to 2022	45
4.6. Average Research and Development Expenditures from 2013 to 2022	46
4.7. Median Dividend Payouts from 2013 to 2022	47
4.8. Average Dividend Payouts from 2013 to 2022	47

Preface

This master's thesis marks the end of a five-year journey in pursuing a master's degree in business and economics. The process behind this master's thesis has been challenging, but also a significant learning opportunity, pushing us to delve deep into financial theory, quantitative and qualitative data analysis and statistics. The complexity of the financial concepts has not only tested our intellectual capabilities but have also broadened our understanding of the dynamic field of finance, accounting, and behavioral economics.

As we reflect on this journey, we would like to express our gratitude to the managers who have participated and provided us with valuable insights on this topic, enriching the analysis and making it both fruitful and interesting. Additionally, we express our sincere gratitude to our supervisor, Asle Fagerstrøm, for his valuable input and contributions to the work on this master's thesis. Lastly, we want to thank our families and friends for their support and encouragement during this whole journey.

As we present this master's thesis, we do so with a sense of pride and accomplishment, knowing that it is not only the peak of our academic journey, but also the beginning of a new chapter in our professional development. We hope that the insights and the analyses presented in this master's thesis can contribute to the ongoing dialogue in the field and that it inspires future research and practitioners to continue pushing the boundaries of knowledge in business and economics.

Horten, May 13th, 2024

Zanfina Radoniqi & Stian Sjøberg

1 Introduction

At the beginning of 2020 the world was thrown into a whole new reality with the COVID-19 pandemic sending shockwaves through the global economy. Reduced income, increased costs, disruptions in the supply chain, decreased consumer demand, and workforce reductions all contributed to more stress on firms' cash holdings.

Cash holdings are an important part of a firm's financial strategy as it enables firms to pay its financial obligations in day-to-day operations, act upon potential value-creating investment opportunities, and to better navigate through uncertain events such as financial crises (Opler et al., 1999; Bates et al., 2009; Chung et al., 2023; Bukalska & Maziarczyk, 2023). In financial theory there are three major underlying motives to hold cash: the transaction motive, the precautionary motive, and the speculative motive (Opler et al., 1999; Bates et al., 2009; Bukalska & Maziarczyk, 2023). The transaction motive concerns day-to-day operations and ensures a firm's ability to pay its obligations on time as costs and revenue don't always occur in the same period. The precautionary motive concerns the uncertainty in a firm's cash flow due to unforeseen circumstances and leads firms to hold excess cash as a precaution. The speculative motive concerns a firm's reasons to hold excess cash in case of sudden opportunities in the market (e.g. investment opportunities as a result of a market crash). The relative importance of these motives is subjective and influenced by managers' risk tolerance, where a risk averse manager will have different incentives to hold cash than a risk-seeking manager.

The aim of this master's thesis is to investigate the impact of the COVID-19 pandemic on corporate cash holdings and managers' risk tolerance in Norwegian industrial firms. Following the theory of cash holdings, we study its changes and analyze how different determinants influence cash holdings. Additionally, we analyze managers risk tolerance by studying the changes in financial accounts and delving into the underlying motives behind the financial decisions made during the pandemic. This helps us to better understand the rationale behind decisions regarding cash holdings, which can provide managers with valuable insights in how to position themselves towards future crises. It further adds to the literature by delving into areas that have not yet been fully explored.

Previous studies have primarily focused on underlying firm characteristics and key accounting figures, and how these affect the level of cash holdings. It is found that cash

holdings play a crucial role on firms' performance, especially during and after financial downturns (Chen et al., 2018; Chang & Yang, 2022), supporting a precautionary motive. Firms with greater cash holdings tend to experience a more rapid recovery in terms of operating performance and are even able to improve their performance after a financial crisis (Chang & Yang, 2022). This is because firms with a healthy cash position are able to increase capital investments in these periods (Duchin et al., 2010; Chang et al., 2017; Chen et al., 2018; Chang & Yang, 2022). During the 2000 dot-com crash and the 2008 credit crisis, it was found that financially constrained firms with less cash were more affected than other firms (Chen et al., 2018). The financially constrained firms, who survived the 2000 dot-com crisis, tended to accumulate more cash post-crisis, and were less likely to default during the 2008 credit crisis (Chen et al., 2018). This supports the idea that managers and firms who have experienced financially hard times in turn experience a change in risk tolerance.

While there are studies on cash holdings related to past financial crises such as the 2000 dot-com crash and the 2008 credit crisis, there is to the best of our knowledge, none that investigates how the COVID-19 pandemic have impacted cash holdings in Norwegian firms, and none that have communicated with managers to understand the potential change in their risk tolerance. This master's thesis is relevant because it can assist managers in determining the appropriate cash holdings level, especially during a financial crisis. On this basis we have developed the following thesis statement:

Thesis Statement: *How has the COVID-19 pandemic affected cash holdings and managers' risk tolerance in Norwegian industrial firms?*

To effectively address this thesis statement, we have created two research questions:

Research Question 1: *To what degree has cash holdings changed in Norwegian industrial firms during and after the COVID-19 pandemic?*

Research Question 2: *To what degree has the COVID-19 pandemic had an effect on Norwegian managers' risk tolerance?*

The rest of this thesis proceeds as follows: In Section 2 we present our literature review. In Section 3 we present our research methodology. In Section 4 we present our results. In Section 5 we discuss our findings. Section 6 concludes.

2 Literature Review

To write a good master's thesis, it is important to develop a strong theoretical framework and to identify relevant literature. This all begins with a thorough literature search. In Subsection 2.1 we explain how the literature search was planned and conducted. In Subsection 2.2 we build our theoretical framework. In Subsection 2.3 we present our hypotheses and sub-research questions.

2.1 The Literature Search

To find relevant literature, suitable keywords must be identified (Bell et al., 2019, pp. 100-101). In line with the research questions presented in Section 1, we first identified three keywords and associated alternative terms (Table 2.1). Such alternative terms help us find relevant literature even when the literature doesn't specifically contain the identified keywords (Bell et al., 2019, p. 101).

Table 2.1

Keywords and Associated Alternative Terms Used in the Literature Search Process

Key words	Alternative terms	
Crisis	<i>COVID-19</i>	<i>Pandemic</i> <i>Financial crisis</i>
Cash holdings	<i>Cash reserves</i>	<i>Liquidity reserves</i>
Risk tolerance	<i>Risk aversion</i>	<i>Risk appetite</i>

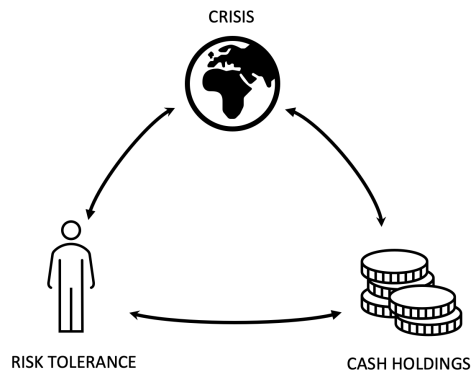
Further, we identified relevant databases. There are many databases available to us, therefore some limitations are necessary, and a good starting point is to seek guidance from the university's library staff (Bell et al., 2019, pp. 98-99). With guidance from the university's library staff and through our own assessments, we decided to use the following four databases: Academic Search Premier, Emerald, Scopus, and Web of Science. All of these are relevant databases for subject areas in business and management.

Using different combinations of the keywords and their alternative terms from Table 2.1, we then created three different search strings to cover our research topic as broadly as possible, without being too vague or too specific. We created one search string combining the keywords *crisis* and *cash holdings*, one combining *crisis* and *risk tolerance*, and one

combining *risk tolerance* and *cash holdings* (Figure 2.1). Appendix A shows the exact search strings used for each topic and the results for each database.

Figure 2.1

Combination of Keywords Used to Create Search Strings

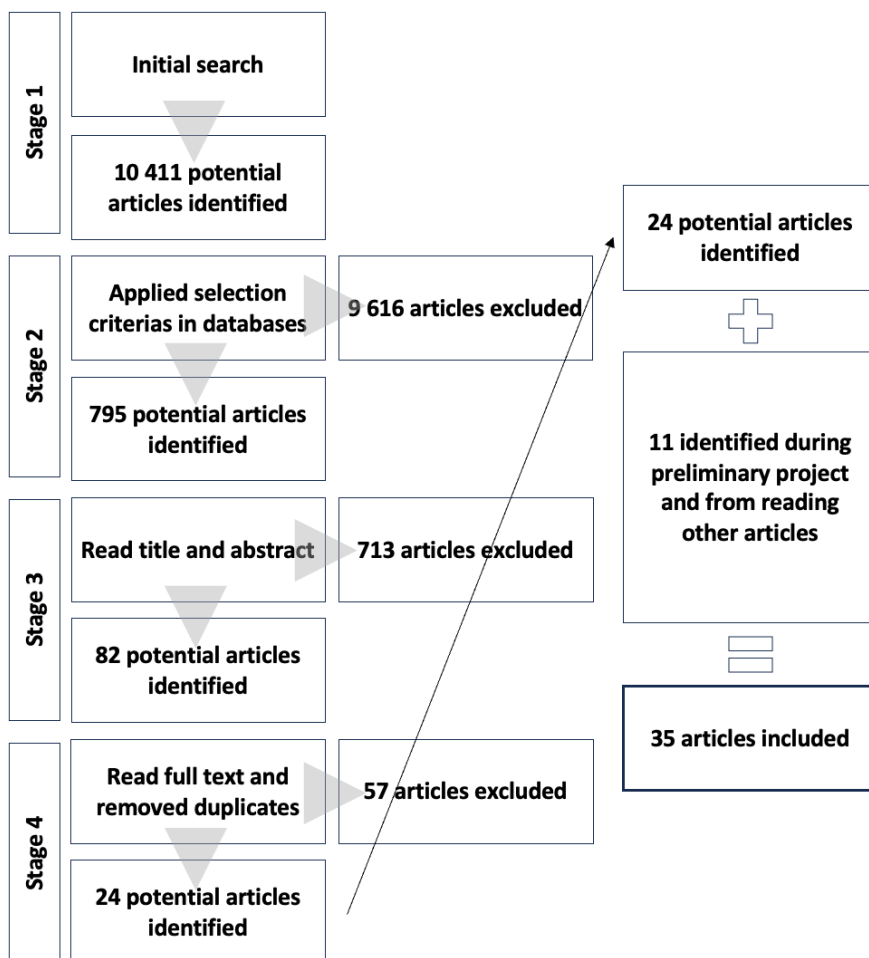


In the first stage of the search process, we achieved 10 411 results across the four databases using the three different search strings (Figure 2.2). To narrow the search and to ensure that we find the most relevant research, we introduced different selection criteria to the different databases. The different databases have different selection criteria options, and our goal was to only include peer-reviewed research articles written in English. Therefore, we introduced relevant search criteria where possible. Not all criteria were available as a filter option for all databases, therefore some exclusion had to be done manually. For example, the criteria to show only English articles was selected where this was an option; where this was not an option, non-English articles were excluded manually. We also had the possibility to exclude articles based on publication date, but we found this option to be unnecessary as our results were few enough that we were able to manually evaluate each article later in the process. The ability to sort by relevance was used when the number of the results was still too many after applying all relevant selection criteria. In one case we had 156 results on the Emerald database before sorting by relevance and only going forth with the 50 most relevant articles. In total the selection criteria reduced our initial findings from 10 411 in stage one to 795 in stage two. We then read the title and abstract of the 795 identified articles and selected only the ones that we found to be potentially relevant. We did this by reviewing approximately half of the 795 articles each (two databases each) and downloading every article we found potentially relevant based on the title and abstract alone before sorting into relevant categories. While 795 articles sounds like too big of a sample to review in an effective way, many of these articles surrounded topics such as leadership in the health

sector during COVID-19 and were therefore excluded. In total, this stage resulted in 82 potential articles. Many of the 82 articles were found more than once across the different databases, and duplicates were therefore removed, leading us to 59 potential articles. We then read these 59 articles in full text, approximately half each, and found 24 of them to be relevant for this master's thesis. These articles form the basis for our understanding of how a crisis such as the COVID-19 pandemic can affect corporate cash holdings and managers' risk tolerance. Additionally, we have included some articles that were identified during our preliminary project in preparation for this master's thesis, as well as some articles that were identified during the review of other articles. In total 35 articles were used to develop our hypotheses and research questions. An overview of all articles and their findings are presented in a literature matrix (Appendix B).

Figure 2.2

The Stages of the Literature Search Process



2.2 Theoretical Framework

2.2.1 What Are Cash Holdings and Why Are Cash Holdings Important

Most research follows e.g. Opler et al.'s (1999) definition of cash holdings as the sum of cash and marketable securities and measures the level of cash holdings as its ratio to a firm's total assets. Holding cash is necessary for firms to be able to face unexpected shocks in the future (Bates et al., 2009), and is vital for firms' survival and growth (Bukalska & Maziarczyk, 2023; Chung et al., 2023). When cash flows become riskier, cash holdings become more important (Bates et al., 2009) and might determine how strong and resilient a company is to future difficulties (Bukalska & Maziarczyk, 2023). Previous studies show that firms with greater cash holdings perform better during crisis periods (Wu et al., 2023) and that they tend to experience a faster recovery post-crisis (Chang & Yang, 2022). In fact, firms with limited access to external financing who survived the 2000 dot-com crisis, tended to accumulate more cash post-crisis and were less likely to default during the 2008 credit crisis (Chen et al., 2018). This indicates that firms learn that saving cash is crucial in preparation for future crises (Wu et al., 2023).

2.2.2 Motives to Hold Cash

Within the finance literature researchers have identified different motives for firms to hold cash. Most importantly the transaction motive, the precautionary motive, and the speculative motive (Opler et al., 1999; Bates et al., 2009; Bukalska & Maziarczyk, 2023). These motives reflect the underlying financial objectives of firms. When a firm possesses excess cash, it has the opportunity to decrease debt, increase savings or distribute dividends to shareholders. Conversely, when a firm faces cash deficits it must find ways to meet these financial obligations, which may involve increased debt, reduced savings or by issuing additional shares. The motives to hold cash will now be described in detail.

The Transaction Motive

The transaction motive for holding cash concerns holding readily available cash to meet day-to-day transactions and financial obligations (Opler et al., 1999; Kafayat et al., 2014; Uyar & Kuzey, 2014 as cited in Jebran et al., 2019). This motive is based on the idea that individuals and firms hold cash to meet their regular expenses, such as the purchase of goods and

services, and paying salaries, bills, and other financial transactions. Holding cash based on a transaction motive reflects the need for liquidity to support ongoing economic activities and ensure efficient transactions. According to Bates et al. (2009) firms have become better at managing their operations and transactions throughout the years, which has led to a decrease in the need to hold excess cash based on a transaction motive.

The Precautionary Motive

The precautionary motive concerns keeping readily available cash on hand to cover unexpected expenses caused by for instance a financial crisis. This motive is based on the idea that having readily available cash can provide financial security and help firms and individuals to navigate and protect for future uncertain events without relying on increasing debt or selling assets. Maintaining a cash buffer based on a precautionary motive helps individuals and firms to better manage a financial crisis when cost of capital can be relatively high (Opler et al., 1999; Bates et al., 2009; Bukalska & Maziarczyk, 2023). Previous research highlights the advantages of holding cash based on a precautionary motive when unexpected events occur. However, there are also some drawbacks such as the cost of missing out on potential investment opportunities or the risk of decreased purchasing power due to inflation.

The Speculative Motive

The speculative motive is closely tied to expectations about the future market conditions and investment opportunities. This motive is based on the idea of individuals' or firms' desire to take advantage of fluctuations in asset prices or market trends with a goal of generating investment returns (Shiau et al., 2018, as cited in Bukalska & Maziarczyk, 2023). Individuals or firms may choose to hold cash or liquid assets to be able to invest when interest rates are low, such as during the COVID-19 pandemic, opening for growth and expansion. However, holding cash based on a speculative motive also carries risks, as market conditions can be unpredictable, and investments may not always yield the desired results.

2.2.3 Financial Theories and Cash Holding Policies

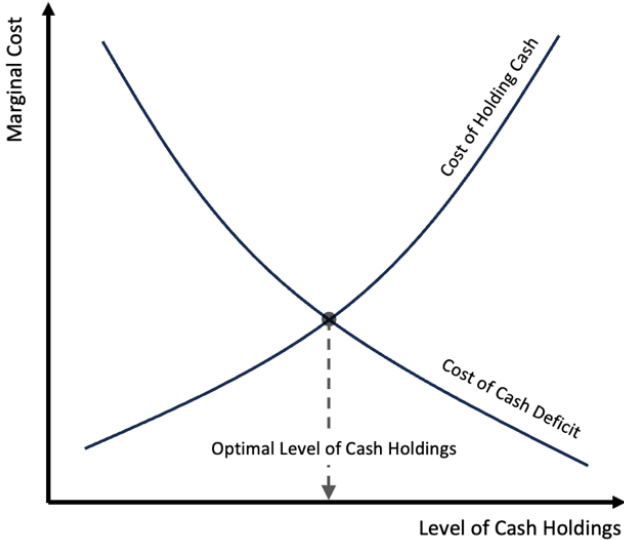
Motives to hold cash are one thing, but they do not alone explain firm's policies for holding cash, and they do not tell us how much they should hold. A firm's level of cash holdings is a non-trivial decision as neither too much nor too little cash is optimal (Opler et al., 1999; Jebran et al., 2019). While cash can help firms remain independent from the capital markets, holding excess cash is costly in the form of opportunity costs and possible tax disadvantages

(Opler et al., 1999). On the other side, there is a cost to not holding enough cash in the form of the cost of raising new funds when needed. There is no agreement on how much cash a firm should hold (Jebran et al., 2019), but there are several financial theories used to explain cash holding policies. The most important and widely used ones are the trade-off theory and the pecking order theory (Alves, 2018; Jebran et al., 2019; Batuman et al., 2022). These theories will now be explained in detail.

