STOCKHOLM SCHOOL OF ECONOMICS
Department of Economics
659 Degree project in economics
Spring 2022

How Press Conferences and their Sentiment Affected Stock Market Volume and Returns during Covid-19

Gustav Ring (24613) & Zacharias Veiksaar (24843)

ABSTRACT

This paper investigates how press conferences held by the Public Health Agency of Sweden and their sentiment affected trading volume and returns on Nordic stock markets during the Covid-19 pandemic. We show that the occurrence of a press conference significantly increased trading volume and caused a negative pressure on returns in Sweden, Norway, and Denmark. We also find a positive correlation between press conference sentiment and returns in Sweden, Finland, and Denmark. Furthermore, we find evidence that press conferences had a larger effect on market behavior during times of high uncertainty. Countries in which press conferences caused a significant increase in trading volume experienced a larger effect during the first period of the pandemic than during its later stages. Moreover, we show that during the first period of the pandemic, sentiment was positively correlated with returns in all Nordic countries, and that press conferences predicted a negative pressure on market returns in all countries except Iceland. Both the explanatory value of sentiment and the negative pressure on returns decreased as the pandemic developed. Finally, we show that press conferences only caused an increase in trading volume in Sweden, Norway, and Denmark when death tolls in Sweden were high or moderate.

Keywords: Sentiment, Volume, Returns, Covid, Public Announcement
JEL: C88, G01, G14, G15

Supervisor: Sampreet Goraya
Date submitted: 16 May 2022
Date examined: 23 May 2022
Discussants: Spencer Robild & Anna Johnsson
Examiner: Johanna Wallenius

Acknowledgements

We would like to thank our supervisor Sampreet Goraya for his valuable support and guidance throughout the process of writing this thesis. Your input has been of great value in shaping this paper. We would further like to thank our fellow classmates for the support and engaging discussions held throughout the course of this project.

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1 Introduction

The Covid-19 virus began spreading rapidly across the globe in early 2020, later developing into a global pandemic, causing ”the worst recession since the Great Depression” (IMF, 2020). By the end of 2020, the pandemic had caused 1.9 million deaths globally (Dong et al., 2020) and the global economy had shrunk by roughly 3.2% (Jackson, 2022). Economic turmoil in combination with the global spread of the previously unknown virus made this a period of high uncertainty, both on the financial markets and in society at large.

During periods of uncertainty, financial markets tend to experience turbulence in the form of increased volatility and market-wide pullbacks (Manda et al., 2010). For stock market investors, this makes times of high uncertainty periods of both high risk and great opportunity. With access to good information, investors can make informed decisions on what to buy and what to sell, potentially increasing their performance relative to other investors. This, however, requires that an investor takes action on new information before the market has fully incorporated it, resulting in a race between investors to act on new information that is deemed valuable for future returns. This makes markets during uncertain times especially responsive to new information. Since markets are set to respond only to information that investors deem valuable for their investment decisions, market reactions can be used to study what information investors regard as valuable.

In this paper, we study whether information unveiled through press conferences held by the Public Health Agency of Sweden (PHAS) concerning the Covid-19 pandemic was deemed valuable by stock markets. We do this by studying how these press conferences and their sentiment affect trading volume and returns on the Nordic stock markets. By both studying the press conferences in their entirety and by analyzing their sentiment, we can draw nuanced conclusions regarding what information investors value. Since we study all Nordic markets we will also be able to answer whether or not information regarding the state of the pandemic in Sweden was considered valuable for investments on other Nordic stock markets. Finally, studying whether results are homogeneous throughout the entire period studied, we can draw conclusions regarding when the information is valued.

In short, we show that a press conference being held by the PHAS increases trading volume in several Nordic countries, meaning that investors on these markets find information unveiled during the press conferences valuable for their investment decisions, both in Sweden and across the Nordics. We also find that the occurrence of a press conference is negatively correlated with daily returns, and that sentiment is positively correlated with daily market returns on several of the markets studied. Finally, we find that our results are concentrated during earlier parts of the pandemic, and during the more severe periods of the pandemic.

The paper will be structured as follows. Section 2 provides a background on the Nordic countries, the Covid-19 pandemic, and the Swedish response. Section 3 provides an overview of previous literature and formulates our hypotheses. In section 4 the data and methodology is described. Section 5 presents and discusses the results of this study, and provides robustness checks. Finally, section 6 concludes.

2 Background

2.1 The Nordic Countries

The phrase "The Nordic Countries" refers to the sovereign states of Denmark, Finland, Iceland, Norway, and Sweden, including the autonomous region of Åland as well as the autonomous territories of the Faroe Islands and Greenland. All countries are located in the very northern parts of Europe and the Atlantic Ocean, have a combined area of 3,425,804 square meters (Kronvall, 2022), and a total population of 27.5 million as of 2020 (The World Bank, 2022a).

Although separate states as of today, the Nordic Countries have an intertwined history and the region has been ruled by many different political entities during the past 900 years. These include The Kalmar Union (1397-1523) which united all of the Nordic Countries, the Dano-Norwegian Realm (1524-1814) which united Denmark and Norway following the dissolution of the Kalmar Union, and the union between Sweden and Norway (1814-1905) which followed from the Treaty of Kiel. Furthermore, Finland was part of Sweden from around 1150 until Russia occupied Finland in 1809. Iceland was brought under Norwegian rule in 1262, something which lasted until the formation of the Kalmar Union (1397-1523), of which Iceland became part. Following the dissolution of the Kalmar Union in 1523, the territory of Iceland became part of the Dano-Norwegian Realm (1524-1814) until its dissolution, and then Denmark up until its Independence in 1918 (Gustafsson, 2007)(The Nordic Council and the Nordic Council of Ministers, 2022a).

In terms of languages spoken in the Nordic countries, Swedish, Norwegian, Danish, and Icelandic are all North Germanic languages, making them closely related (The Nordic Council and the Nordic Council of Ministers, 2022b). Out of these, Swedish, Norwegian, and Danish are oftentimes referred to as Scandinavian Languages, which are considered mutually comprehensible (Holmberg and Platzack, 2005). Furthermore, since Finland was long part of Sweden, Swedish is considered a minority language in Finland with 5.2 % of Finns having Swedish as their native language (Saarela, 2021). Given the Swedish minority and the history of the Swedish language, Swedish is a mandatory subject in Finnish primary education and is a national language alongside Finnish (Lehti-Eklund et al., 2011). This, in combination with the fact that English proficiency is considered very high in all Nordic countries (EF Education First, 2022), makes cross-country communication relatively uncomplicated.

The historical proximity of the countries has led to many persisting similarities between them. In economic literature, the Nordic Countries have become known for the "Nordic Model", implement-

Table 1: Nordic Imports & Exports, 2019.