The Trade-Off Theory

The trade-off theory suggests an optimal level of cash based on the trade-off between the costs and benefits of holding cash (Kim et al., 1998; Opler et al., 1999, as cited in Alves, 2018; Batuman et al., 2022). The theory is that the marginal cost of holding cash increases when the amount of cash increases, while the marginal cost of not holding cash increases when the amount of cash decreases (Figure 2.3). On the one hand, the cost of holding cash increases with the level of cash held because of the alternative cost associated with low rates of return on cash as opposed to more valuable investment opportunities. On the other hand, the cost of not holding enough cash increases the less cash you have because of the cost associated with raising new funds (Opler et al., 1999). Hence, the trade-off theory claims that firms hold cash at a level where the marginal cost reaches its marginal benefit (Opler et al., 1999; Jebran et al., 2019; Batuman et al., 2022). According to Opler et al. (1999) firms should hold cash at this level to maximize shareholder wealth, and while the authors find evidence that firms adjust their cash holdings towards this level, they also find that firms that do well hold more cash than expected.

Figure 2.3
The Trade-Off Theory

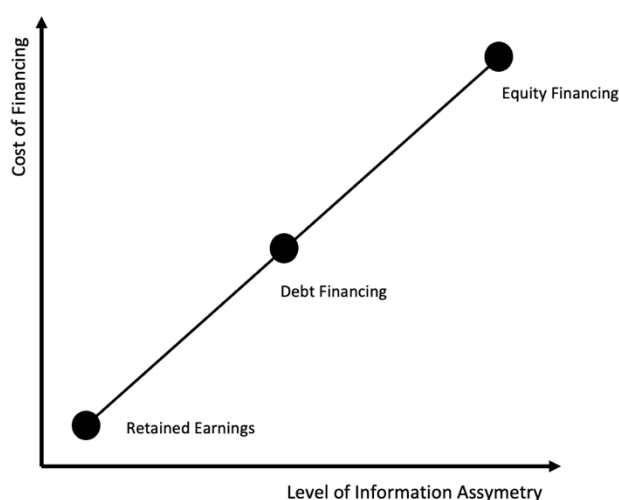


The Pecking Order Theory

Alternatively to the trade-off theory, the pecking order theory suggests that there is no optimal level of cash. Rather, firms prefer financing their business using internal funds over external funds due to information asymmetry (Myers & Majluf, 1984, as cited in Opler et al., 1999; Jebran et al., 2019; Batuman et al., 2022). Information asymmetry exists when management holds private information about the firm that is not available to outsiders. Such information asymmetry makes it harder and more expensive to raise funds since external investors want to make sure their investments are not overpriced, and the less information they get, the higher returns they would expect (Opler et al., 1999). There are three levels of financing associated with this theory: retained earnings, debt, and equity, and for each level, the cost of financing increases with the level of information asymmetry (Opler et al., 1999) (Figure 2.4). Internal funds, such as retained earnings, are a firm's first and best choice of financing since it does not need to disclose any information to the public. The firm can simply choose to spend their saved-up cash on what they want and when they want. However, when internal funds are not enough, e.g. when firms wish to expand beyond what they can afford, their second choice is debt financing. Debt financing is more expensive than using retained earnings, but cheaper than equity. This is because debt issuers such as banks, while wanting a safe return on their investment, are obligated to not disclose any information they learn about the business to the public. Equity financing is viewed as a last resort when other financing options are not available. This is because when issuing equity potential investors will demand information about the investment, which might be a risk factor for the firm as it has to release private information. Additionally, issuing new equity might signal to the market that the firm's stock is overvalued or that managers lack confidence in the firm's future prospects (Myers & Majluf, 1984 as cited in Opler et al., 1999).

Figure 2.4

The Pecking Order Theory



Information Asymmetry and Agency Cost of Managerial Discretion

As mentioned earlier, to maximize shareholder value, the trade-off theory explains how firms should hold cash at the level where the marginal cost and marginal benefit intersect (Figure 2.3). However, managers may choose to hold excess cash to pursue their own objectives at shareholder expense (Opler et al., 1999). Managers may hold excess cash (1) because they are risk averse, (2) to be able to pursue their own objectives that the capital markets would not be willing to finance, and (3) because they don't want to make payouts to shareholders, but rather choose to invest (Opler et al., 1999). Point 3 is only a problem when there are no good investment opportunities, which may lead managers to invest in unprofitable projects. When there are good investment opportunities this is not a problem, as investing in good projects are in line with shareholder objectives (Opler et al., 1999).

2.2.4 How the COVID-19 Pandemic Affected the Norwegian Economy

The COVID-19 pandemic had a significant impact on the Norwegian economy, as it did on economies worldwide. The pandemic led to disruptions in global supply chains, reduced consumer demand, reduced workforce, and restrictions in travel and business operations, all of which contributed to economic challenges (Holden & Wulfsberg, 2021). Many industries experienced a sharp decline in activity, leading to big income losses for numerous firms. A key factor in this downturn was the announcement on March 12th, 2020, of a lockdown aimed at mitigating the rising number of infections (NOU, 2021: 6, p. 133). This lockdown triggered a negative shift in consumer behavior, highlighting the impact of individuals' stress and fear on the economy (NOU, 2021: 6, p. 67). By January 2020, oil prices had dropped by approximately 20%, where the finance department indicated that Norway would be particularly affected by the decline in oil prices (NOU, 2021: 6, p. 427). The GDP of Norway fell by 145 billion NOK, which is 4.7% lower than estimated before the pandemic (Fredriksen, 2021). Further, the main index on Oslo Stock Exchange had a value of NOK 942,89 on the 20th of February 2020 before the crash and fell to NOK 639,05 March 16th (Nordnet, 2024).

Supply and Demand

The supply and demand curves in Norway were affected differently across industries during the COVID-19 pandemic. Overall, there was a negative shift in both supply and demand due to lockdowns and reduced economic activity (Holden & Wulfsberg, 2021). Other measures implemented by the government and the central bank of Norway also influenced the dynamics of this shift. When certain goods disappear and it becomes impossible to purchase them, the realized demand for such goods also disappears. The limitation of purchasing certain goods can increase the demand for other goods, or it can lead to an increase in

savings, but this can be referred to as forced savings (Mehlum & Torvik, 2020). During the period from December 2013 to November 2016, the annual increase in cash deposits ranged between 5.5% and 8.6%. In March 2020, after the lockdown was implemented, Norwegian households significantly increased their cash deposits. In April 2020, the total amount of cash deposits was 1.461 billion NOK. As we entered the second year of the pandemic the cash deposits decreased (Brynestad et al., 2021).

Unemployment Rates

Norway has a lower unemployment rate than the EU. However, the unemployment rate grew more significantly than in the EU when the COVID-19 measures were implemented (Statistics Norway, 2022). Several of these measures influenced production in certain industries, such as shutdowns of kindergartens, hairdressers, restaurants, dentists, schools, and universities. The lockdown thus resulted in a larger amount of capital and labor becoming inactive. In a short period of time after the lockdown, almost 300.000 employees were terminated, which is an increase of over 10% (Holden & Wulfsberg, 2021). Higher unemployment rates generate lower wage growth resulting also in lower inflation. The pandemic created an increase in unemployment rates as well as fewer jobs being created. Calculations revealed that Norway's activity level by the end of March was 14% lower than in the beginning of the same month (Bougroug & Sletten, 2020, as cited in Holden & Wulfsberg, 2021).

Interest Rates

The changes in the international supply and demand curve had a significant effect on the Norwegian economy as well and led to unusual and large fluctuations in the exchange rate by a sharp decrease of 25% against the Euro in March 2020 (Holden & Wulfsberg, 2021). The central bank of Norway's most important tool to handle such downfalls is through the policy rate to generate stable price growth and the overall development of the Norwegian economy. In an attempt to reduce the ongoing downfall in the economy, the central bank of Norway decided to reduce the policy rate to a historic low of zero percent in the spring of 2020 to stimulate the economy (Bank of Norway, 2021). The intention was to improve the liquidity situations for firms and households affected by income losses, to stimulate the investments and the housing prices and to reduce a persistently high unemployment rate.

Inflation

At the outbreak of the pandemic, inflation was close to the inflation target, indicating that the Norwegian economy was reasonably balanced (Holden & Wulfsberg, 2021). The central bank of Norway aims to maintain stable resource utilization and provide economic stability in

the long term through an inflation target of two percent (Bank of Norway, 2020). As the pandemic led to a decrease in demand because of the lockdown it further led to lower GDP and inflation rates. As a response to this the central bank of Norway reduced the interest rate to stimulate the economy by giving easier access to cash and to generate greater economic activity.

2.3 Hypotheses and Sub-Research Questions

2.3.1 How a Crisis Affects Cash Holdings

Even though the global financial markets operate well most of the time, it is not perfect, and from time-to-time experience events that leads to global financial distress and gets labeled as a financial crisis (e.g. the 2000 dot-com crisis, the 2008 credit crisis, and the 2020 COVID-19 pandemic). While all crises are unique in their own way, previous studies have made a solid effort to understand how such crises affect firms' cash holdings. The lockdown at the beginning of 2020 led to an increased demand for liquidity for firms affected by the crisis (Acharya & Steffen, 2020) and led to the largest liquidity demand by firms ever documented (Li et al., 2020, as cited in Acharya & Steffen, 2020). This is in line with the precautionary motive, and several studies find that cash holdings increase during or after such crises (e.g. Alves, 2018; Acharya & Steffen, 2020; Hoang et al., 2022; Yu et al., 2022; Zhou et al., 2022; Bukalska & Maziarczyk, 2023; Chung et al., 2023). Conversely, some studies find that cash holdings decrease in such periods (e.g. Jebran et al., 2019; He et al., 2022), and some find this reduction to be short lived before returning to normal rather quickly (e.g. Chung et al., 2023). One argument for the increased cash holdings is that when it becomes more difficult for firms to replace cash, they tend to build up cash as a precautionary motive (Alves, 2018; He et al., 2022). Then, when the market recovers and firms have better access to new cash the need for cash holdings decreases (Alves, 2018). Another argument is that firms predict an increase in the cost of external financing in the future which could lead to inefficient investments (Deng & Yao, 2021; He et al., 2022). This as well supports the precautionary motive as firms hedge themselves for uncertainties in the future. Increased cash holdings are also a result of firms delaying investments in times of uncertainty (Ingersoll & Ross, 1992; Julio & Yook, 2012; Kang et al., 2014; Gulen & Ion 2016; Kim & Kung, 2017; Barrero et al., 2020, as cited in Hoang et al., 2022).

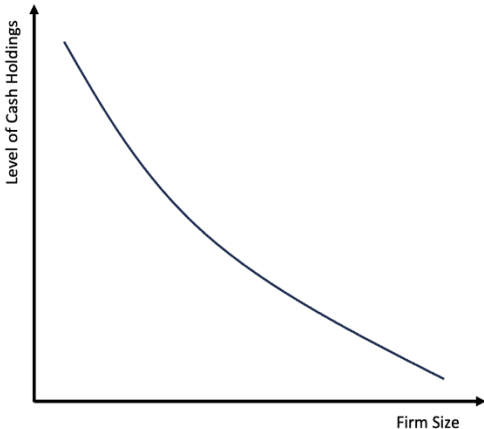
During the COVID-19 pandemic, firms' cash holdings were found to increase as their exposure to COVID-19 increased, suggesting that firms increase their cash holdings to protect themselves from future uncertainty (Hoang et al., 2022). However, Hoang et al. (2022) found this relation to be nonlinear and that cash holdings were eventually reduced if the firm's exposure to COVID-19 reached a certain level. This effect was found to be stronger for firms with less cash to begin with. Conversely, He et al. (2022) found COVID-19 to negatively affect firms' cash holdings, but only for financially constrained firms and non-global firms. This suggests that changes in a firm's cash holdings depend on different firm specifics, and to get a more nuanced understanding of how the COVID-19 pandemic affected Norwegian firms we need to take a closer look at the different determinants of cash holdings. There are many determinants of cash holdings, but according to Batuman et al. (2022) firm size, cash flow, debt leverage, and debt maturity are among the most important ones.

Firm Size

Firm size is found to be negatively related to cash holdings as larger firms often have greater access to the capital market and therefore hold less cash (Opler et al., 1999; Bates et al., 2009), indicating a weaker precautionary motive for larger firms (Figure 2.5). Smaller firms are found to hold more cash for the opposite reason as well as their cost of external financing potentially being higher (Opler et al., 1999; Bates et al., 2009). Conversely, Batuman et al. (2022) find that larger firms have higher cash holdings than smaller firms because they are more diversified and therefore are more likely to hold cash to finance their operations. This is in line with the transaction motive. Following Opler et al. (1999) and Bates et al. (2009) we expect firm size to be negatively related to cash holdings.

Figure 2.5

The Expected Relationship Between Firm Size and Cash Holdings



Further, firm size is found to be negatively related to financial constraints (Chavez, 2017). Financially constrained firms are defined as those with a reduced capacity to obtain external financing and therefore need to rely more on cash flows and cash holdings to finance their business (Bukalska & Maziarczyk, 2022). These financially constrained firms tend to hold more cash (Almeida et al., 2004; Lian et al., 2011, as cited in Lozano & Yaman, 2020; Batuman et al., 2022). This is because it is too difficult or too expensive for them to finance by increasing their debt. However, Bukalska & Maziarczyk (2023) finds the opposite and explains this on how constrained firms spend their available cash flow on investment projects as opposed to building a cash reserve.

During a crisis, financially constrained firms' access to new capital is further reduced and are expected to hold more cash as a precautionary motive (Almeida et al. 2004, as cited in Lozano & Yaman, 2020). In line with this, Lozano & Yaman (2020) find that financially constrained firms during the 2008 financial crisis first increased their cash holdings before being reduced the following period as uncertainty decreased. During the first quarter of 2020 Acharya & Steffen (2020) also found financial constrained firms to increase their cash holdings, further supporting a precautionary motive. This leads to our first hypothesis.

Hypothesis 1a: Firm size is negatively related to cash holdings.

Hypothesis 1b: During the COVID-19 pandemic the relative change in cash holdings are greater for smaller firms.

Cash Flow

A firm's cash flow is calculated as the ratio of EBIT (earnings before interests and tax) to total assets (Batuman et al., 2022), and is found to be positively related to cash holdings (Opler et al., 1999; Horioka & Terada-Hagiwara, 2014) (Figure 2.6). This means that when cash flow increases, so does cash holdings, and vice versa. This is because the more (less) profitable a firm is, the more (less) it requires cash to finance its own transactions (Alves, 2018). This is in line with the transaction motive. As lockdown took place in the beginning of 2020 many businesses' cash flows were negatively affected as demand was significantly reduced or halted completely (e.g., restaurants, transportation, etc.). Conversely some firms experienced an increased cash flow due to increased demand (e.g., communication services such as Zoom). Cash flows are previously found to decrease during a crisis before significantly increasing post-crisis (Jebran et al., 2019). Such changes in cash flow are expected to have a positive effect on changes in cash holdings and are bigger and more

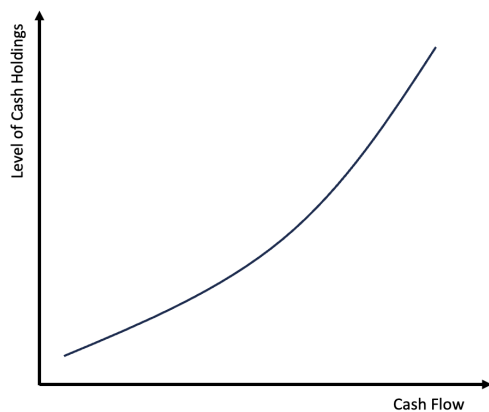
significant for smaller and presumably more constrained firms (Horioka & Terada-Hagiwara, 2014). This leads to our second hypothesis.

Hypothesis 2a: *Cash flow is positively related to cash holdings.*

Hypothesis 2b: *During the COVID-19 pandemic the effect cash flow has on cash holdings is more significant for smaller firms.*

Figure 2.6

The Expected Relationship Between Cash Flow and Cash Holdings



Debt Leverage

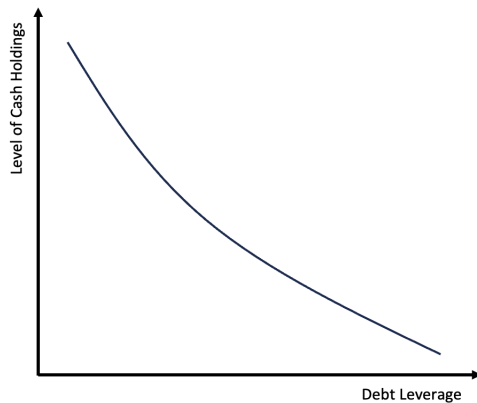
A firm's debt leverage is defined as the ratio of debt to total assets and is found to be negatively related to cash holdings (Batuman et al., 2022) (Figure 2.7). This means that as debt increases cash holdings decrease (Baskin, 1987, as cited in Batuman et al., 2022). One explanation for this is that firms with higher levels of debt experience greater monitoring from financial institutions (Ferreira & Vilela, 2004, as cited in Batuman et al., 2022). During the COVID-19 pandemic Chinese firm's debt leverage was found to negatively affect their cash holdings, where cash holdings decreased more for firms with higher debt leverage than low leverage firms (Xu & Jin, 2022). However, when looking at the 2008 financial crisis, Jebran et al. (2019) found debt leverage to affect cash holdings only post-crisis. This leads to our third hypothesis.