	Denmark	**Finland**	**Iceland**	**Norway**	**Sweden**
	Imports	*Imports*	*Imports*	*Imports*	*Imports*
Denmark	-	2.62%	8.01%	6.74%	6.94%
Finland	1.17%	-	0.99%	2.12%	4.85%
Iceland	0.16%	0.76%	-	0.27%	0.02%
Norway	4.5%	2.18%	10.8%	-	6.1%
Sweden	11.1%	14.4%	5.25%	16.8%	-
Sum	**16.93%**	**19.96%**	**25.05%**	**25.86%**	**17.91%**
	Exports	*Exports*	*Exports*	*Exports*	*Exports*
Denmark	-	1.57%	2.61%	4.11%	7.02%
Finland	1.79%	-	0.14%	1.44%	6.58%
Iceland	0.51%	0.09%	-	0.66%	0.22%
Norway	5.7%	2.53%	3.99%	-	9.5%
Sweden	9.88%	9.75%	0.59%	8.38%	-
Sum	**17.88%**	**13.94%**	**7.33%**	**13.59%**	**23.32%**

Source: The Observatory of Economic Complexity (2022).

ing a high level of social security and services within the framework of a capitalistic and democratic system (Christiansen, 2006). As of 2019, all of the Nordic Countries had a GDP per capita higher than $50,000 (PPP) which places them all among the 30 richest countries in the world (The World Bank, 2022b). The combination of high economic output and high social security makes the Nordic Model a subject for discussion internationally (Sandbu, 2018).

Politically, the Nordic Countries form a cooperative relationship, and use the Nordic Council and the Nordic Council of Ministers as platforms for cooperation within the region (The Nordic Council and the Nordic Council of Ministers, 2022c), making the Nordic Countries very well integrated relative to many other countries. Furthermore, since all Nordic Countries are part of either the European Union (EU) or the European Free Trade Organization (EFTA) (The European Free Trade Organization, 2022) as well as the EU Single Market and the Schengen Area (European Commission, 2022), there are very limited restrictions on trade across the borders within the Nordic Region. Given these circumstances, there is little surprise that the Nordic countries make up a substantial share of each other's imports and exports, despite the fact that they make up a relatively small share of world GDP. Statistics on imports and exports during 2019 within the region from The Observatory of Economic Complexity (2022) is found in table 1.

2.2 The Covid-19 Pandemic

On the 31st of December in 2019, reports of several cases of pneumonia of unknown cause started surfacing in Wuhan, China, quickly gaining the attention of the World Health Organization (WHO).

In the days following, the WHO activated a part of its emergency response framework and notified major public health agencies, laboratories, sister UN agencies, international organizations, and NGOs of a cluster of pneumonia cases in China. On the 11th of January, Chinese media reported the first death from the novel virus and the situation continued to escalate enough for the WHO to declare the outbreak a public health emergency of international concern by the end of January. On March 7th, the number of confirmed Covid-19 cases had surpassed 100,000 globally, prompting the WHO to issue a statement "calling for action to stop, contain, control, delay and reduce the impact of the virus at every opportunity". By March 11th the outbreak was officially recognized as a pandemic by the WHO (World Health Organization, 2022).

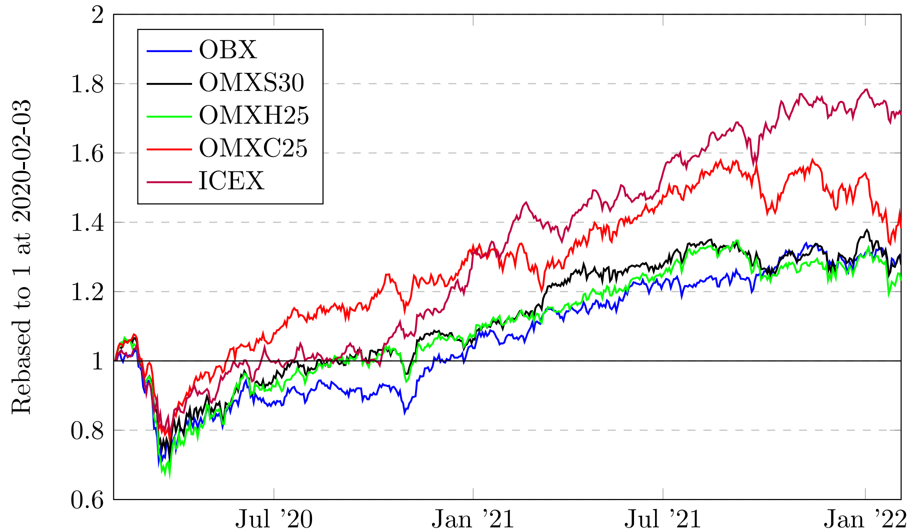
Since March, it is now clear that the impact of Covid-19 has been severe. By the end of 2020, the virus had racked up a cumulative death toll of 1.9 million worldwide and by the end of 2021, that same number was 5.4 million (Dong et al., 2020). The rising number of deaths seemingly hit low-income countries the hardest, causing a 34% increase in mortality in 2020 compared to previous years.[1] For medium and high-income countries that number was 14% and 10% respectively. The pandemic not only had a severe impact on human health; the lockdowns commonly implemented to combat the virus had a severe economic impact. The global GDP growth for 2020 was 7.3 percentage points lower than what the International Monetary Fund (IMF) had forecasted in October of 2019, a development that affected medium-income countries the most (Sanchez, 2021). The decline was so severe that it reduced global economic growth to an annualized rate of roughly -3.2% and caused an estimated drop in the global trade of 5.3% in 2020 (Jackson, 2022). However, the recession sparked by the pandemic was not long-lived. In 2021, many countries rebounded from the trough of 2020 with the World Bank projecting the economy would grow by 5.6%, "the fastest post-recession pace in 80 years".[2]

It wasn't only the fundamental economic development of the world which took a hit from the pandemic. Global stock markets also saw a severe downturn in response to the outbreak. In March of 2020, on the announcement of the first confirmed death caused by the virus, the S&P 500 took a two-day plunge of 15% and had dropped by more than 30% after the roughly three weeks that followed. What did come as surprising, however, was that the S&P 500 proceeded to rally more than 80% above its March low in the year that followed (Domm, 2021). This swift drop followed by a remarkable recovery has also been present in the Nordic stock markets. As figure 1 shows, the Nordic stock markets experienced a strong recovery from their low points in March of 2020, increasing by between 80 and 120 percent over the following two-year period.

As this paper is being written, the Covid-19 pandemic seems to be nearing its end. The European Union has said it is moving out of the "emergency phase" of the pandemic as deaths and

[1] The author of the cited article notes that "only two countries had available data for excess mortality in the low-income group" used for the excess mortality calculations (Sanchez, 2021).

[2] This development was largely driven by a few strongly recovering major economies with developed economies continuing to struggle during 2021 (World Bank, 2022).



This figure shows how Nordic stock markets have developed since the beginning of the pandemic using the main indices for Norway(OBX), Sweden(OMXS30), Finland(OMXH25), Denmark(OMXC25), and Iceland(ICEX).
Source: Fusion Media Limited (2022).

Figure 1: Nordic Stock Markets from 2020-02-03 to 2022-02-03

hospitalizations in the Union have seen a significant decrease. A development attributed to high immunization levels and the prevalence of less severe strains of the virus (Pronczuk, 2022). China, however, is still actively combating the virus with lockdowns and mass-testing; and the end to the pandemic seems further away for China than many other countries (Bradsher and Buckley, 2022).

Sweden, along with Denmark, Norway, and Iceland have lifted most Covid-restrictions (Anderson and Cumming-Bruce, 2022) (Iceland Review, 2022), while Finland is more conservative in lifting restrictions altogether, still maintaining a slightly stricter stance (Finnish Government, 2022). Assuming that the Nordic countries have put the worst parts of the pandemic behind them means that we have a relatively complete overview of the pandemic in the Nordic Region at hand when completing this piece of work.

2.3 The Swedish Response

The Swedish response to the Covid-19 pandemic - or simply "the Swedish response" - has been the subject of many debates, and the target of much scrutiny for its unique nature. Sweden was, along with Belarus, one of two countries in Europe that did not enforce lockdowns to combat the pandemic and remained mostly open during the first half of 2020. Instead of implementing mandatory regulatory measures, Sweden issued recommendations that were highly influenced by the Public

Health Agency of Sweden (the PHAS). Local politicians have thus played a less significant role in formulating the response to the pandemic in Sweden than in many other countries. In effect, this has given Sweden's state epidemiologist, Anders Tegnell, who quickly gained a cult-like following both domestically and abroad, great influence over the Swedish response. The motivation behind Tegnell's and Sweden's conservative response to the pandemic was an aim to find a solution sustainable in the long term, and an expressed "[deep distrust] of easy solutions to complex problems." (Milne, 2020a).

The early criticism against the Swedish response was mainly pointed at the fact that Sweden saw a significantly greater spike in Covid-19 related deaths during the early stages of the pandemic than several other countries (Münchau, 2020) (FT, 2022). In October of 2020, Sweden had a death rate per capita 10 times higher than that of Finland and Norway with total deaths reaching 5 900. Interestingly, the criticism had mainly originated outside of Sweden, with its own citizens showing support for the Public Health Agency and the Swedish response (Milne, 2020b). In support of Sweden's strategy, others have also pointed out the risks of using lockdowns as a policy measure and the fact that their consequences will not be known for quite some time (Münchau, 2020), a risk that seems to have been belittled in favor of a quick response by many nations. The debate surrounding the Swedish response has ranged from practical issues such as death rates and what constitutes effective prevention to deeper philosophical questions, with some claiming "Sweden's bad conscience over the second world war 'translated into the idea of becoming a moral superpower'" (Milne, 2020b).

The early criticism of Sweden's response was later supported in October of 2021 by the findings of an independent commission appointed by the government, stating "Sweden's response to the spread of coronavirus was too slow and preparations to handle a pandemic were insufficient". The commission further found that the "initial disease prevention and control measures were insufficient to stop or even substantially limit the spread of the virus in the country." Sweden's strategy continued to be criticized for being a reckless and cruel approach, and praised as a sustainable and business-friendly solution by others both domestically and abroad in 2021 (Ahlander and Pollard, 2021). In February of 2022, the commission took a more moderate stance, stating "Sweden should have shut venues and taken other tougher measures early in the COVID-19 pandemic, though its no-lockdown strategy was broadly beneficial" (Ahlander and Pollard, 2022).

Whatever the content of debates and whatever the stance of the probing commission, it is clear to us that the Swedish response to the Covid-19 pandemic has received a great amount of attention, both domestically and abroad. This has made the contents of press conferences held by the Public Health Agency of Sweden unusually relevant internationally, likely drawing the interest of many investors.

3 Literature & Hypothesis Development

3.1 The Economic Value of Information

The fact that information is valuable has long been known within the Financial and Economic literature, with models estimating the economic value of information having been around for more than five decades (Feltham, 1968). Studies have also shown that information "plays a crucial role in reducing uncertainty and judging alternative options", as well as helping businesses take strategic managerial decisions (Citroen, 2011). In short, having access to better information than others gives a competitive edge over others in many economic situations, helping actors act optimally in situations ranging all the way from sealed-bid auctions (Milgrom and Weber, 1982) or the sale of a home (Levitt and Syverson, 2008), to choosing an optimal competitive position for a business (Vives, 1990).

As is expected, having access to superior information also provides a competitive edge on equity markets. The magnitude of this edge is large enough for trading on not-yet-public information, known as insider trading, to be illegal in many countries (Rundfelt, 1986). Still, it has been shown that "insider purchases earn abnormal returns of more than 6% per year" (Jeng et al., 2003). Furthermore, it has been shown on multiple occasions that local investors achieve better returns than external investors, as a result of their superior information. For example, it has been shown that domestic investors achieve higher returns on their investments than foreign investors do on the Indonesian equity market (Dvořák, 2005). Similarly, Baik et al. (2010) showed that "both the level of and change in local institutional ownership predict future stock returns, particularly for firms with high information asymmetry".

Given the value of information, it is not surprising that understanding its importance in stock trading, how it spreads, how it affects investor decisions, and how quickly it is incorporated into investing strategies long has been of interest in the Economic and Financial literature. Since public announcements are merely events where new information is made available to the public, they have, in their different forms, been studied extensively within the fields of Economics and Finance.

Many, including Fama (1970) has provided evidence supporting the efficient market hypothesis, wherein the market always fully reflects all available information. It is then natural that the announcement of new information relevant to the risk and future cash flows of a security have an effect on the price of that security. McQueen and Roley (1993) and Nofsinger (2001) show that the stock market reacts to the announcement of economic news within a day of the announcement when the news are good or bad, showing markets. Nofsinger (2001), however, does not find evidence that the announcement of neutral economic news prompts a reaction from the market. These findings display that markets only react when new information is introduced if the information is valuable.

However, it is not only the announcement of new objective information that affects activity on the stock market. Subjective discourse covering already public information also seems to be of interest to investors. Using a proxy for sentiment based on a popular column in the Wall Street Journal, Tetlock (2007) finds that high media pessimism predicts downward pressure on market prices in the short term, and shows that unusually extreme levels of sentiment predict high market trading volume. García (2013) further supports that sentiment can predict stock returns, showing that news content helps predict stock returns at the daily frequency. Busse and Green (2002) further show that the release of analyst reports increased trading volume and that positive (negative) reports predicted positive (negative) price movements. These findings show that the sentiment of subjective information can predict price movements and spark increases in trading volume without the introduction of novel objective information.