Hypothesis 3a: *Debt leverage is negatively related to cash holdings.*

Hypothesis 3b: *During the COVID-19 pandemic this effect is more significant for high debt leverage firms.*

Figure 2.7

The Expected Relationship Between Debt Leverage and Cash Holdings



Debt Maturity

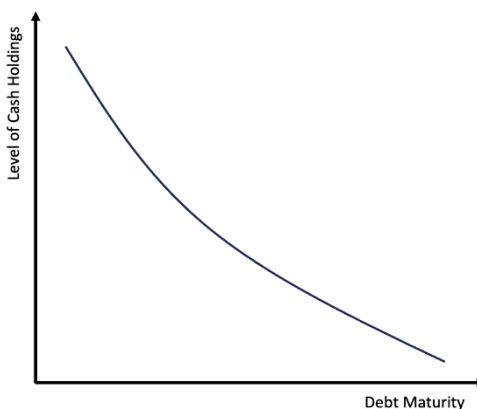
Debt maturity is defined as a firms' short-term debt as a ratio of total debt and is suggested to be negatively related to cash holdings as firms use short-term debt as a substitute for cash (Ferreira & Vilela, 2004; Ozkan & Ozkan, 2004, as cited in Batuman et al., 2022) (Figure 2.8). This means that the more short-term debt a firm has as a ratio to its total debt, the less cash holdings it has. Conversely, firms with a high debt maturity may be motivated to hold more cash to avoid defaulting on their loans (García-Teruel & Martínez-Solano, 2008, as cited in Batuman et al., 2022). This leads to our fourth hypothesis.

Hypothesis 4a: *Debt maturity is negatively related to cash holdings.*

Hypothesis 4b: *During the COVID-19 pandemic changes in cash holdings are greater for high debt maturity firms.*

Figure 2.8

The Expected Relationship Between Debt Maturity and Cash Holdings



Research and Development

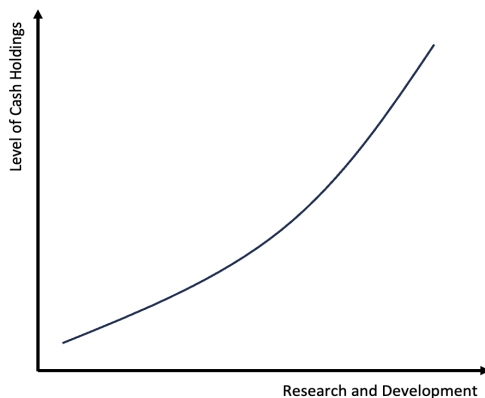
Firms with high research and development expenditures (R&D) are expected to have higher cash holdings to reduce the need to raise external funds (Opler et al., 1999; Batuman et al., 2022) (Figure 2.9). Additionally, firms with greater growth opportunities tend to hold more cash (Opler et al., 1999; Lian et al., 2011, as cited in Batuman et al., 2022). This is to avoid a possible cash shortage and having to pass on good investment opportunities (Batuman et al., 2022), as well as being influenced by the need for information asymmetry. This is in line with the speculative motive and the pecking order theory. This leads to our fifth hypothesis.

Hypothesis 5a: *Research and development expenditures are positively related to cash holdings.*

Hypothesis 5b: *During the COVID-19 pandemic the relative change in research and development expenditures has a negative effect on cash holdings.*

Figure 2.9

The Expected Relationship Between Research and Development and Cash Holdings



Dividends

Firms that pay dividends often do so based on last year's performance, meaning that the actual profits from prior year (e.g. 2019) is the basis for dividend payouts the current year (e.g. 2020). These firms are found to hold more cash to make sure they can continue their dividend payments even when cash flow is reduced (Ozkan & Ozkan, 2004, as cited in Batuman et al., 2022), and to avoid signaling bad news to the market (Lindén et al., 2023). This leads us to expect a positive relation between dividends and cash holdings (Figure 2.10). While there are firms that don't deviate from their established dividend patterns in fear of signaling bad news to the market, the severity of the pandemic is still visible through the retained earnings of 2019 at the expense of dividend payouts in 2020 (Lindén et al., 2023).

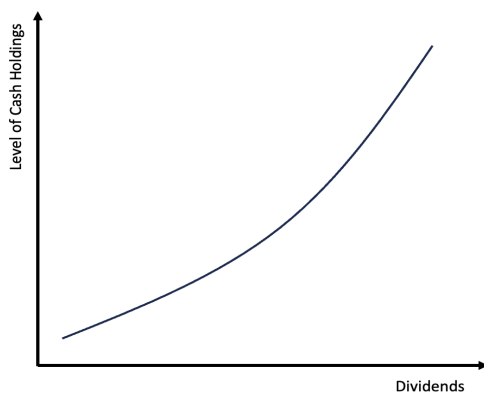
Lindén et al. (2023) found that dividends were reduced in 2020 and suggest that these changes could help explain how decision-makers perceived the severity of the COVID-19 pandemic. This leads to our sixth hypothesis:

Hypothesis 6a: *Dividends are positively related to cash holdings.*

Hypothesis 6b: *During the COVID-19 pandemic firms that continue to pay dividends reduce their cash holdings.*

Figure 2.10

The Expected Relationship Between Dividends and Cash Holdings



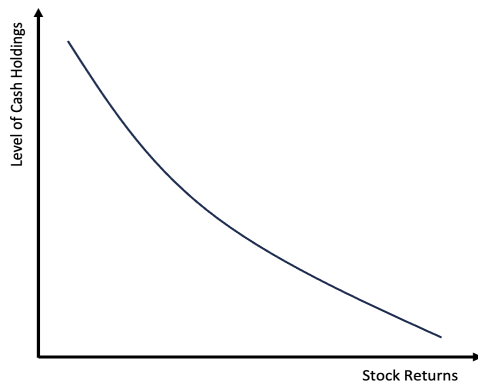
Stock Returns

Stock returns are found to have a negative effect on cash holdings, and firms whose stock returns were negatively impacted by the COVID-19 pandemic were found to increase their cash holdings as a precautionary motive (He et al., 2022) (Figure 2.11). An example of firms whose stock returns were negatively impacted by the COVID-19 pandemic are firms in the field of tourism. An example of firms whose stock returns were positively impacted by the COVID-19 pandemic are pharmaceutical firms working on vaccine development. This leads to our seventh hypothesis:

Hypothesis 7: *Stock returns are negatively related to cash holdings.*

Figure 2.11

The Expected Relationship Between Stock Returns and Cash Holdings



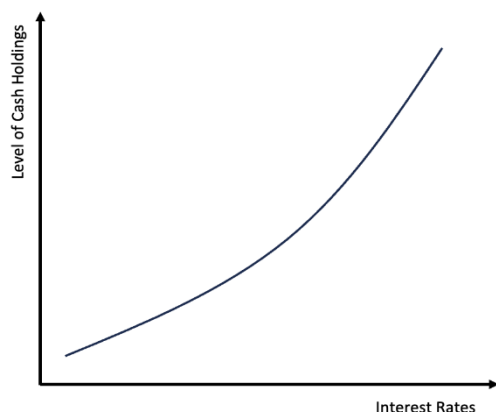
Interest Rates

Interest rates are an important tool the central banks can use to lead the economy a certain way. In response to the COVID-19 pandemic changes in interest rates were made by the central banks to stimulate the economy. Such fast and unexpected changes in monetary policies are positively related to cash holdings, and more pronounced during times of crisis (Deng & Yao, 2021). A restrictive monetary policy leads firms to hold more cash, while a less restrictive policy leads firms to hold less cash (Deng & Yao, 2021) (Figure 2.12). The lowered interest rates at the beginning of 2020 are therefore expected to lead to a decrease in firms' cash holdings as their cost of financing is reduced and their precautionary motive weakened (Chung et al., 2023). The increased interest rates following the pandemic are expected to have the opposite effect on firms' cash holdings. This leads to our eighth hypothesis:

Hypothesis 8: *Interest rates are positively related to cash holdings.*

Figure 2.12

The Expected Relationship Between Interest Rates and Cash Holdings



2.3.2 How a Crisis Affects Risk Tolerance

Individuals' risk tolerance is highly relevant for various financial decision-making processes, such as savings and investments (Schooley & Worden, 2016; Sakha, 2019; Heo, et al. 2021). It is therefore important to not just understand how a financial crisis affects cash holdings, but also how a financial crisis affects individuals' risk tolerance. According to Arrow (1951, as cited in Saivasan & Lokhande, 2022) the core of every economic activity involves risk and the related human response. The theory of making choices when faced with risk says that the main challenge is dealing with the constantly changing economic environment (Saivasan & Lokhande, 2022). This makes it difficult to understand how individuals respond to uncertain economic events. In traditional economic theory it is assumed that risk tolerance is stable or fixed over time and is unaffected by experience (Jetter et al., 2020; Tsutsui & Tsutsui-Kimura, 2022). However, recent studies find evidence that risk tolerance can be affected by experiences with uncertain economic events (e.g. Guiso, 2012; Schooley & Worden, 2016; Hu et al., 2019; Sakha, 2019; Sun et al., 2019; Gu et al., 2023). Kahneman and Tversky (1973, as cited in Schooley & Worden, 2016) argue that individuals tend to give more importance to information and events that they can easily remember. This often results in decisions being influenced by recent news or dramatic and unexpected events such as the COVID-19 pandemic (Schooley & Worden, 2016).

During a crisis like the COVID-19 pandemic the economic fluctuations can present financial challenges for some and investment opportunities for others. One argument is how a financial crisis affects risk tolerance through individuals' emotional responses, such as stress and fear (Guiso, 2012; Jetter et al., 2020; Tsutsui & Tsutsui-Kimura, 2022). An example is how unemployment rates following the COVID-19 pandemic resulted in decreased well-being, which negatively affected risk tolerance (Guiso, 2012; Jetter et al., 2020).

Interestingly, evidence shows that individuals who experienced constant stress during the COVID-19 pandemic, became more willing to take risks because of getting used to repeated stress (Tsutsui & Tsutsui-Kimura, 2022). Another argument is that firms that are already in a vulnerable position before facing such crises (e.g. highly leveraged firms) has a heightened risk of bankruptcy (Sun et al., 2019). This can lead some managers to be risk averse and choose safer options to navigate through a crisis and increase cash holdings, supporting a precautionary motive (Guiso, 2012; Schooley & Worden, 2016; Atallah et al., 2022; Hoang et al., 2022). This is in line with Hypothesis 3 and Hypothesis 4.

Conversely, Sun et al. (2019) argue that some individuals view crises as an opportunity rather than a threat, supporting a speculative motive. During crises such as the COVID-19 pandemic, interest rates are reduced to stimulate the economy, and thus opens for investment opportunities. This allows some firms to utilize resources saved up in stable times, and for instance invest in research and development and innovation efforts (Leppäo & Ritala, 2022). This is in line with Hypothesis 5 and Hypothesis 6. However, when fear of bankruptcy occurs, some managers are risk tolerant to safeguard the future of the firm and for instance choose to invest or pay out dividends (Greve, 2003, as cited in Sun et al., 2019). As mentioned earlier such decisions are most likely based on either growth opportunities or market signaling. These findings lead to our first sub-research question:

Sub-Research Question 1: Which motives to hold cash did managers in Norwegian firms have during the COVID-19 pandemic?

While evidence shows that risk-averse managers perform better than risk tolerant managers during a time of crisis, they perform worse during normal periods, as they potentially forgo possible value creating investment opportunities (Gu et al., 2023). The negative consequences of a crisis such as the COVID-19 pandemic influence individuals' ability to adapt to future uncertain events (Hu et al., 2019), which can help explain individuals' leniency towards a precautionary motive and risk-averse behaviors. This is in line with Hypothesis 8. This further raises questions on the impact of a crisis on individuals' risk tolerance. Some are risk-tolerant while others are risk-averse during a crisis, where evidence suggests that such changes in risk-tolerance are most likely to persist once the economy returns to normal conditions (Guiso, 2012). This leads us to our second sub-research question:

Sub-Research Question 2: To what degree have managers in Norwegian firms changed their risk tolerance towards future crises?

Measuring risk tolerance can be a challenging task (Sakha, 2019; Tsutsui & Tsutsui-Kimura, 2022). Previous research has focused on experiments and presented different dilemmas regarding savings, investments, dividends, and debt, in questionnaires to understand a crisis' impact on financial decisions, using changes in these decisions to interpret individuals risk tolerance (e.g. Guiso, 2012; Sakha, 2019; Huber et al., 2021; Saivasan & Lokhande, 2022). Since such types of financial decisions in a firm are reflected in different accounting data, a possibility is to analyze the changes in e.g. cash holdings, debt, research and development,

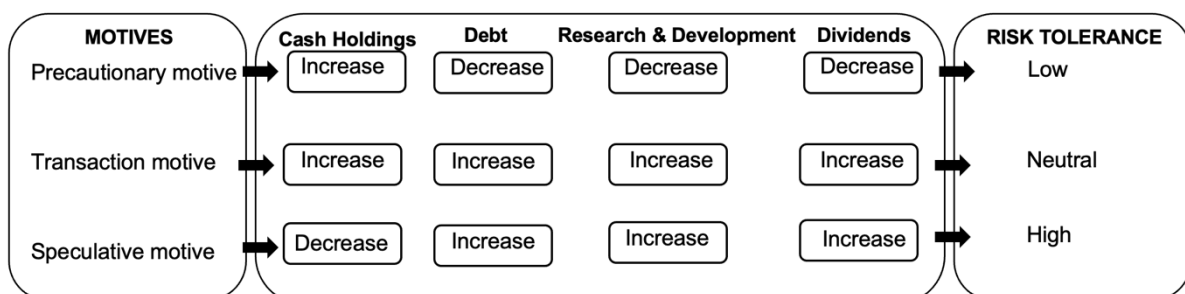
and dividends during and after the pandemic. This can provide an indication of changes in managers' risk tolerance.

An increase in cash holdings during the COVID-19 pandemic, in combination with a decrease in debt, research and development or dividends, can indicate that managers are risk averse and that their risk tolerance is affected by the pandemic. Further, an increase in cash holdings in combination with an increase in debt, research and development, or dividends could also be explained by an increase in cash flow and can therefore indicate that managers' risk tolerance is not affected by the pandemic and that the decisions are based on a transaction motive. Conversely, a decrease in cash holdings, in combination with an increase in debt, research and development or dividends, can indicate that managers are risk tolerant.

However, looking at these accounts alone does not provide us with the background of what these decisions are based on. Therefore, a possibility is to ask managers directly if the decisions are a response of the COVID-19 pandemic or not. If the decisions are a response to the COVID-19 pandemic and based on the precautionary motive, it can indicate that managers are risk averse as a result of the pandemic. If the decisions are not a response to the pandemic and based on the transaction motive, it indicates no change in managers risk tolerance during the pandemic. If the decisions are a response to the pandemic and based on the speculative motive, it indicates that managers are risk tolerant as a result of the pandemic. The relationship between the underlying motives to hold cash and risk tolerance is illustrated in Figure 2.13.

Figure 2.13

The Relationship Between the Underlying Motives to Hold Cash, Changes in Financial Accounts, and Risk Tolerance



3 Research Methodology

Note: For the remainder of this master's thesis, we will refer to Study 1 and Study 2.

Study 1 concerns the topic of how the COVID-19 pandemic affected cash holdings.

Study 2 concerns the topic of how the COVID-19 pandemic affected risk tolerance.

To best answer our research questions, as presented in Section 1, it is integral to choose a suitable research strategy, research design, and research method (Bell et al., 2019). In Subsection 3.1 we present our chosen research strategy, design, and method. Subsection 3.2 concerns Study 1. Subsection 3.3 concerns Study 2. Subsection 3.4 covers quality criteria and research ethics.

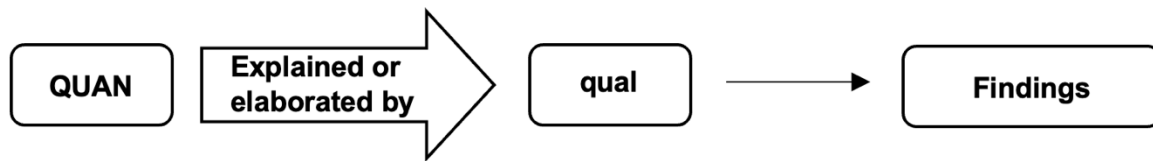
3.1 Strategy and Design

Selecting a suitable research strategy is important as it guides the choices of design and methods to be used. The research strategy acts as a roadmap for the entire master's thesis (Bell et al., 2019). This includes reflecting critically on our research perspective to best find out how we are going to address our research questions.

All research builds upon a foundation of implicit philosophical assumptions. These assumptions enable us to think about how to study the topic of interest (Bell et al., 2019, p. 26). The topic of interest in this master's thesis is to find what effect the COVID-19 pandemic has had on firms' cash holdings and managers' risk tolerance. This indicates an ontological assumption with an objectivistic position because the topic of interest is external and beyond our influence (Bell et al., 2019). This type of philosophical assumption is in line with the quantitative research strategy. For Study 1 we developed hypotheses based on previous research, which represents a deductive approach between the relationship between theory and research (Bell et al., 2019). For the Study 2 we developed research questions based on previous research findings, which represents a deductive approach but with an interpretivist position (Bell et al., 2019). This together is carried out through mixed-methods research using an explanatory sequential design (Figure 3.1).

Figure 3.1

Mixed-Method Research: Explanatory Sequential Design



Note: adapted from Bell et al. (2019, p. 573)

The explanatory sequential design involves collecting and analyzing quantitative data and collecting and analyzing qualitative data in order to explain or elaborate the quantitative findings (Bell et al., 2019). The need for this approach arises as accounting data alone does not provide sufficient information to explain changes in managers risk tolerance. It is however the quantitative portion of this master's thesis that is the priority.

3.2 Study 1

3.2.1 Sample and Data

The main data for Study 1 is firm specific accounting data gathered from Proff Forvalt (www.forvalt.no) using a license we have access to through our employer. Proff Forvalt is a database collecting and distributing annual accounting data from all Norwegian firms subject to accounting. The total number of businesses with data available to us at the time of writing is more than one million, so we had to introduce some limitations. By only focusing on industrial firms officially registered no later than 01.01.2018 we narrowed the number of firms down to 19.726. This is necessary due to both time constraints and limits on how much data we are allowed to download in a certain period of time. Our license only allows us to download data for 10.000 firms every 24 hours, therefore our dataset was downloaded over the span of 48 hours. We decided to focus on industrial firms because we find it to be an interesting sector as it is affected by many different factors connected to import, export, material- and labor cost, supply- and demand issues etc. It is also the fifth biggest sector in Norway in terms of the number of people employed and fourth biggest in terms of gross product as of 2023 (Statistics Norway, 2023). Further we have excluded any firms registered later than 01.01.2018 as we wish to only include firms who have operated for at least two

years prior to the COVID-19 pandemic. Our selected time period for data analysis is the latest ten years of available data. At the time of writing the latest complete set of accounting data available to us is from 2022, our ten-year period is therefore from 2013 to 2022. This period is also the furthest back in time we have access to through Proff Forvalt. We argue that this time spanning seven years prior to the COVID-19 pandemic is sufficient to establish a *normal* period that allows us to analyze changes from 2020 to 2022 as the *crisis-* and *post crisis* period.

Additional data collected for Study 1 is data on stock returns and interest rates. *Stock return* is the annual average value of the Oslo Stock Exchange main index (OSEBX). This was done by downloading a dataset containing daily closing values for OSEBX for the time period 03.05.2013-31.12.2022 from Yahoo Finance (finance.yahoo.com). This dataset was then used to create a pivot table in Excel showing the average closing value for each year (Appendix C). *Note:* the starting date of 03.05.2013 was the farthest back we were able to go in the Yahoo Finance database, but we argue that the remaining data for this year, 03.05.2013-31.12.2013, is sufficient as we are operating with averages. *Interest rate* is the annual average policy rate of the central bank of Norway, gathered directly from their website (Bank of Norway, 2023).

3.2.2 Tools, Models, and Variables for Analysis

To analyze the data, we have conducted an ordinary least squares (OLS) panel regression analysis (Figure 3.2). This method allows us to analyze the relationship between different independent variables and one dependent variable and allows us to make some suggestions as to which independent variables affect the dependent variable and to what degree (Dougherty, 2016). Additionally, we have analyzed the data using descriptive statistics. Specifically, we have analyzed the data using a combination of IBM SPSS Statistics version 29.0.1.0 and Microsoft Excel version 16.83. To be able to analyze the data from Proff Forvalt in SPSS using regression analysis we have restructured the data from *wide form* to *long form*. In *wide form* years are displayed in columns while in *long form* years are displayed in rows. This was done using the restructure function in SPSS.

Figure 3.2

Linear Regression Model

$$Y = \beta_0 + \beta_n X + \delta + \varepsilon$$

Note: Y represent the dependent variable; β_0 represent the constant, β_n represent the beta estimating the coefficient; X represent the independent variable; δ represent the dummy variable, and ε represent the residual variable.

Dependent Variable

Our dependent variable is *cash holdings* (CH). It is important to note that going forward we are deviating from the traditional definition of cash holdings as presented in Section 2.2.1. This is because in our dataset a big portion of investments are categorized as *other investments*. Since we are unable to know for sure to what degree these investments are liquid, we exclude them from the term *cash holdings* and choose to focus only on actual bank deposits. Therefore, our definition of cash holdings is the ratio of bank deposits to total assets. Using a ratio as opposed to actual cash value allows us to compare firms of different sizes.

Independent Variables

Our independent variables are Firm Size (SIZE), Cash Flow (CF), Debt Leverage (LEV), Debt Maturity (MAT), Research and Development (R&D), Dividends (DIV), Stock Returns (STOCK), Interest Rates (RATE), and Time of Crisis (CRISIS) (Table 3.1).

Table 3.1*Variables, Their Definition and Expected Effect on Cash Holdings*

Variable	Definition	Expected effect on cash holdings
Cash Holdings (CH)	Cash deposits / total assets	
Firm Size (SIZE)	Natural logarithm of total assets	Negative
Cash Flow (CF)	EBIT / total assets	Positive
Debt Leverage (LEV)	Total debt / total assets	Negative
Debt Maturity (MAT)	Short term debt / total debt	Negative
Research and Development (R&D)	R&D / total assets	Positive
Dividends (DIV)	Dividends / total assets	Positive
Stock Return (STOCK)	Annual average value of Oslo Stock Exchange	Negative
Interest Rate (RATE)	Annual average policy rate of Bank of Norway	Positive
Time of Crisis (CRISIS)	Dummy taking the value of 1 in the year 2020 and the value of 0 all other years	Negative

Firm Size, Cash Flow, Debt Leverage, Debt Maturity and Dividends are calculated in line with previous research (e.g. Batuman et al., 2022).

Research and Development is calculated as its ratio to total assets in the same manner *Dividends* is calculated.

Stock Return is the annual average value of the Oslo Stock Exchange main index (OSEBX) (Figure 3.3).

Interest Rate is the annual average policy rate of the central bank of Norway (Bank of Norway, 2023) (Figure 3.4).

Figure 3.3

The Annual Average Value of Oslo Stock Exchange Main Index from 2013 to 2020

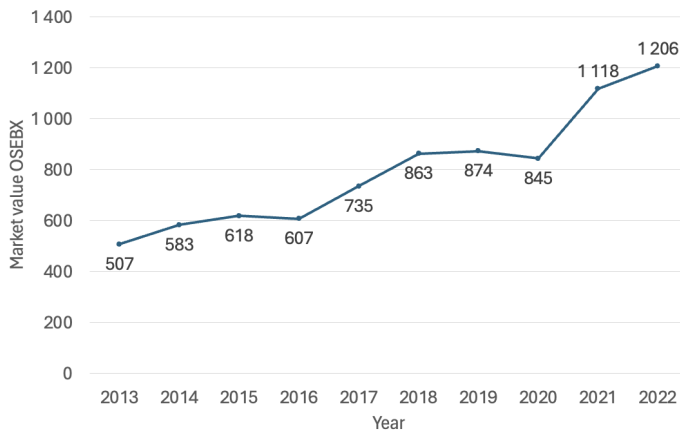
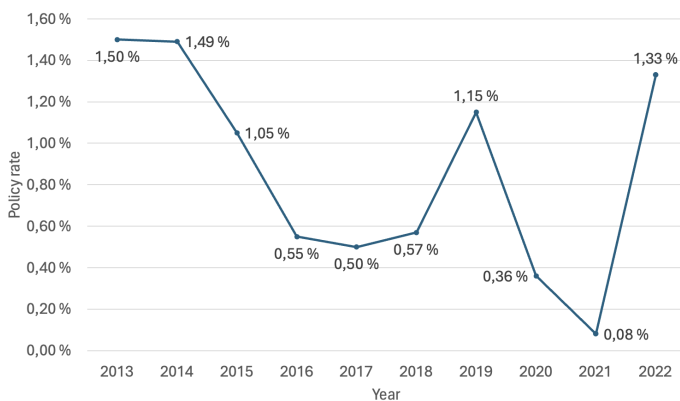


Figure 3.4

The Annual Average Policy Rate from 2013 to 2022



Time of Crisis is a dummy variable taking the value of 1 the period identified as a time of crisis, and 0 otherwise. Determining if a time period qualifies as a time of crisis is subjective and is therefore important to define. Bukalska & Maziarczyk (2023) identify the year 2020 as a time of crisis while Chung et al. (2023) identifies the years 2020 and 2021 as a time of crisis. We have chosen to identify the year 2020 as a time of crisis, based on the information that the main index on Oslo Stock Exchange had a value of NOK 942,89 on the 20th of February 2020 before the crash, but exceeded this value already on the 27th of November the same year with a value of NOK 946,30 (Figure 3.5). Alternatively, we could define the time of crisis as the period between the 20th of February 2020 and the 16th of March as this was the period where the index on Oslo Stock Exchange crashed to its lowest to a value of NOK 639,05 before increasing again. However, this would be too short of a time period to

use in our analysis as our main data is year-end accounting data, and not month-to-month data.

Figure 3.5

Changes in Oslo Stock Exchange Main Index in 2020



Note: screenshot from www.dn.no/investor

This leads to our panel regression model for cash holdings (Figure 3.6):

Figure 3.6

Panel Regression Model for Cash Holdings

$$\begin{aligned} CH = & \beta_0 + \beta_1 SIZE + \beta_2 CF + \beta_3 LEV \\ & + \beta_4 MAT + \beta_5 R\&D + \beta_6 DIV \\ & + \beta_7 STOCK + \beta_8 RATE \\ & + \delta CRISIS + \varepsilon \end{aligned}$$

3.3 Study 2

3.3.1 Sample, Data and Method for analysis

Study 2 is divided into a quantitative and a qualitative part. The data used in the quantitative part are from the same dataset used in Study 1, and the data used in the qualitative part are from a self-completion questionnaire with open-ended questions. Our sample was gathered by focusing only on industrial firms in Vestfold with a revenue of more than 5 million NOK in 2022, which initially gave us a result of 272 firms. These limitations were due to both time constraints and based on the priority of this portion of this master's thesis. To find relevant contact information we explored websites of the 272 firms until we reached an amount that felt satisfactory for this portion of the master's thesis. We specifically looked for names and e-mail addresses for individuals in key positions such as managers, CEO's and CFO's. This was to make sure we reach individuals that have knowledge about the firm's financial statements and were able to answer the questions in the questionnaire. We finally ended up with 17 firms that had the desired contact information and sent out an invitation for the self-completion questionnaire through email (Appendix D). We ended up with 6 agreeing to participate, but only 4 responses were received.

The self-completion questionnaire with open-ended questions consists of three parts, each providing information in order to interpret the changes in managers' risk tolerance. The *first* part of the self-completion questionnaire has the purpose of capturing the attitudes at the *beginning* of the COVID-19 pandemic. We ask specific questions about the firm's response at the beginning of the pandemic, and in what way they were prepared. To analyze this, we look at the language provided by the respondents. Positive language towards the crisis can indicate that the managers were prepared enough to handle the crisis, and that they did not view it as a threat. This can strengthen the indication of risk-tolerant or risk-neutral managers. On the other hand, negative language towards the crisis can indicate that the managers were not prepared enough to handle the crisis and that they viewed it as a threat. This can strengthen the indication of risk averse managers. This way of analyzing language is in qualitative research referred to as discourse analysis, where the emphasis lies on versions of the respondent's reality in relation to the studied context (Bell et al., 2019).

The *second* part of the self-completion questionnaire has the purpose of strengthening our interpretation of the accounting data for the four firms. We first analyze the accounting data focusing specifically on cash, debt, investments and dividends in the period from 2018 to 2022. Where 2018 represents the time period before the COVID-19 pandemic, and 2022 represents the time period after the COVID-19 pandemic. After analyzing the changes in the different accounts, we then analyze the responses from the questionnaire. The way we interpret changes in risk tolerance through accounting data is provided in Subsection 2.3.3.

The *third* and last part of the self-completion questionnaire has the purpose of capturing the manager's attitudes *after* the COVID-19 pandemic. We analyze the changes in the specific accounts in 2022 and ask questions about whether changes were made as a result of the COVID-19 pandemic with the intention to better handle a new possible crisis. Based on the interpretations on the accounting data, we can strengthen our interpretations further by the answers provided by the respondents. Where positive language can strengthen the interpretation of managers being risk tolerant, and negative language can strengthen the interpretation of managers being risk averse in the period after as a result of the COVID-19 pandemic.

3.4 Quality Criteria and Research Ethics

Validity and Reliability

The quality of the data material is important to assess in all research projects (Bell et al., 2019). When the data material is of high quality, there is a greater likelihood that the research question is accurately reflected. It is common to assess the data material through criteria related to reliability and validity (Bell et al., 2019). Because this is a mixed methods study it is recommended to address the reliability and validity for each strategy separately (Creswell & Creswell, 2018).

The reliability of the quantitative data collection is linked to the accuracy of the recorded data (Creswell & Creswell, 2018). The data are publicly available from Proff Forvalt, meaning that the findings can be replicated and verified by other researchers. On the other hand, the qualitative data collection can be more difficult to replicate as these are self-completion questionnaires with open-ended questions developed specifically to each firm based on their accounting data. This together means that the study has some degree of reliability, but that the qualitative portion of the study diminishes this to some extent. A common way to increase

the validity of the qualitative portion can be to give the respondents the opportunity to review the analysis, to ensure that we as researchers have interpreted the answers correctly (Creswell & Creswell, 2018). We have chosen to not do this due to time constraints and the reduced priority of this part of the master's thesis.

The weakness of the qualitative study can be argued to be the relatively low number of respondents. We did not get the opportunity to proceed with physical interviews which were initially planned, and the sample was less than what might have been satisfactory. We therefore need to consider that the answers would have had larger variations if it would have been a larger sample. But this would however not affect the interpretations of managers' risk tolerance.

Research Ethics

Considering ethical issues involves protecting the research participants to uphold the integrity of the research and to prevent misconduct and falsification that could impact their organization (Creswell & Creswell, 2018). In this study we have an interpretive approach, indicating minimal interaction in the data collection processes. The only way of interaction is through the self-completion questionnaires, but these were carefully developed as our goal was to only gather information about their experience and decisions during and after the COVID-19 pandemic. The respondents were promised full anonymity and that all the data would be erased as soon as the study is over. In this way the responses can never be traced back to the individuals who participated.

4 Results

In this section we present the results from our analyses. In Subsection 4.1 we present the results from Study 1. In Subsection 4.2 we present the results from Study 2.

4.1 Study 1

The following results surrounding Study 1 on cash holdings are presented using a combination of descriptive statistics and panel data regression analysis. All findings are based on longitudinal data from 2013 to 2022. Presented in Table 4.1 we see the results for each of the variables included in the analysis. In total, we have achieved an R value of 0.622 and an R Squared value of 0.387. Meaning that the variables in the model explain almost 40% of the changes in cash holdings. This is the combination of variables that gave us the highest R and R Squared values.

Table 4.1

Regression Analysis Results

		Coefficients ^a				
Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.783	.079		9.865	<.001
	Firm Size	-.062	.005	-.590	-13.533	<.001
	Cash Flow	.069	.025	.147	2.798	.005
	Debt Leverage	-.043	.016	-.142	-2.753	.006
	Debt Maturity	.109	.038	.123	2.831	.005
	R&D	-.130	.155	-.034	-.838	.403
	Dividends	.251	.103	.108	2.428	.016
	Stock Return	.000	.000	-.009	-.202	.840
	Interest Rate	-.016	.022	-.032	-.711	.478
	Time of Crisis	.014	.031	.020	.465	.642

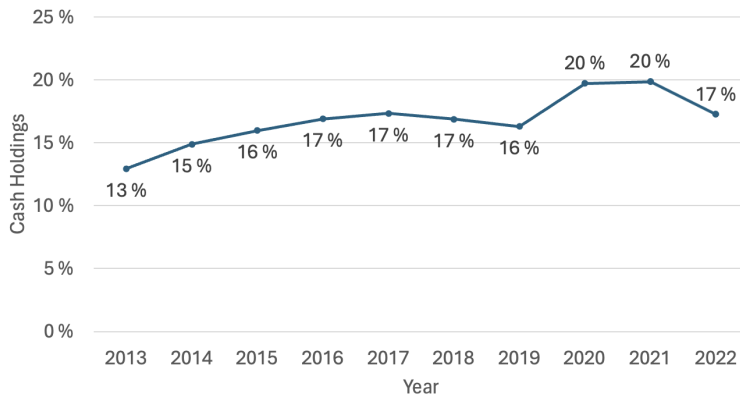
a. Dependent Variable: Cash holdings

Note: R = .622, R Squared = .387

In general, we find that the median value of *cash holdings* was relatively stable from 2013 to 2019, leading up to a sharp increase in 2020 following a decrease in 2022 (Figure 4.1).