Concerning the Covid-19 pandemic specifically, a recent study by Cepoi (2020) showed that media coverage of the Covid-19 pandemic was detrimental to market returns. More specifically, the study showed that media coverage was detrimental to the higher quantiles of market returns in a quantile regression. For our study, this suggests that press conferences will affect market returns negatively on average.

3.2 Stock Markets & New Information

As the speed of information flows has increased over the past decades, not least because of the improvements in information technology, the financial industry has been able to access information quicker and more efficiently than ever before. In their study, Busse and Green (2002) showed that trading of a security intensifies in the first minute following televised analyst coverage, and that positive information is fully incorporated into the market price within one minute.

A more recent article by Scholtus et al. (2014) studies the speed of trading around macroeconomic news announcements, with a focus on algorithmic trading. They found that speed is crucially important for high-frequency trading (HFT) based on US macroeconomic news. More specifically, they found that the fastest traders acted on the new information within five milliseconds, and that traders with a 300 ms delay suffered a loss of 0.80% per year, and a one-second delay resulted in a loss of 1.48%.

Although this text will not analyze the speed of trading more closely, we note that previous literature shows that financial markets are quick to incorporate new information introduced through public announcements.

3.3 Stock Markets & Information Flows during Past Crises

A crisis often means that the state of the world is changing rapidly, meaning that a faster flow of information is necessary for people to stay updated. Given the importance of information when making investments, it is not surprising that an increased information flow can be observed when studying financial markets during times of crisis.

Dimpfl and Peter (2014) showed that "the flow of information [relevant for financial markets] across the Atlantic [...] dramatically increased during the financial crisis [of 2007-2009]". During the crisis, US hedge funds significantly reduced their equity holdings. This development was driven primarily by margin calls, and most of the selloffs occurred in volatile and liquid stocks (Ben-David et al., 2012). Manda et al. (2010) showed that during the same period, "most asset classes experienced significant pullbacks, the correlation between asset classes increased significantly and the markets [became] extremely volatile". Furthermore, it is documented that what might be the most acute form of crisis, war, both increases global volatility and reduces global stock market returns (Berkman and Jacobsen, 2006). On a similar note, García (2013) finds that the degree to which media sentiment predicts stock returns increases during recessions, suggesting that investors are more sensitive to media sentiment in bad times.

Looking back at historical epidemics, it can be seen that both US and European stock markets reacted "significantly, and negatively, to the surging death rates" during the Spanish Flu of 1918-1919 (Burdekin, 2021). The more recent, and less deadly, seasonal flu is also associated with "decreased trading, decreased volatility, decreased returns, and higher bid-ask spreads" (McTier et al., 2013). Both showing that disease outbreaks can have negative effects on stock markets.

Compared to historical crises, the introduction of social media has made the spread of important information such as diagnostics, treatment, follow-up protocols, etc. much more efficient (González-Padilla and Tortolero-Blanco, 2020). According to Tsoy et al. (2021), social media has also provided a platform for spreading information on the number of cases, hospitalized, deaths and policy changes, and therefore help shape the risk perception of users. In addition, it has been shown that the activity on social media (Twitter) was a good predictor of peaks in cases during the swine flu outbreak of 2009 (Kostkova et al., 2014), supporting the view that modern technology has facilitated the flow of disease-related information.

Finally, Kim and Verrecchia (1991) present a theoretical framework where market trading volume and the variance of returns are functions depending positively on individual traders' idiosyncratic reactions to public announcements, which in turn is suggested to be large when the precision in the information unveiled is high and when their access to information prior to the announcement is low. The framework also suggests that both price moves and jumps in volume are higher when the precision in the unveiled information is high, the shift in the average traders' perception is large and the information accessible prior to the announcement is relatively imprecise. Given that many viewed the Covid-19 pandemic as a period of high uncertainty, and that many view information from the PHAS as both precise and reliable, this model suggests that trading volume, price shifts, and volatility should be large following the press conferences studied. The model also predicts that surprising, large shifts in the coverage of the pandemic should increase volume and affect the direction of trading.

3.4 Home Bias

"Home bias is the tendency for investors to invest the majority of their portfolio in domestic equities, ignoring the benefits of diversifying into foreign equities." - Chen (2021). The tendency for investors to invest in equity of local companies has been shown many times, among others by Coval and Moskowitz (1999), French and Poterba (1991), and Tesar and Werner (1995). As discussed in the latter two articles, lack of opportunity to invest internationally or high transaction costs seems to be an unlikely explanation for this phenomenon.

Since one of the goals of this paper is to analyze how information released by the Public Health Agency of Sweden affects the stock market of both Sweden and its neighboring countries, home bias plays a role in explaining how large the effect on international stock markets will be. If there is a strong home bias in the Nordic region we would expect a weaker response in the markets analyzed outside of Sweden. This is partly because an international investor not owning Swedish equity has less incentive to stay updated on Swedish news, and partly because Swedish investors (who are presumably more up to date on Swedish news) own less international equity, meaning that their actions following the press conference will have less effect on international markets. How strong the effect of the PHAS's press conferences on international markets is will therefore partly depend on how strong home bias across the Nordic countries is.

Although still a concept used in economic literature, the importance of Home Bias seems to vary over time. For example, Karlsson and Nordén (2007) showed that home bias decreased in many parts of Europe over the period 2000-2003, including within the Nordic Region. If the trend of decreasing Home Bias has continued since the publication of this study, it could be the case that the Nordic Region has a relatively low level of Home Bias today. Furthermore, the intertwined history of the Nordic Countries, their common identity, low language barriers, highly integrated markets, and high level of collaboration could also cause relatively low Home Bias within the Nordic Region compared to other regions.

3.5 Hypotheses

Having presented the relevant literature above, this section presents our hypotheses after a short motivation related to the literature.

Given the closeness of the Nordic Countries, we expect that information announced by the PHAS will spread to Sweden's neighboring countries rapidly following the press conference. Furthermore, since all countries are closely related and mutually dependent, we expect home bias within the region to be relatively low and thus expect trading across Nordic borders to be relatively high. Finally, given their interconnectedness, the Nordic countries will likely deem information regarding Sweden's Covid-19 situation to be relevant domestically.

> *(i) We expect that the effects on stock markets identified in this study will not be*

isolated to Sweden, but instead will be present in all Nordic countries.

Dissemination of information through public announcements tends to trigger increased trading volume following the announcement. This seems to hold true regardless of whether novel objective information has been introduced or not.