Figure 4.1

Median Cash Holdings from 2013 to 2022



Regarding *firm size*, we find it to be negatively related to cash holdings (Table 4.1), meaning that bigger firms have lower cash holdings than smaller firms in terms of its relative value. These findings are statistically significant at the < 0.001 level.

We find *cash flow* to be positively related to cash holdings (Table 4.1), meaning that the higher a firm's earnings the higher its cash holdings. We find the Beta for this variable to be positive at 0.069, meaning that if cash flow (EBIT/assets) increase by one percent, cash holdings are expected to increase by 0.069%. These findings are statistically significant at the 0.005 level.

Looking at *debt leverage*, we find it to be negatively related to cash holdings (Table 4.1). This means that the higher a firm's debt leverage, the lower its cash holdings. We find the Beta for this variable to be negative at -0.043, meaning that if debt leverage (debt/assets) increase by one percent, cash holdings are expected to decrease by 0.043%. These findings are statistically significant at the 0.006 level.

Concerning *debt maturity*, we find it to be positively related to cash holdings (Table 4.1). This means that the more short-term debt a firm has, as a ratio to long term debt, the higher its cash holdings. We find the Beta for this variable to be positive at 0.109, meaning that if debt maturity (short debt/total debt) increase by one percent, cash holdings are expected to increase by 0.109%. These findings are statistically significant at the 0.005 level.

We find some indication that *research and development* is negatively related to cash holdings (Table 4.1). This would mean that the higher a firm's research and development

expenditures, the lower its cash holdings. We find the Beta for this variable to be negative at -0.13, indicating that if research and development (research and development/assets) increased by one percent, cash holdings are expected to decrease by 0.013%. However, these findings are not statistically significant.

We find *dividends* to be positively related to cash holdings (Table 4.1). This means that the higher a firm's dividends the higher its cash holdings. We find the Beta for this variable to be positive at 0.251, meaning that if dividends (dividends/assets) are increased by one percent, cash holdings are expected to increase by 0.251%. These findings are statistically significant at the 0.016 level.

We find no evidence suggesting that *stock returns* affect cash holdings (Table 4.1). These findings are not statistically significant.

We find some indication that *interest rates* are negatively related to cash holdings (Table 4.1). We find the Beta for this variable to be negative at -0.016, indicating that if interest rates are increased by one percent, cash holdings are expected to be reduced by 0.016%. However, these findings are not statistically significant.

We find some indication that our dummy variable *time of crisis* has a positive effect on cash holdings. We find the Beta for this variable to be positive at 0.014, indicating that cash holdings increased by 1.4% during 2020. However, these results are not statistically significant.

4.2 Study 2

The following results surrounding Study 2 are presented using a combination of descriptive statistics, changes in accounting data, and the received responses of the four firms. Table 4.2 provides an overview of the changes in the different accounts for the four firms from 2018 to 2022.

Table 4.2

Changes in Financial Accounts from 2018 to 2022

Firm	Cash holdings	Long-term debt	Short-term debt	Dividends
A	Increase	Decrease	Decrease	Increase
B	Increase	Decrease	Decrease	Increase
C	Decrease	Increase	Decrease	No change
D	Decrease	Decrease	Increase	-

Note: to ensure anonymity we refer to the different firms as A, B, C and D.

Cash

From Figure 4.2 we see a large increase in the median value of cash from 2019 to 2020. Table 4.2 shows the changes in cash holdings for the four firms. Firm A and B increased cash holdings, whereas firm C and D decreased cash holdings. From the received responses we find that firm A and B increased cash holdings based on normal liquidity fluctuations, and that it was not in relation to the COVID-19 pandemic. Firm D decreased cash holdings, where the respondent highlighted that it was not directly in relation to the COVID-19 pandemic but rather an effect of a decrease in revenue. We therefore also analyzed the changes in cash flow, and found, as shown in Figure 4.3, a large increase in the median value of cash flow from 2019 to 2020.

Figure 4.2

Median Value of Cash from 2013 to 2022 (in thousands)

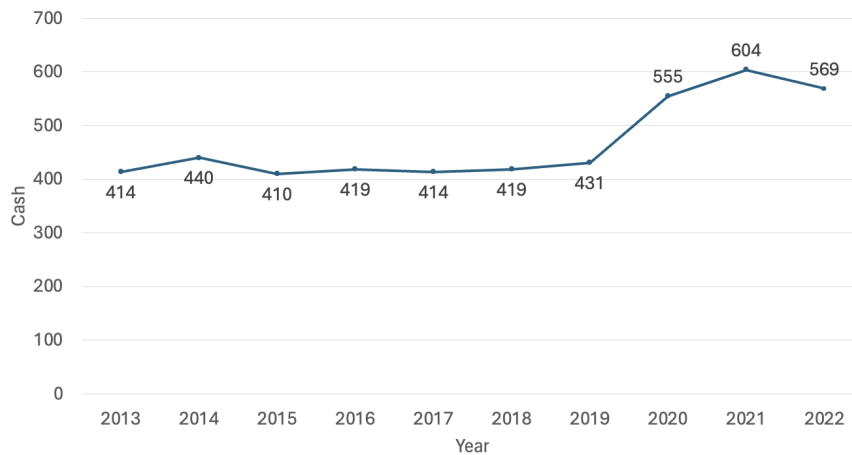
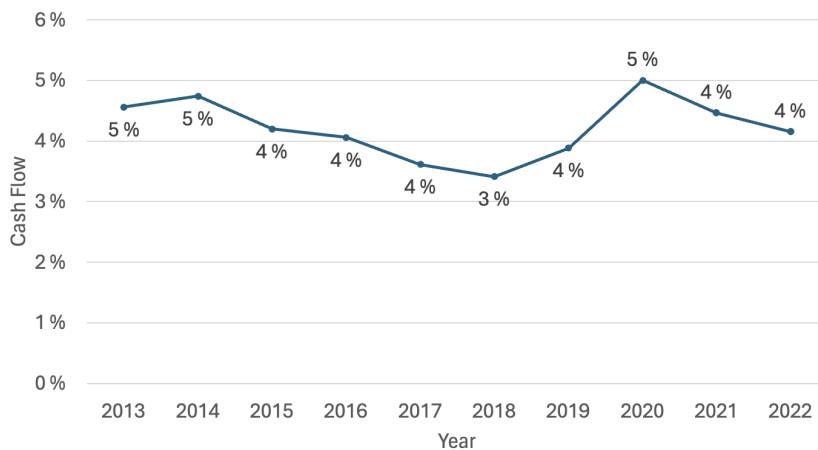


Figure 4.3

Median Cash Flow from 2013 to 2022



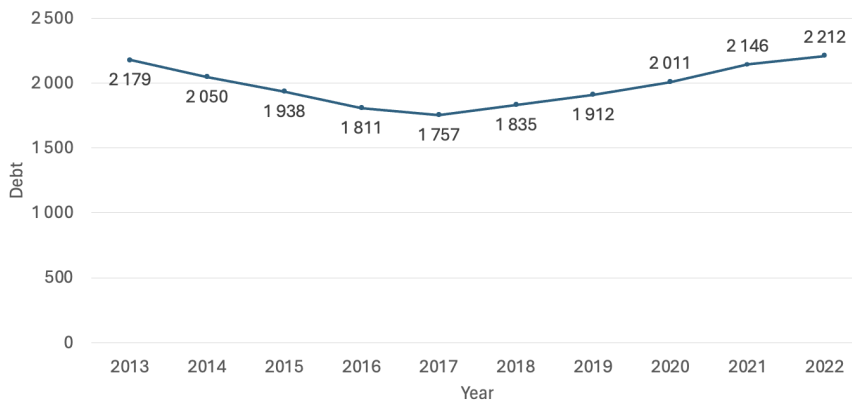
Debt

From Figure 4.4 we see a slight increase in the median value of total debt from 2019 to 2020. Conversely, the results from Table 4.2 shows us that firm A and B experienced a decrease in total debt. The received responses from these two firms highlight that the decrease is due to other financial obligations such as costs associated with new investments and costs associated with inventory. Further we see an increase in long-term debt for firm C, and an increase in short-term debt for firm D. From the received responses we find that firm C has increased investments during 2020 explaining the increase in long-term debt. Firm D

highlights that there have been some changes with the financing strategy, and that normal liquidity fluctuations are the reasons for the increase in short-term debt.

Figure 4.4

Median Debt from 2013 to 2022 (in thousands)

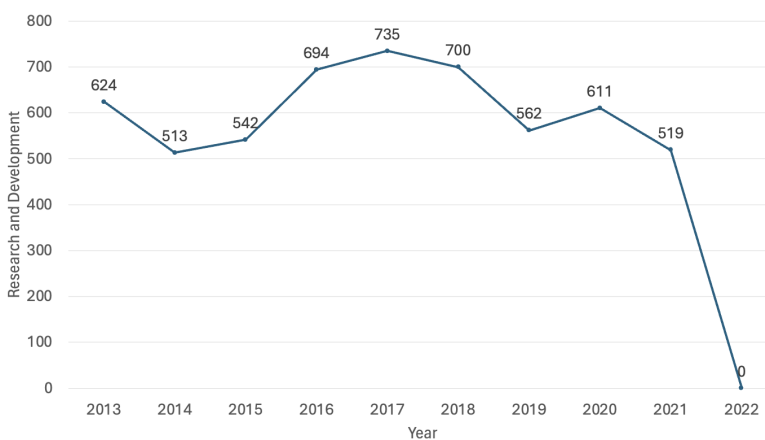


Research and Development

From Figure 4.5 we see an increase in the median value of research and development expenditures from 2019 to 2020. Specifically, we find a nine percent increase in the median research and development expenditures in 2020 before a 15% decrease in 2021 and full reduction to zero in 2022. Unfortunately, we did not find any accounting data for the four firms. But we did receive responses indicating that investments were made during the pandemic.

Figure 4.5

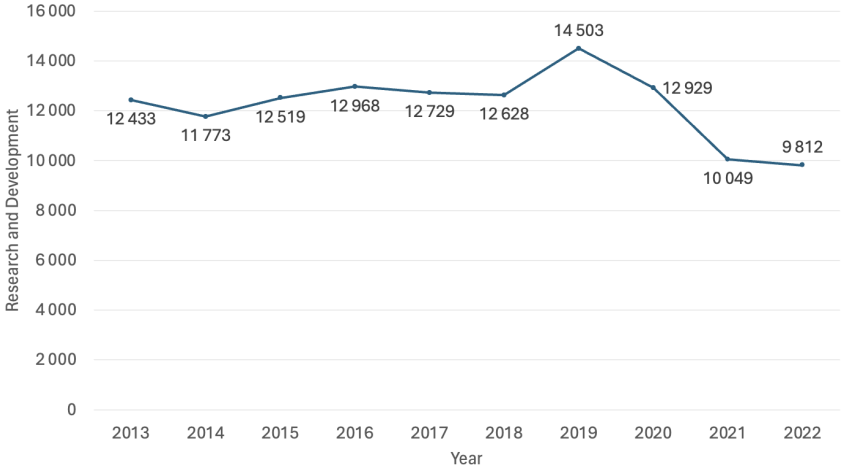
Median Research and Development Expenditures from 2013 to 2022 (in thousands)



We acknowledge that the median value of 0 in 2022, as presented in Figure 4.5, might be an error due to faulty data. To try to alleviate this we have also analyzed research and development by looking at average values as opposed to median values and find that while there was a large increase in 2019 there is an equally large decrease the following years, as shown in Figure 4.6.

Figure 4.6

Average Research and Development Expenditures from 2013 to 2022 (in thousands)

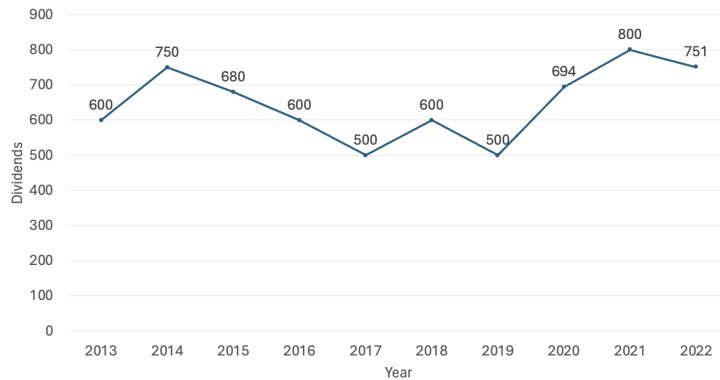


Dividends

From Figure 4.7 we see an increase in the median value of dividend payouts from 2019 to 2020. We further see an increase in 2021 before a reduction in 2022. One could speculate that the median values are skewed as a result of a potential reduction in the number of firms paying dividends in the years from 2020 to 2022, but in our dataset the number of firms paying dividends are relatively stable and even increase in 2020.

Figure 4.7

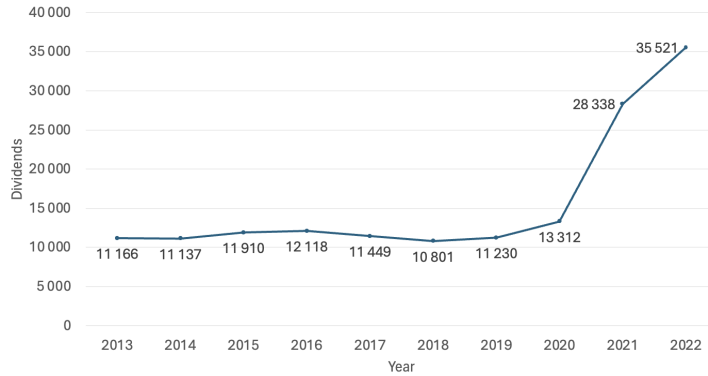
Median Dividend Payouts from 2013 to 2022 (in thousands)



Looking at average values from Figure 4.8 we also find a significant increase in dividend payouts in 2020. From Table 4.2, only firms A, B and C paid dividends in this period. The received responses highlight that this is not in relation to the COVID-19 pandemic, but rather the increase in revenue, which can also be highlighted from the findings regarding cash flow.

Figure 4.8

Average Dividend Payouts from 2013 to 2022 (in thousands)



5 Discussion

In this section we discuss our main findings, and to what degree these are in line with previous research and theory. In Subsection 5.1 we present our theoretical contribution. In Subsection 5.2 we present our managerial contributions. In Subsection 5.3 we present the weaknesses of this master's thesis and our suggestions for future studies.

Before continuing we would like to remind you of our thesis statement and research questions as presented in Section 1.

Thesis Statement: *How has the COVID-19 pandemic affected cash holdings and managers' risk tolerance in Norwegian industrial firms?*

Research Question 1: *To what degree has cash holdings changed in Norwegian industrial firms during and after the COVID-19 pandemic?*

Research Question 2: *To what degree has the COVID-19 pandemic had an effect on Norwegian managers' risk tolerance?*

5.1 Theoretical Contribution

5.1.1 Study 1

As presented in Section 4.1 we find an increase in *cash holdings* in 2020 before a decrease in 2022 (Figure 4.1). This is in line with previous findings (e.g. Alves, 2018; Acharya & Steffen, 2020; Hoang et al., 2022; Yu et al., 2022; Zhou et al., 2022; Bukalska & Maziarczyk, 2023; Chung et al., 2023) and supports a precautionary motive. However, as presented in Section 4.2 we find a similar increase and decrease in *cash flow* in the same period (Figure 4.3) supporting a transaction motive. This means that it is uncertain if the changes we see in cash holdings are a result of managers being risk averse or simply a result of changes in cash flow.

Our findings surrounding *firm size* agree with the previous findings of Opler et al. (1999) and Bates et al. (2009) further supporting a precautionary motive. These findings support the notion that bigger firms have a lower precautionary motive as a result of having greater access to the capital markets, and therefore they are not as dependent on retained earnings as smaller firms. Additionally, our findings disagree with the findings of Batuman et al. (2022) rivaling a transaction motive. According to Batuman et al. (2022) larger firms hold more cash because they have higher transaction costs than smaller firms. We find no indication of this being the case. These findings give us support for Hypothesis 1a: Firm size is negatively related to cash holdings. However, we were unable to find support for Hypothesis 1b.

Our findings on *cash flow* are in line with the previous findings of Opler et al. (1999) and Horioka & Terada-Hagiwara (2014), and further support Alves et al.'s (2018) notion that more profitable firms require more cash to finance their operations. Additionally, as discussed in Section 4.2 we find that cash flow increased in 2020 before being reduced the following two years (Figure 4.3). This disagrees with the findings of Jebran et al. (2019) who suggest the opposite happens during and after a time of crisis. This further enhance the idea that the changes we see in cash holdings might be a result of a transaction motive as opposed to a precautionary motive. These findings give us support for Hypothesis 2a: Cash flow is positively related to cash holdings. However, we were unable to find support for Hypothesis 2b.

Our findings regarding *debt leverage* are in line with Batuman et al. (2022) and supports Ferreira & Vilela's (2004, as cited in Batuman et al., 2022) notion that firms with higher debt leverage experience greater monitoring from financial institutions and therefore hold less cash. This is in line with the pecking order theory and supports the idea that retained earnings is a cheaper option of financing compared to debt- and equity financing. Additionally, looking back at the trade-off theory as described in Section 2.2.3 (Figure 2.3), higher leveraged firms would exist below the optimal level of cash on the X-axis relative to lower leveraged firms, demonstrating the cost of a cash deficit. These findings give us support for Hypothesis 3a: Debt leverage is negatively related to cash holdings. However, we were unable to find support for Hypothesis 3b.

Our findings on *debt maturity* disagrees with the findings of Ferreira & Vilela (2004, as cited in Batuman et al., 2022) and Ozkan & Ozkan (2004, as cited in Batuman et al., 2022), but supports the findings of García-Teruel & Martínez-Solano (2008, as cited in Batuman et al., 2022). We find that debt maturity is positively related to cash holdings which might indicate

that firms possibly use short-term debt as a speculative or precautionary motive. However, we find it more likely a result of accounts payable being a part of short-term debt resulting in firms with higher accounts payable holding more cash as a transaction motive. These findings do not give us support for Hypothesis 4a: Debt maturity is not negatively related to cash holding. Additionally, we were unable to find support for Hypothesis 4b.

According to Opler et al. (1999) and Batuman et al. (2022), firms with higher *research and development* expenditures are expected to have higher cash holdings to reduce the need to raise external funds. This is in line with the speculative motive and the pecking order theory. However, we find no statistical difference between firms with high, low, or no research and development expenditures. A plausible explanation for this could be that firms with research and development expenditures invest it continuously, supporting the trade-off theory, rather than accumulating cash as a speculative motive. We find no evidence supporting Hypothesis 5a or Hypothesis 5b.

We find *dividends* to be positively related to cash holdings, which is in line with Ozkan & Ozkan (2004, as cited in Batuman et al., 2022) and Lindén et al. (2023). However, while Lindén et al. (2023) found a decrease in dividends as cash flow decreased in 2020, we see an increase in dividends as cash flow increased in the same period. These findings give us support for Hypothesis 6a: Dividends are positively related to cash holdings. However, we were unable to find support for Hypothesis 6b.

We find no statistical evidence supporting Hypothesis 7 or Hypothesis 8. This indicates that neither stock returns nor interest rates had any significant impact on the cash holdings of the firms in our dataset.

Lastly, we find no indication that the year 2020, as represented by a dummy variable, had any significant effect on cash holdings. This further leads us to believe that the main reason for the changes we see in cash holdings are a result of changes in cash flow, further supporting the transaction motive.

5.1.2 Study 2

The increased *cash holdings* during the COVID-19 pandemic indicates, based on previous research, risk aversion and is in line with the precautionary motive (Guiso, 2012; Schooley & Worden, 2016; Atallah et al., 2022, Hoang et al., 2022). We find that two of four firms increased cash holdings, where the respondents highlight that this increase is not in relation

to the COVID-19 pandemic. This indicates that the pandemic has not affected managers' risk tolerance. We further find a decrease for the other 2 firms, who highlight that the decrease is not in relation to the pandemic, but rather a regular decrease in revenue. This also indicates that the pandemic has not affected managers' risk tolerance. We did find an increase in cash flow, which can help explain the increase in cash holdings for some firms. Analyzing the received responses, indicates that these decisions are based on the transaction motive, meaning that they hold cash in order to meet regular expenses (Opler et al., 1999; Jebran et al., 2019). This further strengthens the indication that managers risk tolerance was not affected by the COVID-19 pandemic.

Further, we find an overall increase in total debt during the COVID-19 pandemic. However, we find that two of four firms decreased debt in this period. A combination of decreased debt and increased cash holdings could indicate that managers are risk averse (Guiso, 2012; Schooley & Worden, 2016; Ataulloh et al., 2022; Hoang et al., 2022). The respondents highlight that the decreased debt is based on costs associated with regular financial obligations, and that the decisions are not in relation to the COVID-19 pandemic. This indicates that managers' risk tolerance is not affected by the COVID-19 pandemic and that their decisions are based on the transaction motive. Interestingly, we find that one of the firms increased long-term debt, due to increased investments in 2020, supporting a speculative motive. We also see a decrease in cash holdings for this particular firm, further strengthening the interpretation that the decisions could be speculative, and that some managers are risk tolerant. For the last firm we find an increase in short-term debt, where the respondent highlights that the decision is not in relation to the COVID-19 pandemic, indicating that the managers risk tolerance has not been affected by the COVID-19 pandemic. However, such decisions viewed in combination with the decreased cash holdings, can indicate that these decisions are based on speculative motives and that the manager is risk tolerant.

The increase in *research and development* during the COVID-19 pandemic indicates, based on prior research, that managers are risk tolerant (Sun et al. 2019; Leppäo & Ritala 2022). We could assume that when managers are faced with a crisis such as the COVID-19 pandemic, a response could be that some view the crisis as an opportunity rather than a threat and therefore chooses to increase investments, which is in line with the speculative motive (Sun et al., 2019; Leppäo & Ritala, 2022). We do not obtain responses regarding investments, as results on research and development were not available to us. However, some of the responses highlight that investments increased during the pandemic. A

combination of increased investments with decreased cash holdings, further strengthens the indication that some managers are risk tolerant and that their decisions are based on speculative motives.

The increase in *dividends* during the COVID-19 pandemic indicates, based on prior research, that managers are risk tolerant (Sun et al., 2019). We could assume that when managers are faced with a crisis such as the COVID-19 pandemic a fear of bankruptcy occurs and therefore paying dividends as a market signal becomes an option (Sun et al., 2019). From the received responses, we find that two of the four firms increased dividends. The respondents highlight that the decisions are not in relation to the COVID-19 pandemic but rather is a result of increased profit. This is an indication that the decisions are based on the transaction motive, and that managers risk tolerance is not affected by the COVID-19 pandemic.

Analyzing the managers attitudes before and after the crisis can provide us with insights into their emotional responses of the COVID-19 pandemic (Guiso, 2012; Jetter et al., 2020; Tsutsui & Tsutsui-Kimura, 2022), which in turn can help explain the changes in managers' risk tolerance towards future crises. From the received responses we observed relatively positive language regarding the period before and after the pandemic, indicating that the respondents feel that the pandemic was handled in a satisfying way. On one hand, we can argue that managers have been through financial crisis before and know how to navigate through them (Guiso, 2012; Schooley & Worden, 2016; Hu et al., 2019; Sakha, 2019; Sun et al., 2019; Gu et al., 2023). On the other hand, we can argue that Norway's measures and guidelines were efficient for firms to better navigate through the pandemic. Our findings from Section 4.2 shows a decrease in the median value of cash, research and development, dividends, and cash flow in 2022. The interpretations drawn from the self-completion questionnaire in this period suggests that these results are primarily driven by the transaction motive and are not significantly influenced by the COVID-19 pandemic but rather related to cash flow, further indicating no financial change towards future crises and hence no change in managers risk tolerance.

In general, this suggests that managers risk tolerance in Norwegian industrial firms were not affected by the COVID-19 pandemic, and that their decisions are based on the transaction motive and even a little towards a speculative motive, indicating that they did not view the crisis as a threat. We further find no indication that managers have chosen to change their financial strategies towards future potential crises based on the impacts of the pandemic.

5.2 Managerial Contribution

This master's thesis contributes by providing valuable insights that can inform managers decision-making processes during a time of crisis. Understanding the impact of the COVID-19 pandemic on cash holdings and risk tolerance can help managers to adjust their financial strategies to ensure the firm's stability and strength during challenging times. Additionally, analyzing these factors can provide valuable insights for future crises. It offers an exchange of different experiences, where managers can learn both from their own and other firms' experiences.

While crises such as the COVID-19 pandemic typically have negative impacts, we find that industrial firms in Norway were not significantly affected by the crisis. The increased cash flow during the COVID-19 pandemic indicates that these firms did not face financial struggles. Further, the received responses indicate that managers' risk tolerance has not changed because of the pandemic, and that their decisions were primarily driven by the transaction motive. In general, this suggests that there is potential for increased investments to further strengthen their market position and drive sustainable growth. This is important to continue evolving to ensure ongoing success in the future. However, as financial theory suggests that there is no agreement of how much cash a firm should hold, it is crucially important to evaluate the pros and cons for holding excess cash during stable and challenging times.

5.3 Weaknesses and Future Studies

Any type of research of this size and magnitude produced on a time limit is bound to have its weaknesses and it is inevitable that you at some point run into problems that are either impossible to avoid or too late to fix.

One of the bigger problems discovered late in the process was how we failed to plan the analysis of Study 1 properly and therefore created hypotheses that we have not been able to answer. The regression model presented in Section 3.2.2 (Figure 3.5) works for answering questions regarding how endogenous variables such debt leverage and exogenous variables such as interest rates affect cash holdings. However, it fails to answer the questions regarding how *changes* in these variables affect cash holdings. For this we should have

designed a regression model that analyzes change rather than a number fixed in time. This would have let us analyze how different firms reacted to, and was affected by, the COVID-19 pandemic. This also would have let us say something about what type of firms handled the COVID-19 pandemic better or worse than others. This might be a result of us being too ambitious, not seeing the scope of this master's thesis until too late. One solution could be to go back and rewrite the hypotheses to adjust for this and to better suit our findings, but we wish to be transparent and acknowledge our errors where they occur.

A second weakness is in the quantitative data collected and our handling of it. While we did manage to collect an impressive amount of data, we are uncertain if this was the better approach. Many of the almost 20.000 firms in our dataset did not have complete records for all years and we failed to control and adjust for this. A better solution might have been for us to have been more rigorous in the selection process and opted for a smaller sample in exchange for a higher quality sample. This way we would have better control and could focus more on the quality of the work, and not its size. Additionally, our dataset consists of *year-end* accounting data and *annual average* data for stock returns and interest rates. A preferred option would be to analyze daily or monthly data, but unfortunately, we do not have access to such accounting data.

We have further evaluated the questionnaire and discovered that some of the questions could have been formulated differently and could have been handled more effectively. In part one and three the questions are relatively broad and general. These could have been formulated more precisely as we recognize that managers provide us with information that was not directly relevant to our research questions. Our aim was to understand their response regarding their financial position prior to the crisis, and this could have been highlighted more in the question. However, we are still able to get an indication of their attitudes in the beginning of the pandemic with the received answers. We also acknowledge that questions of this nature would have been more effective if conducted through a face-to-face interview or phone call, allowing for follow-up questions in case of misunderstandings. However, it would then have been crucial to consider the recording and transcription of such data and to ensure that there is sufficient time for such a process. In part two the received answers were sufficient to support our interpretations of the financial accounts and risk tolerance. While additional context and background information in the questions could have been helpful, it also increases the risk of introducing anchoring biases. We must be careful

when asking such types of questions to not lead the respondents, and this was one of the challenges we experienced when developing the questions.

Future Studies

How certain events affect changes in cash holdings is undoubtedly an interesting and important topic and can give us valuable insights that can help us prepare for and navigate uncertain events such as the COVID-19 pandemic. This master's thesis has only scratched the surface, and as indicated above there are many things that could, and should, be explored further. We encourage future studies to focus more specifically on *changes* during and after 2020 as well as studying a wider sample, not just one sector. Selecting a smaller sample, but across multiple sectors, would give us a better understanding of how different firms in different sectors handled the COVID-19 pandemic and how they should manage their cash holdings moving forward.

6 Conclusion

This master's thesis is motivated by the desire to understand the impact of the COVID-19 pandemic on Norwegian firms' cash holdings and managers' risk tolerance through answering the following research questions:

Research Question 1: *To what degree has cash holdings changed in Norwegian industrial firms during and after the COVID-19 pandemic?*

Research Question 2: *To what degree has the COVID-19 pandemic had an effect on Norwegian managers' risk tolerance?*

Regarding Research Question 1 we find an increase in cash holdings in our sample in the period during and after the COVID-19 pandemic, but not for the reasons we had initially thought. We expected to see an increase in cash holdings based on a precautionary motive and that firms were hoarding cash to safeguard themselves for uncertainty. Instead, we find that an unexpected increase in cash flow is the reason for the increased cash holdings supporting the transaction motive.

Regarding Research Question 2 we find no evidence that indicates any change in managers' risk tolerance during or after the COVID-19 pandemic. Rather, the risk tolerance has remained stable throughout the period, and the managers in our sample seem quite unfazed by the situation.

In summary we find little evidence suggesting that the COVID-19 pandemic has had any significant negative impact on Norwegian industrial firms' cash holdings or managers' risk tolerance.

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Appendix A

The Literature Search Process and Results

This appendix shows the exact search strings used and their results from each of the four databases (Table A1; Table A2).

Table A1

Search Strings Used

Search string 1 ("cash holdings" OR "liquidity reserves" OR "cash reserves") AND ("COVID-19" OR "financial crisis" OR "pandemic")
 Search string 2 ("COVID-19" OR "financial crisis" OR "pandemic") AND ("risk tolerance" OR "risk aversion" OR "risk appetite")
 Search string 3 ("cash holdings" OR "liquidity reserves" OR "cash reserves") AND ("risk tolerance" OR "risk aversion" OR "risk appetite")

Table A2

Search Results from Each Database

Search string	1	2	3
Academic Search Premier			
Initial findings	55	195	3
After applying search criteria	21	135	2
After reading title and abstract	6	6	1
After removing duplicates	6	5	0
Emerald			
Initial findings	1 324	6 918	343
After applying search criteria	74	156	11
After reading title and abstract	1	5	1
After removing duplicates		5	0
Scopus			
Initial findings	227	627	28
After applying search criteria	87	146	8
After reading title and abstract	19	9	6
After removing duplicates	9	6	3
Web of Science			
Initial findings	207	464	20
After applying search criteria	84	65	6
After reading title and abstract	16	9	3
After removing duplicates	13	9	3
Total			
Initial findings	1 813	8 204	394
After applying search criteria	266	502	27
After reading title and abstract	42	29	11
After removing duplicates	28	25	6
After reading full text	12	12	0

Appendix B

Literature Matrix

Table B1 (please refer next page) presents the articles used in our literature review. The first part of the table consists of articles on financial crises and cash holdings. The second part of the table consists of articles on financial crises and risk tolerance.

Table B1

Literature Matrix

Papers on Cash Holdings						
#	Publication	Purpose of the Study	Independent Variable	Dependent Variable	Method	Findings
1	Acharya, V. V. & Steffen, S. (2020). The Risk of Being a Fallen Angel and the Corporate Dash for Cash in the Midst of COVID. <i>The Review of Corporate Finance Studies</i> , 9 (3), 430-471. https://doi.org/10.1093/rcfs/cfaa013	Study changes in credit lines and changes in cash holdings in American firms during the C-19 pandemic	log(total assets), log(cash), leverage, M/B-ratio, CapEx/assets, R&D/sales, dividend dummy, loss dummy, financial rating indicators	log(cash/assets)	Quantitative	In the beginning of C-19 firms drew from credit lines and increased cash holdings. Later higher credit-rated firms switched to capital markets to raise cash
2	Alves, P. (2018). Abnormal retained earnings around the world. <i>Journal of Multinational Financial Management</i> , 46, 63-74. https://doi.org/10.1016/j.mulfin.2018.05.002	Evaluate firms' abnormal retained earnings surrounding the 2008 credit-line crisis.	Industry risk, dividends-to-assets, size, M/B-ratio, banking development, capital market development, gdp growth, shareholder rights	Retained earnings, cash holdings	Quantitative data from survey database covering 41 countries	Cash holdings increase but retained earnings decrease showing that CH is influenced by a precautionary motive while retained earnings are influenced by growth opportunities
3	Bates, T. W., Kahle, K. M., & Stulz, R. M. (2009). Why Do U.S. Firms Hold So Much More Cash than They Used To? <i>The Journal of Finance</i> , 64 (5), 1985-2021. https://doi.org/10.1111/j.1540-6261.2009.01492.x	Study changes in American firm' cash holdings from 1980-2006	M/B-ratio, size, CF/assets, NWC/assets, CapEx/assets, debt leverage, dividend dummy, R&D/sales,	Cash holdings	Quantitative	Document a large increase in cash holdings in the period and find the precautionary motive to be a critical determinant
4	Batuman, B., Yildiz, Y., & Karan, M. B. (2022). The impact of the global financial crisis on corporate cash holdings: Evidence from Eastern European countries. <i>Borsa Istanbul Review</i> , 22 (4), 678-687. https://doi.org/10.1016/j.bir.2021.10.002	Investigate the impact of the global financial crisis on the determinants of corporate cash holdings and adjustments towards target cash levels	R&D, growth opportunities, CapEx, size, debt leverage, debt maturity, cash flow, cash flow volatility, NWC, ROA, inflation, GDP	Cash holdings	Quantitative panel fixed effects using a sample of Eastern European firms.	Firm-level determinants of cash holdings significantly differ for pre- and post-crisis periods

5	Bukalska, E. & Maziarczyk, A. (2023). Impact of financial constraints and financial distress on cash holdings. <i>International Journal of Management and Economics</i> , 59(1), 13-31. https://doi.org/10.2478/ijme-2022-0032	Examine the impact of financial constraints and financial distress on cash holdings	Crisis dummy, ln(total assets), profitability, debt leverage, asset turnover	Cash holdings	Quantitative using 4,406 firm-year observations of companies listed on the Warsaw Stock Exchange	Companies maintain higher cash holdings during a crisis than in a normal period, and companies with financial difficulties have lower cash holdings both in normal and crisis times
6	Chang, C. C. & Yang, H. (2022). The role of cash holdings during financial crises. <i>Pacific-Basin Finance Journal</i> , 72(April). https://doi.org/10.1016/j.pacfin.2022.101733	Examine the role of cash holdings during crises, whether the firm with higher cash holdings could quickly recover the operating performance after the financial crisis	Cash holdings, size, dividends, debt, ROA, GDP	Sales, EBIT	Quantitative data from 38 countries	If a firm has higher cash holdings, its operating performance recovers more rapidly after financial crisis
7	Chavez, E. (2017). Credit Information and Firms' Access to Finance: Evidence from an Alternative Measure of Credit Constraints. <i>World Bank Malaysia</i> , (2). https://documents1.worldbank.org/curated/en/524781502187576101/pdf/117973-BRI-PUBLIC-4-8-2017-12-28-44-DBRN.pdf	Analyze the role of credit information in firms' access to finance	Size, age, audit-information, export information	Credit constraint status	Quantitative data from World Bank Enterprise Surveys and credit information data from Doing Business for 111 economies	Small and medium-size firms are more likely to be credit constrained
8	Chen, H. C., Chou, R. K., & Lu, C. L. (2018). Saving for a rainy day: Evidence from the 2000 dot-com crash and the 2008 credit crisis. <i>Journal of corporate finance</i> , 48(February), 680-699. https://doi.org/10.1016/j.jcorpfin.2017.12.025	Examines the role of pre-saved cash in helping financially constrained firms during the 2000 dot-com crash and the 2008 financial crisis	Liquidity, size, M/B-ratio, cash flow, debt leverage, cash flow volatility, dividends, R&D, industry indicator	Changes in cash holdings	Quantitative data from Compustat annual files and CRSP for the period from 1995 to 2013	Constrained firms tended to increase capital investments during these severe economic downturns if they had pre-saved more cash.