(ii) We expect that trading volume will increase significantly on days when a press conference is held.

As described previously, earlier studies have shown that Covid-19 coverage effects stock market returns negatively.

(iii) We expect that daily market returns will tend to be negative on days when a press conference is held.

Previous research has found that trading volume increases following positive and negative announcements but has failed to show the same for neutral announcements. It has also been shown that more extreme sentiment in media predicts increased trading volume. Furthermore, large shifts in traders' perception is positively correlated with trading volume.

(iv) We expect that more extreme measures of sentiment and/or more extreme changes in sentiment will correlate positively with trading volume on days when a press conference is held.

Furthermore, previous studies have shown that sentiment can help predict stock market returns. More specifically, positive sentiment is correlated with positive returns while negative sentiment is correlated with negative returns. Moreover, we know that traders to a large extent act on shifts in perception.

(v) We expect that sentiment and/or changes in sentiment will be positively correlated with daily returns on the days when a press conference is held.

Finally, previous theory suggests that market reactions are greater in times of high uncertainty. For this paper, we assume uncertainty to be decreasing over time as people gain access to more information regarding the pandemic. We also assume uncertainty to be higher in times when death tolls are high.

(vi) We expect that the independent variables studied will have a larger effect on market activity in periods of high uncertainty.

3.6 Contributions to the Literature

This paper contributes to the Finance and Economics literature in several ways. First, the paper finds evidence that the information presented during governmental press conferences covering Covid-19 is valued and acted upon by public equity markets. We find that the value of this information was the highest early in the pandemic and during the third wave of cases. In these two periods, press conferences caused an increased trading volume, and the sentiment of the press conferences had a significant positive correlation with daily returns.[3] There was little evidence for a significant reaction to the press conferences between or after these two periods. Furthermore, we find that stock markets, on average, reacted negatively to the press conferences during 2020, but not continuing into 2021.[4] During 2020, this negative pressure on daily returns diminished over time.

Second, the paper adds to the previous literature on sentiment analysis in several ways. By showing that the sentiment of governmental press conferences can predict stock market returns, we widen the evidence for the effectiveness of sentiment analysis. This evidence, we observe, has previously been concentrated around the sentiment of news media. Furthermore, by showing that the explanatory value of sentiment in predicting market returns has decreased as the pandemic developed, and that it has not been correlated with the severity of the pandemic, we find direct evidence for the hypothesis that sentiment is more valuable during recessions as presented by García (2013).[5] As we find that press conferences continue to predict increased trading volume into later periods of the pandemic, sentiment losing explanatory value for daily returns is not likely due to the underlying information losing relevance. Finally, we fail to find any evidence that more extreme measures of sentiment predict increased trading volume. This is contrary to what the previous literature would suggest. One possible explanation is that the information presented during press conferences held by a governmental agency constitute market relevant information regardless of its sentiment.

Finally, we contribute to the literature by showing that several Nordic stock markets reacted to the information presented during press conferences in Sweden. Thus, we provide an example of when national governmental announcements in one country affect the stock markets of other countries.

4 Data, Methodology & Models

4.1 Data Collection

The five indices OMX Stockholm 30 (OMXS30), OMX Copenhagen 25 (OMXC25), OMX Helsinki 25 (OMXH25), OBX Index (OBX), and ICEX Main (ICEX) have been used as proxies for overall stock market activity when analyzing market behavior in the Sweden, Denmark, Finland, Norway,

[3]The Covid-19 pandemic swept through Sweden in three distinct waves during the period covered in this study. The formal definition and cut-off points for the sub-periods studied can be found in section 4.2.

[4]This statement constitutes a rough estimate of the effect we find. Our model significantly predicts negative returns for periods 1 and 2 with period 2 ending on 2021-02-02, one month into 2021.

[5]We find that sentiment has explanatory value in predicting stock market returns during the period 2020-03-06 to 2020-09-01. During this period, the Nordic stock markets had all dropped to their lowest point during the pandemic and subsequently recovered to within 90% of their prices before the market-wide drop.

and Iceland respectively. Throughout this paper, we will interchangeably refer to these using the name of the country in which they are traded, its capital, or the specific market in question. Trading volume and market cap data for the indices were collected on a daily interval from Fusion Media Limited (2022) for the period 2020-01-02 to 2022-03-02.[6] For ease of interpretation, trading volume is converted to natural logs (ln). Dates and transcripts for PHAS press conferences were collected for the period March 2020 to January 2022 and was provided by the PHAS directly.

Data covering daily Covid-19 death tolls in the Nordic countries has been collected from the PHAS (Public Health Agency of Sweden, 2022) and Our World in Data (Ritchie et al., 2020) for Sweden and the remaining Nordic countries respectively. This data was then aggregated to a rolling weekly death toll in number of deaths to better represent current death rates and to reduce potential distortions stemming from outliers in the daily data. The Oxford Coronavirus Government Response Tracker (OxCGRT) project calculates a Covid-19 Stringency Index, a composite measure of nine metrics, where a higher score indicates a stricter response to the pandemic (Ritchie et al., 2020). This stringency index was collected in a daily interval for all countries studied.

4.2 Variables Defined & Used

The two dependent variables studied in this paper are daily trading volume and daily market returns for all the Nordic indices mentioned in section 4.1. Throughout this paper, we use the following definition of trading volume ϕ_i on day i, where i is the index of trading days: The daily trading volume ϕ_i of an index is defined as the weighted average of the trading volumes on trading day i in the underlying stocks traded on the local stock market. The weights used for calculating the volume of the index is the same as the weights used to calculate the value of the same index. Furthermore, we define daily growth δ in relative terms. More formally, we have defined our variable δ_i for daily returns on trading day i as follows:

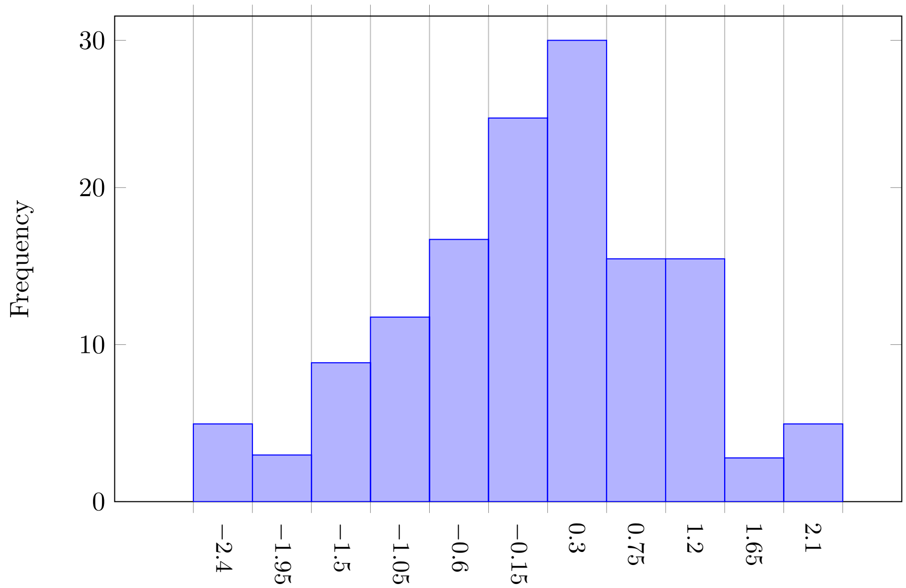
$$\delta_i = \frac{K_i - K_{i-1}}{K_{i-1}}, \tag{1}$$

where K_i is the closing price of the index measured on trading day i.