9	Chung, H. J., Jhang, H., & Ryu, D. (2023). Impacts of COVID-19 pandemic on corporate cash holdings: Evidence from Korea. <i>Emerging Markets Review</i> , 56. https://doi.org/10.1016/j.ememar.2023.101055	Examine how corporate cash management in Korea has evolved during the COVID-19 crisis	C-19 dummy, cash flow, size, NWC, PPE, changes in debt	Changes in cash holdings	Quantitative quarterly data from Korean firms in 2018-2022	Firms reserve more cash in 2020 in response to the increased uncertainty
10	Deng, Y. & Yao, H. (2021). Corporate cash holdings and monetary shocks: A test of the credit channel theory. <i>Review of financial economics</i> , 39 (2), 203-222. https://doi.org/10.1002/rfe.1117	Studies the impact of monetary shocks on corporate cash holdings before the 2008 financial crisis	Size, cash flow/assets, NWC/assets, R&D/sales, dividend dummy, M/B, CapEx, debt leverage	Cash holdings	Quantitative data from all Compustat firm-quarter observations from 1970Q1 to 2007Q4	Find evidence supporting the credit channel theory that industrial firms increase cash holdings when monetary policy is unexpectedly tightened
11	He, Z., Suardi, S., Wang, K., & Zhao, Y. (2022). Firms' COVID-19 Pandemic Exposure and Corporate Cash Policy: Evidence from China. <i>Economic Modelling</i> , 116. https://doi.org/10.1016/j.econmod.2022.105999	Study how Chinese listed firms' COVID exposure influences their cash holdings	Size, debt leverage, ROA, sales growth, firm age, cash flow	Cash holdings	Quantitative data from all firms listed on the Shanghai and Shenzhen Stock Exchanges from 2020 to 202	Firms increase (decrease) cash balances when their stock returns fall (increase) with COVID severity due to precautionary motives
12	Hoang, K., Nguyen, C., Tran, D. V., & Phan, A. (2022). International Corporate Cash Holdings and Firm-Level Exposure to COVID-19: Do Cultural Dimensions Matter? <i>Journal of Risk and Financial Management</i> , 15 (6), 262. https://doi.org/10.3390/jrfm15060262	Investigates the impact of COVID-19 exposure on corporate cash holdings	Covid-exposure, size, ROA, debt leverage, NWC, sales growth, dividend dummy, CapEx, PPE, M/B-ratio	Cash holdings	Quantitative data from firms across sixteen developing and developed economies	Firms reserve more cash when their exposure to COVID-19 increases

13	Horioka, C. Y. & Terada-Hagiwara, A. (2014). Corporate Cash Holding in Asia. <i>Asian Economic Journal</i> , 28(4), 323–345. https://doi.org/10.1111/asej.12039	Analyze the determinants of corporate saving in the form of changes in cash holdings	Cash flow, cash flow/assets, M/B-ratio, total debt, firm size	Changes in cash holdings	Quantitative firm-level data from 11 Asian economies from the Oriana Database in 2002–2011	Find some evidence that cash flow has a positive impact on the change in cash holdings
14	Jebran, K., Iqbal, A., Bhat, K. U., Khan, M. A., & Hayat, M. (2019). <i>Financial Innovation</i> , 5(3). https://doi.org/10.1186/s40854-018-0116-y	Investigate factors that determine corporate cash holdings in different periods from 2005 to 2014.	Cash flow, CapEx, growth, debt leverage, liquidity, size, tangibility, volatility	Cash holdings	Quantitative from a sample of 280 firms listed on the Pakistan Stock Exchange	Financial crises affect firms' cash holdings policies. Financial crisis has influenced the relationship of size and leverage with cash holdings
15	Lindén, A., Lehner, O. M., Losbichler, H., & Martikainen, M. (2023). Dividend payout decisions under uncertainty: the ownership influence in the early days of the COVID-19 pandemic in Finland. <i>Journal of Applied Accounting Research</i> , 24(2), 299-317. https://doi.org/10.1108/JAAR-10-2021-0274	Examines whether ownership type has a moderating influence on dividend payouts during the COVID-19 pandemic crisis with respect to changes in profits	Owner structure, sector	Change in dividends	Quantitative using data from 152 companies listed on OMX Helsinki in 2017–2020	A significant effect on dividend payout during the COVID crisis was found when the companies are dominantly held by individual owners
16	Lozano, M. B. & Yaman, S. (2020). The European Financial Crisis and Firms' Cash Holding Policy: An Analysis of the Precautionary Motive. <i>Global Policy</i> , 11(1). https://doi.org/10.1111/1758-5899.12768	Analyzes the relation between the 2008 European financial crisis and firms' cash holding policies	Cash flow volatility, size, NWC, cash flow,	Cash holdings	Quantitative using financial and stock data from the Worldscope database and macroeconomic data from EUROSTAT and OECD	Find a positive effect for the short crisis period and a negative effect for long crisis period

17	Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. <i>Journal of Financial Economics</i> , 52(1), 3-46. https://doi.org/10.1016/S0304-405X(99)00003-3	Examine the determinants and implications of holdings of cash and marketable securities	M/B-ratio, size, cash flow/assets, NWC/assets, CapEx/assets, debt leverage, R&D/sales, dividend dummy	Cash holdings	Quantitative using data from publicly traded U.S. firms in 1971-1994	Large firms tend to hold lower ratios of cash
18	Wu, S-W., Nguyen, M-T., Ma, N. T., & Tsai, J-F. (2023). Is it good to hold more cash before the pandemic? A case of Taiwanese firms. <i>Heliyon</i> , 9(6). https://doi.org/10.1016/j.heliyon.2023.e16050	Study if firms holding more cash before the pandemic can perform better during the pandemic in 2020	ROE, ROA, cash holdings, debt leverage	Profit	Quantitative using all data from listed firms on Taiwan Stock Exchange	Find supportive evidence that pre-saved cash is valuable and can help firms perform better during the pandemic
19	Xu, J. & Jin, Z. (2022). Exploring the Impact of the COVID-19 Pandemic on Firms' Financial Performance and Cash Holding: New Evidence from China's Agri-food Sector. <i>Agronomy</i> , 12(8). https://doi.org/10.3390/agronomy12081951	Investigate the impact of COVID-19 on the financial performance and cash holdings of Chinese agri-food companies	Covid dummy, size, debt leverage, growth, year	ROA, ROE, cash	Quantitative using data from agri-food companies listed on the Shanghai and Shenzhen stock exchanges	C-19 had no significant impact on financial performance and the cash-holding level of agri-food companies
20	Yu, D., Soh, W., Noordin, B. A. A., Yahya, M. H., & Latif, B. (2022). State ownership, information asymmetry and cash holding: Impact of COVID-19 on Chinese-listed firms. <i>Frontiers in Psychology</i> , 13. https://doi.org/10.3389/fpsyg.2022.1052979	Investigates the relationship between information asymmetry and cash holdings under COVID-19 in China.	Covid dummy, size, leverage, tangibility, turnover, M/B-ratio, cash flow, NWC, CapEx	Cash holdings	Quantitative using firm-level data from China Stock Market & Accounting Research (CSMAR) in 2014-2020.	State ownership moderates information asymmetry's impact on cash holdings and softens firms' precautionary motive for cash holdings during the pandemic

21	Zhou, D., Zhou, H, Ba, M., & Qin, Y. (2022). The COVID-19 outbreak and corporate cash-holding levels: Evidence from China. <i>Frontiers in Psychology, 13</i> . https://doi.org/10.3389/fpsyg.2022.942210	Examines the relationship between the degree of C-19's impact on firms' cash-holdings levels in China	Size, debt leverage, cash flow, NWC, debt, CapEx, dividends, age, growth	Cash holdings	Quantitative using data from Shanghai and Shenzhen A-share listed companies 2019-2020	Firms that are severely affected by the COVID-19 pandemic have higher current cash holdings levels
Papers on Risk Tolerance						
#	Publication	Purpose of the Study	Independent Variable	Dependent Variable	Method	Findings
1	Atullah, A., Le, H., & Wood, G. (2022). Institutional Investor Heterogeneity and Corporate Response to the Covid-19 Pandemic. <i>British Journal of Management, 33</i> (2), 634-656. https://doi.org/10.1111/1467-8551.12601	Explores the role of institutional investors in determining firms decisions whether to reduce dividends and share buybacks during the Covid-19 pandemic.	Cash, Leverage, Size, ROA, Cash flow volatility	Pay out cuts	A quantitative study obtaining financial data from 440 firms in UK by using regression analysis.	Findings reveal that firms response to the COVID-19 pandemic was to cut payouts to conserve cash indicating risk aversion.
2	Gu, L., Li, J., Ni, X., & Peng, Y. (2023). The long shadow beyond lockdown: Board chairs' professional pandemic experiences and corporate investments. <i>Journal of Economic Behavior & Organization, 214</i> , 522-541. https://doi.org/10.1016/j.jebo.2023.08.012	Explores how entrepreneurs past pandemic experiences affects corporate investment decisions long-term.	Dummy variable SARS (2003), Dummy variable COVID-19	Investments	A quantitative study using data from listed firms in China for 2000-2019.	Findings reveal that firms led by board chairs who experienced SARS invest less in subsequent years, including during COVID-19.
3	Guiso, L. (2012). Trust and Risk Aversion in the Aftermath of the Great Recession. <i>European Business Organization Law Review, 13</i> , 195-209. https://doi.org/10.1017/S1566752912000146	Explores how a financial crisis affects trust and risk aversion.	Investments	Risk Tolerance	A mixed-methods study by comparing data from a telephone survey conducted on 1000 households in the US and Italy before and after the crisis.	Findings reveal a drop in trust and risk tolerance where they argue based on past experience that these effects are most likely enduring and are very slow to recover.

4	Heo, W., Rabbani, A., & Grable, J.E. (2021). An Evaluation of the Effect of the COVID-19 Pandemic on the Risk Tolerance of Financial Decision Makers. <i>Finance Research Letters</i> , 41. https://doi.org/10.1016/j.frl.2020.101842	Explores the negative impact of the Covid-19 pandemic on financial risk attitudes of financial decision makers.	Education, Age, Marital status, Equity, Household income, Gender	Financial risk tolerance	Longitudinal study obtaining data from a cross-sectional internet survey 18.193 financial decision makers interested in investment and household financial topics.	Findings show that risk tolerance of financial decision makers are affected when extreme economic, social, or environmental shocks occur. The Covid-19 pandemic shifted risk preferences downwards for most financial decision makers.
5	Hoang, K., Nguyen, C., Tran, D. V., & Phan, A. (2022). International Corporate Cash Holdings and Firm-Level Exposure to COVID-19: Do Cultural Dimensions Matter? <i>Journal of Risk and Financial Management</i> , 15(6), 262. https://doi.org/10.3390/jrfm15060262	Explores the COVID-19 pandemics impact on corporate cash holdings.	Firm size, ROA, Leverage, NWC, Sales growth, Dividends, Capital expenditures, Fixed assets, MTB, Economic policy uncertainty	Cash holdings	A quantitative study using a sample of 5926 listed firms from sixteen countries across the globe using financial data from the Datastream database.	Findings reveal that firms hold more cash when their exposure to C-19 increases. Further, the findings reveal that the cash burn effect is weaker in countries with high levels of risk aversion, masculinity and long-term vision.
6	Hu, J., Li, A., & Luo, Y. (2019). CEO early life experiences and cash holding: Evidence from China's great famine. <i>Pacific-Basin Finance Journal</i> , 57. https://doi.org/10.1016/j.pacfin.2019.101184	Explores the relationship between famine-experienced CEO's and cash holding behavior.	Dummy famine-experienced CEO, Firm characteristics, CEO characteristics	Cash holdings	A quantitative study obtaining manually collected data from 2001 to 2015 from China Stock Market and Accounting Research Database.	Findings reveal that under the precautinary motive, famine-experienced CEO retain higher level of cash.

7	Huber, C., Huber J., & Kirchler M. (2021). Market shocks and professionals' investment behavior – Evidence from the COVID-19 crash. <i>Journal of Banking and Finance</i> , 133. https://doi.org/10.1016/j.jbankfin.2021.106247	Explores how the experience of extreme events, such as the Covid-19, influence risk taking behavior.	Stock Investment	Risk taking behavior	Natural experimental design conducted on 315 financial professionals and 498 management and economics students in 2 waves, first in December 2019, and second in March 2020.	Findings show that the drop in hypothetical investment opportunities was driven by a shift in risk preferences.
8	Jetter, M., Magnusson, L.M., & Roth, S. (2020). Becoming sensitive: Males' risk and time preferences after the 2008 financial crisis. <i>European Economic Review</i> , 128. https://doi.org/10.1016/j.euroecorev.2020.103512	Explores how the risk- and time preferences have changed before and after the global financial crisis (2008).	Unemployment rate, Gender, Crisis	Risk preference	Longitudinal study obtaining 22.579 Australian-based respondents from 11 waves (four before and seven after the crisis)	Since the 2008-crisis, they find that there has been an increased sensitivity to local economic conditions among men, leading to a significant decrease in their willing to take risk, with the change in risk aversion being nearly 40% of the overall gender gap in risk preferences.
9	Leppäo, T. & Ritala, P. (2022). Surviving the coronavirus pandemic and beyond: Unlocking family firms' innovation potential across crises. <i>Journal of Family Business Strategy</i> . https://doi.org/10.1016/j.jfbs.2021.100440	Explores a family firms' innovation behavior during and after crises.	Crises	Innovation behavior	Qualitative single-case study approach, by interviewing "Finnboat" a Finnish family firm as their case.	Findings show that family firms' responses to a crisis are different from other firms. Showing that the crisis unlocks their investments and innovation efforts, indicating risk-taking behaviors.

10	Saivasan, R. & Lokhande, M. (2022). Influence of risk propensity, behavioural biases and demographic factors on equity investors' risk perception. <i>Asian Journal of Economics and Banking</i> , 6(3). https://doi.org/10.1108/AJEB-06-2021-0074	Explores psychological and demographic factors that influence risk	Age, Gender, Employment type, Economy, Country	Risk perception	A mixed-methods study using multiple regression analysis and telephone, face-2-face and social media surveys on 315 investors.	Findings show that that return expectation, time horizon and loss aversion, which influences the risk perception vary significantly based on demographic traits.
11	Sakha, S. (2019). Determinants of risk aversion over time: Experimental evidence from rural Thailand. <i>Journal of Behavioral and Experimental Economics</i> , 80, 184-198. https://doi.org/10.1016/j.socec.2019.03.008	Uses a risk experiment in rural Thailand to explore determinants of the changes in individual risk aversion over time by studying the 2008 financial crisis.	Socio demographic characteristics (age, height, gender, marital status, education, household size, etc.), Village characteristics (no. of seasonal workers, no. of social activities, no. banks etc.), Macroeconomic shocks (social, economic, idiosyncratic shocks etc.), Expected well-being (expected ill-being, perceived ill-being).	Risk preference	Quantitative study with an experimental approach. Interviewing a total of 900 subjects of three waves over a five-year period, followed up with a hypothetical lottery experiment task to reveal their risk preferences.	Findings reveal that time-varying macro-level changes and state-dependent micro level changes significantly explain changes in risk preferences. Findings show that there are high levels of risk aversion in 2007/08, and a decreasing level of risk aversion during the recovery phase in 2010.
12	Schooley, D. & Worden, D. (2016). Perceived and Realized Risk Tolerance: Changes During the 2008 Financial Crisis. <i>Journal of Financial Counseling & Planning</i> , 27(2). http://dx.doi.org/10.1891/1052-3073.27.2.265	Explores households changes in perceived and realized risk after the 2008 financial crisis.	Investments	Risk tolerance perception	A mixed methods study by comparing obtained data from SCF interview survey of 3857 households from 2007 to 2009.	Findings reveal that the change in risk tolerance is related to the change in wealth experienced. Less wealth is associated with less risk tolerance, vice versa.