For independent variables we use both a dummy variable for the occurrence of a press conference, and different variations of sentiment measures based on an algorithm written specifically for this paper. Throughout this text, we will use Γ_i to denote the dummy variable for the occurrence of a press conference held by the PHAS on trading day i. The dummy variable was assigned the value 1 if a press conference was held on trading day i and 0 otherwise.[7] The variable Γ is used to check

[6] Unlike its Nordic counterparts, the Swedish and Norwegian stock markets adjust their opening hours in connection to some specific holidays. In practice, this means that the exchanges are only open for "half-days" on the days listed in section 8.3. To account for the low total trading volume on these "half-days" we have removed these days from the affected indices.

[7] For example, if a press conference was held on day 189 in our dataset, the variable Γ_{189} will be set to 1.



Source: Author-generated sentiment score.

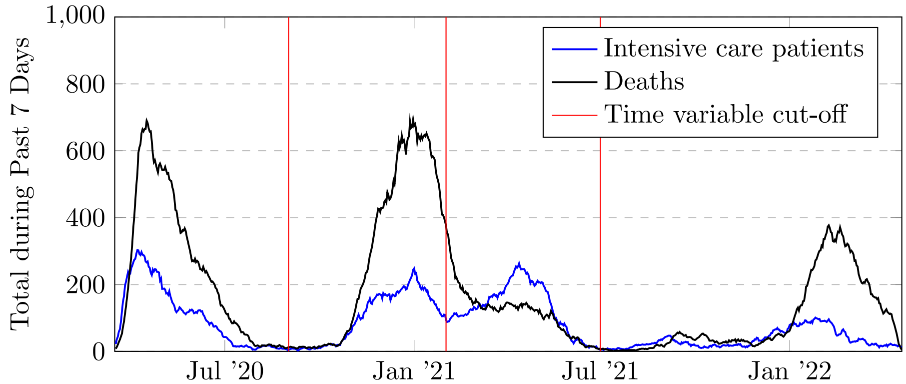
Figure 2: Distribution of Standardized Sentiment Scores Z_i

for differences in both trading volume ϕ and market returns δ on days with press conferences, as will be described further in section 4.4.

To analyze whether the sentiment of a given press conference has an effect on trading volume or market returns, a suitable proxy for the sentiment of the press conference is needed. For this purpose, an algorithm was built to give all 164 press conferences a sentiment-score.[8] The algorithm works through the text contained in the transcripts of all press conferences, looking for two-word combinations that are categorized as positive or negative.[9] The value of the sentiment score is calculated by subtracting the number of negative word combinations from the number of positive word combinations found within the transcript for each day. This value is then divided by the total number of words in the transcript to adjust for length of the press conference. Finally, the scores of all press conferences were standardized around the mean of all sentiment scores for easier interpretation. This standardized value will be referred to as Z_i, where i is the index of the trading day the press conference was held on. A more formal description of the algorithm can be found in Appendix 8.1, and the code can be found in Appendix 8.14. The distribution of all values Z_i can be seen in figure 2.

[8] Due to three transcripts not being available, only 161 out of 164 sentiment scores were generated.

[9] For example, the word "mortality" preceded by "high" will be assigned a negative sentiment point, while "mortality" preceded by "decreasing" would be given a positive sentiment point.



Source: Public Health Agency of Sweden (2022).

Figure 3: Covid-19 Deaths and Intensive Care Patients in Sweden

Throughout this paper we use not only the value of Z_i by itself, but also different variations of it for testing different parts of our hypotheses. First, we define the relative sentiment ΔZ_i as the change in sentiment score Z from the previous press conference, measured on trading day i. More formally, we can express this as $\Delta Z_i = Z_i - Z_p$, where p is the index of the trading day when the previous press conference was held. This variable is used to study how changes in sentiment effect market behavior. Furthermore, we also use the absolute values of both Z_i and ΔZ_i, denoted $|Z_i|$ and $|\Delta Z_i|$ respectively, to study their affects on market behavior.

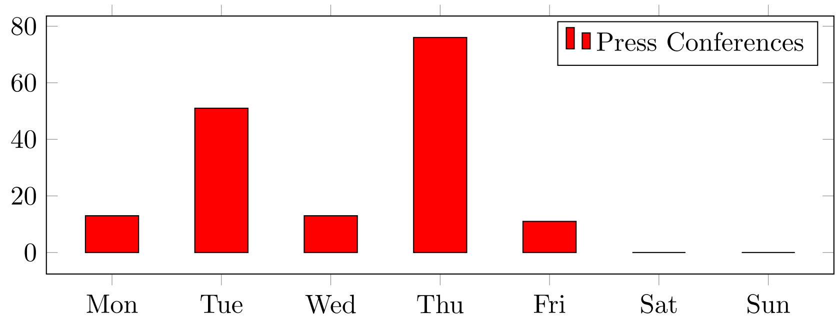
As the period studied is approximately two years long and includes periods of different stages and severity of the Covid-19 pandemic, variables were introduced both to control for these differences, and to calculate differences across periods. First, the pandemic has hit the world in "waves", meaning that its severity has increased and decreased multiple times. How these waves appeared in Sweden can be seen in figure 3, where the weekly rolling sum of deaths and intensive care patients can be seen. Based on this data, three cut-offs were made to create four time-periods, one for each wave.[10] Since these periods take place after one another, we know that the pandemic was considered a more recent phenomenon in the first period than in later periods.

To capture differences between time periods t, four dummy variables Λ_i^t were created for all trading days i and periods t. The value of the variable Λ_i^t is set to 1 if trading day i lies within period t and 0 otherwise.[11] These variables will be used both as control variables, and to calculate different effects across different periods, as will be described further in section 4.4.[12]

[10] As there are no universally defined cut-off dates for the distinct waves of the pandemic, the dates defining the "Period" variables have been chosen based on Covid-19 death and intensive care patient data, visualized in figure 3. The cut-off dates between periods are 2020-09-01, 2021-02-01, and 2021-07-01.

[11] For example, Λ_{12}^1 will be set to 1 if day 12 in the period studied lies within period 1 (which happens to be the case for the periods defined).

[12] The distribution of these variables can be found in Appendix 8.4.



Source: Public Health Agency of Sweden (2022).

Figure 4: Distribution of Press Conferences across Weekdays

For the purpose of estimating different effects across periods of different severity, three dummy variables Π_i^t were created for all trading days i and periods t. We now let periods t represent different levels of death tolls in Sweden, where a higher value for t implies a higher death toll.[13] The variable Π_i^t is assigned the value 1 if trading day i is contained within period t.[14][15]

Finally we define seven dummy variables ω_i^j for all trading days i and all weekdays j.[16] These variables will be used as control variables to adjust for weekday seasonality[17] and to manage the uneven distribution of press conferences across different weekdays. This distribution is visualized in figure 4.

Altogether, control variables used include the following: (1) Previous closing price of the stock indices studied, (2) market returns during the past 7 days of the index studied,[18] (3) stringency index for the country studied and Sweden, (4) deaths due to Covid-19 during the past seven days for the country studied and Sweden, (5) weekday and (6) time period. The occurrence of a press conference will also be controlled for when studying how sentiment of a given press conference effects market returns.

[13]We use the weekly rolling sum of Covid-19 related deaths as new Covid-19 related deaths are not published continuously throughout the week. $t = 3$ corresponds to the top quartile of death tolls among all days covered in the study, $t = 1$ corresponds to the lowest quartile, and $t = 2$ to the middle two quartiles.

[14]For example, the variable Π_{144}^3 is set to 1 if the death toll on day 144 lies within the top 25% of death tolls throughout the study period (counted as a rolling 7-day sum) and 0 otherwise. Π_{12}^1 is set to 1 if day 12 lies within a period of low deaths, and 0 otherwise.

[15]Again, the distribution of these variables can be found in Appendix 8.4.

[16]For example, ω_1^4 will be set to 1 if day i in the period studied is a Thursday (the fourth day of a given week).

[17]This phenomenon has been studied by Pettengill and Buster (1994) and Doyle and Chen (2009) who show that returns on securities differ across weekdays. Furthermore, it has been shown by Pettengill and Jordan (1988) that trading volume also differs across weekdays.

[18]We include previous market close and previous 7 day returns to control for the state of the market (high/low) and for short term trends in order to make individual days more comparable.

4.3 Multiple Linear Regression Model (MLR)

The fundamental model used for generating all of our results is a Multiple Linear Regression (MLR) model. Although most tests in this text aim to show how one specific variable depends of another, we have included other independent variables as controls in most regressions to reduce bias and increase the precision of our estimates. In all regressions we use robust standard errors.

Generally, an MLR model with N independent variables θ_i can be described on the following form:

$$\psi = \alpha + \sum_{i=1}^{N} \beta_i \theta_i \ + \ \varepsilon,$$

where ε is an error term, or the variance in ψ not explained by our independent variables θ_i. Furthermore, we note that an increase of 1 in θ_i implies an increase of β_i in our dependent variable ψ given the linearity of this model. This makes MLR not only a model suitable for creating an unbiased estimate in an environment with many independent variables, but also a model that gives results which are easy to interpret.

4.4 Tests Conducted

4.4.1 The Aggregated Effect of a Press Conference

For analyzing how the occurrence of a press conference from the PHAS affects a dependent variable ψ in the Nordic countries we use an MLR-model to estimate the value of the dependent variable ψ_i on trading day i. Mathematically, we can express the model as follows:

$$\psi_i = \alpha + \beta_1 \Gamma_i + \sum_{j=1}^{J} \beta_j \theta_i^j + \varepsilon_i \tag{2}$$

When testing how the occurrence of a press conference on trading day i (Γ_i), affects daily trading volume, the generic dependent variable ψ_i will be replaced with the daily trading volume ϕ_i before estimating and testing β_1 against the null hypothesis that $\beta_1 = 0$. In this test, the variables β_j represent the coefficients corresponding to the control variables θ^j used.[19] For conducting the corresponding test for daily market returns, the generic dependent variable ψ_i is replaced with daily market returns δ_i and the controls θ^j are altered.[20]

[19] Control Variables: Deaths in Sweden and locally, Stringency in Sweden and locally, Time period and Weekday. All as defined in section 4.2.

[20] Control Variables: Previous Close, Past 7d Returns, Deaths in Sweden and locally, Stringency in Sweden and locally, Time period and Weekday. All as defined in section 4.2.

4.4.2 The Effects of Sentiment

To test how a sentiment score ζ affects a dependent variable ψ, we estimate ψ_i using an MLR-model in four variations. Mathematically, we can express the generic model as follows:

$$\psi_i = \alpha + \beta_1 \zeta_i + \sum_{j=1}^{J} \beta_j \theta_i^j + \varepsilon \tag{3}$$

To test whether the sentiment measure ζ is correlated with daily trading volume ϕ we first replace dependent variable ψ_i in equation 3 with daily trading volume ϕ_i. Having done this, we create two variations of the model. To test whether the absolute value of our standardized sentiment measure $|Z|$ is correlated with daily trading volume ϕ, we replace the generic sentiment variable ζ_i in equation 3 with $|Z_i|$, creating variation one. To then test whether the absolute value of our relative sentiment measure $|\Delta Z|$ is correlated with daily trading volume ϕ, we instead replace the generic sentiment variable ζ_i in equation 3 with $|\Delta Z_i|$, creating variation two.

To test whether sentiment ζ is correlated with daily returns δ we first replace dependent variable ψ_i in equation 3 with daily returns δ_i. Having done this, we create two variations of the model. To first test whether our standardized sentiment measure Z is correlated with daily returns δ, we replace the generic sentiment variable ζ_i in equation 3 with Z_i, creating variation three. To then test whether our relative sentiment measure ΔZ is correlated with daily returns δ, we instead replace the generic sentiment variable ζ_i in equation 3 with ΔZ_i, creating variation four.