13	Sun, X., Lee, S-H., & Phan, P. H. (2019). Family firm R&D investments in the 2007–2009 Great Recession. <i>Journal of Family Business Strategy</i> , 10(4). https://doi.org/10.1016/j.jfbs.2018.02.004	Explores the impact of 2007 Great Recession on R&D decisions of publicly-listed family firms in the US.	total assets, leverage, MTB, Sales, Cash flow, EBITDA	Research and development	A quantitative study analyzing 2391 publicly listed US firms from 1995 to 2015 obtained from Compustat.	Findings reveal that family firms viewed external threats as investment opportunities and were more willing to take risks than non-family firms.
14	Tsutsui, Y. & Tsutsui-Kimura, I. (2022). How does the risk preference change under the stress of COVID-19? Evidence from Japan. <i>Journal of Risk and Uncertainty</i> , 64, 191-212. https://doi.org/10.1007/s11166-022-09374-z	Explores the changes in risk preference during the COVID-19 in Japan.	COVID-19	Risk preference	A mixed-methods study using panel data of individuals in Japan in five waves from March to June 2020. Combining a regression analysis and survey with around 4000 responses in five waves.	Findings reveal that individuals became more risk tolerant over the period, and that perception and degree of fear is more likely to be the cause rather than income position and expectations of future income.

Appendix C

Collecting and Analyzing Data from Yahoo Finance

This appendix shows where our data was collected and the pivoted result showing annual averages for Oslo Stock Exchange main index (OSEBX) in the time period from 2013 to 2022 (Figure C1; Table C1).

Figure C1

Screenshot from Yahoo Finance

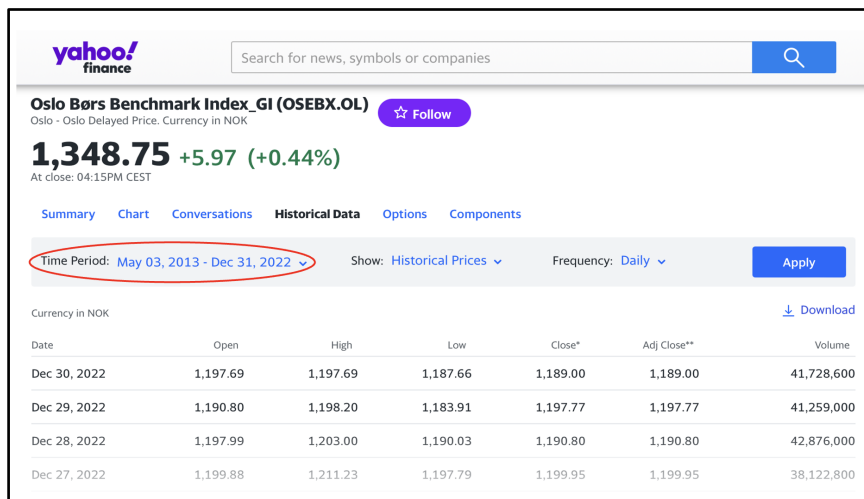


Table C1

Pivot Table Showing the Annual Average Value of Oslo Stock Exchange Main Index

Year	Average closing value
2013	506,75
2014	583,02
2015	618,20
2016	607,03
2017	734,59
2018	862,93
2019	873,77
2020	844,66
2021	1 117,50
2022	1 206,00

Appendix D

Email Sent to Respondents

Note: This invitation for the self-completion questionnaire is in Norwegian as all firms contacted are located in Norway.

Hei,

I forbindelse med en avsluttende masteroppgave ved Universitetet i Sørøst-Norge skriver vi nå en spennende oppgave om hvordan COVID-19 har påvirket norske industribedrifter.

Tidligere forskning viser at bedrifter reagerer ulikt i slike perioder og at dette kan være avgjørende for hvordan de kommer seg gjennom en slik periode.

Dette er et relativt nytt forskningsfelt, og vi har nå muligheten til å bidra til dette forskningsfeltet. Vi tror at dette vil være nyttig både for bedrifter og akademikere for å forstå hvordan slike kriser påvirker norsk industri og hvordan vi kan posisjonere oss mot fremtidige kriser.

Vi ønsker derfor å sende dere noen få regnskapsrelaterte spørsmål knyttet til deres håndtering av COVID-19. Dette vil ikke ta mer enn 15-20 min å svare på. Til gjengjeld vil vi gjerne sende dere en kopi av masteroppgaven vår når denne er ferdig.

Er dette noe dere er interessert i å delta på? Vi er optimistiske og håper på positivt svar.

Med vennlig hilsen
Zanfina Radoniqi og Stian Søberg

(Alle spørsmål vil basere seg på offentlig tilgjengelig regnskapsdata. Alle svar vil bli anonymisert og alle funn generalisert)

Appendix E

Received Responses from the Self-Completion Questionnaire

Note: The following questions and answers are presented in Norwegian as all firms are located in Norway.

Responses from Firm A

Question 1:

Kan du fortelle kort om [Selskap A] sin respons på COVID-19 pandemien da den kom til Norge i starten av 2020 og på hvilken måte dere var rustet til å håndtere en slik situasjon?

Answer 1:

Vi er en fysisk bedrift, som produserer varer i maskiner. Hjemmekontor er ikke mulig, da all verdiskapning skjer i verkstedet. Vi var derfor på jobb gjennom nedstengingen. Arbeidsstasjonene ligger i tilstrekkelig avstand fra hverandre, slik at det lot seg gjøre å opprettholde fysisk avstand. Vi hadde ingen planer eller rutiner i forkant for å håndtere en slik situasjon, men vi tilpasset oss raskt. Fysisk avstand var det viktigste tiltaket i denne perioden.

Question 2:

Fra regnskapet deres ser vi en økning i **kasse/bank** fra 2019 til 2020. Hva er årsaken til dette og i hvilken grad er dette en reaksjon på COVID-19 pandemien?

Answer 2:

Det er naturlige svingninger i likviditeten basert på utlegg ipågående prosjekter. Det har ingen sammenheng med Covid.

Question 3:

Utbytte blir tradisjonelt avgjort og utbetalt etter regnskapsårets slutt. Vi ser fra regnskapet deres at det ble avsatt **utbytte** i 2020. Hva er årsaken til dette og i hvilken grad er dette en reaksjon på COVID-19 pandemien?

Answer 3:

Det er normal policy med utbytte til eiere som avkastning på innskutt kapital. Det har ingen direkte sammenheng med Covid.

Question 4:

Fra regnskapet deres ser vi en reduksjon i **langsiktig gjeld** og **kortsiktig gjeld til kredittinstitusjoner** fra 2019 til 2020. Hva er årsaken til dette og i hvilken grad er dette en reaksjon på COVID-19 pandemien?

Answer 4:

Langsiktig gjeld består hovedsakelig av rentebærende gjeld på investeringer. Den nedbetales som ett annuetslån, og vil øke med bakgrunn i nyinvesteringer. Kortsiktig gjeld består hovedsakelig av leverandør gjeld, og svinger naturlig i forhold til aktivitet på prosjekter. Det har ingen direkte sammenheng med Covid

Question 5:

Hva har dere lært under COVID-19 pandemien som dere tar med videre, og har dere gjort noen endringer som følge av dette som gjør dere bedre rustet mot eventuelle fremtidige kriser?

Answer 5:

Det viktigste vi lærte var at evne til å tilpasse oss endrede rammebetingelser, raske omstillings prosesser og være kreative i måten vi utfører våre oppgaver på. Flere rutiner ble tilpasset under Covid, og noen av disse har vært med å forbedre bedriften. Andre tiltak og rutiner var fordyrende i form av tidsforbruk.

Responses from Firm B

Question 1:

Kan du fortelle kort om [Selskap B] sin respons på COVID-19 pandemien da den kom til Norge i starten av 2020 og på hvilken måte dere var rustet til å håndtere en slik situasjon?

Answer 1:

Vi fulgte råd/anbefalinger fra myndighetene for hvordan vi skulle forholde oss. Vi hadde ikke

hjemmekontor, men heller ingen tilfeller av covid. Vi var vel ikke rustet til å håndtere pandemien, men den ble håndtert på en god måte fra alle ansatte. Vi har et veldig lavt sykefravær og et godt arbeidsmiljø. Dette tror jeg er en styrke for å kunne håndtere slike situasjoner på en god måte.

Question 2:

Fra regnskapet deres ser vi en reduksjon i **kasse/bank** i 2019 før en økning igjen i 2020. Hva er årsaken til dette og i hvilken grad er dette en reaksjon på COVID-19 pandemien?

Answer 2:

Dette er nok litt tilfeldig. Vi hadde også en stor varebeholdning ved inngangen til 2020 som da var betalt på slutten av 2019. Dette er nok årsaken til den lave bankbeholdningen.

Question 3:

Utbytte blir tradisjonelt avgjort og utbetalt etter regnskapsårets slutt. Vi ser fra regnskapet deres at det i 2019 ikke ble tatt noe **utbytte** med utbetaling i 2020. Hva er årsaken til dette og i hvilken grad er dette en reaksjon på COVID-19 pandemien?

Answer 3:

Årsaken til at det ikke ble tatt ut utbytte var pga det svake resultatet for 2019. Dette hadde ingenting med pandemien å gjøre.

Question: 4

Fra regnskapet deres ser vi en økning i **langsiktig gjeld** og **kortsiktig gjeld til kredittinstitusjoner** i 2019 før en reduksjon i 2020. Hva er årsaken til dette og i hvilken grad er dette en reaksjon på COVID-19 pandemien?

Answer 4:

Langsiktig gjeld skyldes ubetalt utbytte fra 2018. Kortsiktig gjeld skyldes bruk av kassakreditt for å finansiere den store varebeholdningen. Dette hadde ingenting med pandemien å gjøre.

Question 5:

Hva har dere lært under COVID-19 pandemien som dere tar med videre, og har dere gjort

noen endringer som følge av dette som gjør dere bedre rustet mot eventuelle fremtidige kriser?

Answer 5: Vi har lært at vi håndterte pandemien ganske godt. Pandemien påvirket regnskapet i veldig liten grad. Vi har derfor ikke gjort noen vesentlige endringer.

Responses from Firm C

Question 1:

Kan du fortelle kort om [Selskap C] sin respons på COVID-19 pandemien da den kom til Norge i starten av 2020 og på hvilken måte dere var rustet til å håndtere en slik situasjon?

Answer 1:

Vi leverer produkter til 3 segmenter. Disse er Dagligvare, storhusholdning og industri. I forbindelse med COVID-19 pandemien ble det et stort fall i etterspørselen innenfor storhusholdning. Typiske kunder innenfor dette segmentet er hoteller, restauranter og catering. Den reduserte etterspørselen innenfor dette segmentet ble i all hovedsak oppveid av en økt etterspørsel fra dagligvare. Ved å ha flere «ben å stå på» sikret vi en god ordreinnngang gjennom hele perioden. Dette er noe vi tar stilling til kontinuerlig, og på denne måten var vi godt forberedt når COVID-19 rammet Norge og verden. Vi gjør også vurderinger av våre leverandørers beliggenhet for å unngå at vi blir ensidig rammet ved for eksempel klimahendelser og geopolitiske endringer. Oppsummert måtte vi i forbindelse med COVID-19 kanalisere mer av salget vårt mot dagligvaresegmentet.

Question 2:

Fra regnskapet deres ser vi en reduksjon i **kasse/bank** fra 2019 til 2020. Hva er årsaken til dette og i hvilken grad er dette en reaksjon på COVID-19 pandemien?

Answer 2:

Kassekreditten vår varierer kontinuerlig. Gjennom året har vi til dels store innkjøp. Dette kan komme periodevis, og spesielt på høsten og like over nyttår har vi mye innkjøp av norske grønnsaker. Dette vil påvirke kassebeholdningen ved årsslutt, og noe som var tilfellet i sammenligning av 2019 og 2020.

Question 3:

Utbytte blir tradisjonelt avgjort og utbetalt etter regnskapsårets slutt. Vi ser fra regnskapet deres en økning i avsatt **utbytte** i 2021 med utbetaling i 2020. Hva er årsaken til dette og i hvilken grad er dette en reaksjon på COVID-19 pandemien?

Answer 3: Generalforsamling bestemmer utbyttes størrelse og avhenger som regel av hvor stort overskuddet er. Fra 2020 til 2021 økte resultatet etter skatt, og det ble dermed besluttet å øke utbyttet. Dette har lite å gjøre med COVID-19, og er et resultat av blant annet større volum, endrede priser, innkjøpskostnader, varesammensetning mm.

Question 4:

Fra regnskapet deres ser vi en økning i **langsiktig gjeld** fra 2019 til 2020, og en reduksjon i **kortsiktig gjeld til kredittinstitusjoner** fra 2019 til 2020. Hva er årsaken til dette og i hvilken grad er dette en reaksjon på COVID-19 pandemien?

Answer 4:

I 2020 ble det gjennomført flere investeringer. Både for å skalere virksomheten og for å svare på offentlige pålegg fra kommunen. Dette førte til økt langsiktig gjeld. Den kortsiktige gjelden har litt den samme forklaringen som under spørsmål 2. Vi får levert varer fra leverandører kontinuerlig. Disse varene har en betalingstid på opp mot 60 dager. Når varene ble levert like før jul i 2019, var forfall på disse leveransene først i 2020. Tilsvarende for overgangen mellom 2020 og 2021. I overgangen mellom 2020 og 2021 var andelen lavere sammenlignet med 2019 og 2020. Derav en reduksjon i kortsiktig gjeld fra 2019 til 2020. Både endringen i kortsiktig gjeld og langsiktig gjeld har ikke noe med COVID-19 å gjøre.

Question 5:

Hva har dere lært under COVID-19 pandemien som dere tar med videre, og har dere gjort noen endringer som følge av dette som gjør dere bedre rustet mot eventuelle fremtidige kriser?

Answer 5:

COVID-19 har lært oss at økt diversifisering er nødvendig. En nedgang i etterspørselen innenfor storhusholdning (hoteller, restauranter og catering) som følge av COVID-19 ble motsvart av en økning i etterspørselen innenfor dagligvare. COVID-19 viste oss at etterspørselen etter våre produkter er forholdsvis fast, men at det er nødvendig at vi har en

god strategi og gjør gode valg for at vi har «flere ben å stå på». Dette har fått økt fokus i etterkant. Vi må sikre at vi er eksponert mot flere markeder og kunder i tilfelle noe skulle oppstå. Tilsvarende endringer er gjennomført innenfor innkjøp. Vi må i større grad sikre at vi sprer innkjøpene geografisk. Både med tanke på utfordringer med logistikk og klimaendringer. Krig i Ukraina og Midtøsten samt økt hyppighet av avlingssvikt som følge av klimaendringer har ytterligere aktualisert disse utfordringene.

Responses from Firm D

Question 1:

Kan du fortelle kort om [Selskap D] sin respons på COVID-19 pandemien da den kom til Norge i starten av 2020 og på hvilken måte dere var rustet til å håndtere en slik situasjon?

Answer 1:

[Selskap D] har en vesentlig del av ansatte fra europeiske land, slik som Polen, Latvia, mfl. Vi var ikke spesielt rustet til en slik type «pandemi», så vi, som alle andre bedrifter, tok dag for dag og etterfulgte råd og regler fra myndighetene. Vi stengte ned en arbeidsuke, før vi påfølgende uke startet opp igjen med diverse interne restriksjoner og hadde fått opp «hygieniske» gode tiltak slik at vi kunne fortsette produksjonen vår. Det som rammet oss mest, var den tidlige reisingen våre ansatte foretok som medførte mye smitte. Vi hadde også en god del smitte på «rundgang» hos de ansatte. Dette løste seg over litt tid da vi igjen endret på interne regler for samvær og utenlands reiser.

Question 2:

Fra regnskapet deres ser vi en reduksjon i kasse/bank i 2020. Hva er årsaken til dette og i hvilken grad er dette en reaksjon på COVID-19 pandemien?

Answer 2:

Det er i utgangspunktet umulig å isolere effekt fra Covid da vårt selskap er utsatt for en rekke andre effekter også, bla endring i kundemasse og produkt sortiment etc. Hvor mye dette utgjør avhenger også av endringer i utestående fordringer hos kunde/leverandør, lagerendringer og endring i gjelden ellers. Det blir derfor vanskelig å svare skikkelig på dette spørsmålet. På den annen side mistet vi en del omsetning i 2020, hvor det interessante er hvor mye dette utgjør i lønnsomhet (som også har innvirkning på kasse/bank). En grov vurdering er 500.000.

Question 3:

Fra regnskapet deres ser vi en reduksjon i langsiktig gjeld fra 2019 til 2020, og en økning i kortsiktig gjeld til kredittinstitusjoner i 2020. Hva er årsaken til dette og i hvilken grad er dette en reaksjon på COVID-19 pandemien?

Answer 3:

Se svaret under sp 2. Den samme vurderingen gjelder her, men i 2020 endret vi også litt på finansieringen så egentlig har ikke dette noe med Covid å gjøre.

Question 4:

Hva har dere lært under COVID-19 pandemien som dere tar med videre, og har dere gjort noen endringer som følge av dette som gjør dere bedre rustet mot eventuelle fremtidige kriser?

Answer 4:

Det vi har lært er nok i hovedsak at den interne kommunikasjonen, på tvers av språk utfordringer, blir det viktigste å håndtere på en bedre måte, om en eventuell tilsvarende situasjon skulle oppstå igjen.