When estimating and testing β_1 against the null hypothesis that $\beta_1 = 0$ for the four variations of equation 3 described above, two sets of control variables are used. The variables β_j represent the coefficients corresponding to the control variables θ^j used.[21]

4.4.3 Effects during Different Parts of the Pandemic

To test how an independent variable ξ affects a dependent variable ψ during different periods of the pandemic, we utilize our previously defined dummy variables for different periods Λ^t and our dummy variables for press conferences segmented by death tolls Π^t that were defined in section 4.2 to estimate different effects during different periods. To do this, we use a regression model of the following form:

$$\psi_i = \alpha + \sum_{t=1}^{T} \beta_1^t \Psi_i^t \xi_i + \sum_{j=1}^{J} \beta_j \theta_i^j + \varepsilon_i,$$

where Ψ_i^t is used to denote a general dummy variable of the same form as our segmented press

[21] Control Variables for all four variations include: Deaths in Sweden, Local deaths, Stringency in Sweden, Local stringency, Period, and Weekday. The two variations of equation 3 using daily returns δ_i also include the control variables Previous close and Past 7 day returns. All as defined in section 4.2.

conference dummy variables Λ^t and Π^t for trading day i. Depending on whether we aim to estimate different effects of the general variable ξ during different waves of the pandemic or during periods of different severity, the general segmented dummy variable Ψ_i^t will be replaced with either the period-segmented dummy Λ_i^t or the death-segmented dummy Π_i^t. Using this method, we are able to estimate one coefficient β_1^t corresponding to the independent variable ξ for each period t. All of these can be tested against the null hypothesis that $\beta_1^t = 0$.

Within the framework defined above, we use both the daily trading volume ϕ and daily market returns δ as the dependent variable, replacing the general dependent variable ψ with one of them at a time. When the daily trading volume ϕ is used as the dependent variable, the occurrence of a press conference, our press conference dummy Γ will be used as the independent variable, replacing ξ. As in previous sections, the variables β_j represent the coefficients corresponding to the control variables θ^j used.[22] When using daily market returns δ as the dependent variable, the independent variable used is instead Z, as defined in 4.2. To account for potential differences effects of a press conference taking place during the different periods we will separate the press conference dummy variable Γ_i over the different periods and use it as a control variable. This means that one of our control variables θ_i^j will look as follows:

$$\theta_i^p = \sum_{t=1}^{T} \Psi_i^t \Gamma_i,$$

where the general segmented dummy variable Ψ_i^t will be replaced with either the period-segmented Λ_i^t or the death-segmented Π_i^t depending on what periods we wish to estimate β_1^t for. This variable will be added to the other control variables.[23]

4.4.4 Differences between Estimated Coefficients

Our models described in section 4.4.3 estimate the magnitude of effects studied across different periods. Since it is of interest to investigate whether the effects during the different periods are significantly different, we also conduct tests for this. More specifically, we conduct a χ^2-test to test the null hypothesis that the coefficients for the different periods are the same.

5 Results & Discussion

In this section we present our main findings and provide an interpretation of the results. Full regression tables with all control variables except weekday and time-period will be presented once

[22] Control Variables used: Deaths in Sweden and locally, Stringency in Sweden and locally, Time Period and Weekday, all as defined in section 4.2.

[23] Further Control Variables: Previous Close, Previous Week Returns, Deaths in Sweden and locally, Stringency in Sweden and locally, Weekday and Time Period.

for regressions with trading volume as the dependent variable, and once for regressions with market returns as the dependent variable. The following variations of these throughout this section will only include results for the main variables of interest. More complete tables can be found in the Appendix.

5.1 The Effect of Press Conferences on Trading Volume

5.1.1 The Occurrence of a Press Conference & Trading Volume

To study whether the PHAS's press conferences had any effect on the daily trading volume in the Nordics we employ the model presented in section 4.4.1. With daily trading volume ϕ (expressed in natural logarithms, ln) as the dependent variable. We use a press conference dummy variable as our main independent variable to test whether the occurrence of a press conference causes an increase in trading volume. We control for weekday seasonality, time period as well as both Swedish and local death tolls and stringency levels.

Table 2: Volume & Press Conference Dummy

Volume (ln)	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Press Conference (Γ)	0.209***	0.244***	0.0428	0.169***	-0.0318
	(4.25)	(3.47)	(0.82)	(3.34)	(-0.31)
Deaths Sweden	0.000397***	0.000671***	0.000114	0.000591***	0.00132***
	(4.36)	(4.62)	(0.62)	(4.70)	(6.01)
Stringency Sweden	-0.00779***	-0.0103***	-0.00455**	-0.00444**	-0.0150***
	(-4.97)	(-4.25)	(-2.26)	(-2.44)	(-3.93)
Local Deaths	N.A.	-0.00194**	0.000510	-0.00119**	0.0246
		(-2.38)	(0.47)	(-2.58)	(0.90)
Local Stringency	N.A.	0.00387*	0.00799***	0.00457**	0.0144**
		(1.76)	(3.12)	(2.19)	(2.56)
Constant	18.55***	18.15***	17.45***	16.32***	17.95***
	(183.69)	(158.10)	(130.10)	(131.62)	(49.18)
N	414	407	413	406	405
R^2	0.275	0.372	0.286	0.239	0.412
adj. R^2	0.257	0.353	0.264	0.215	0.394

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily trading volume (ln) and the main independent variable is a press conference dummy variable.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
* $p < .10$, ** $p < .05$, *** $p < .01$

In table table 2 on the preceding page we can see that the occurrence of a press conference has a significant positive correlation with daily trading volume in Stockholm, Oslo and Copenhagen. Our model predicts that trading volume is 23.2%, 27.8% and 18.4% higher on days with press conferences than on days without on their respective stock markets ($p < 0.01$). However, we do not find any evidence of an increase in trading volume on the stock markets of Helsinki or Reykjavík, noting that the coefficient for Reykjavík is slightly negative. This result supports our hypothesis (*ii*) that press conferences causes an increase in daily trading volume. The results, however, only partially support our hypothesis (*i*) that the effect would be present across all Nordic countries, with no evidence for an effect in Finland or Iceland. We note that the three countries which saw a significant increase in trading volume are the closest to Sweden both geographically and in terms of the language spoken.

Looking at the control variables used in table table 2 on the previous page, we find a significant positive correlation between deaths in Sweden and daily trading volume in Stockholm, Oslo, Copenhagen and Reykjavík ($p < 0.01$). Furthermore, there exists a significant negative correlation between the Swedish stringency level and daily trading volume in all Nordic countries ($p < 0.05$ for Denmark and Finland, $p < 0.01$ for others). Interestingly, all countries except Sweden show a significant positive correlation between their local stringency levels and trading volume, whereas Sweden shows a negative correlation. Moreover, we note that Norway and Denmark, the countries other than Sweden that experience a significant increase in trading volume when a press conference is held, also show a negative correlation between local deaths and trading volume ($p < 0.05$ for Norway, $p < 0.01$ for Denmark), possibly indicating a different response to local deaths compared to the other Nordic countries.

5.1.2 Sentiment & Trading Volume

Having shown that press conferences increase daily trading volume in three of the Nordic countries, we also investigate whether the the sentiment of press conferences had any effect on the daily trading volume. We employ the model presented in section 4.4.2, using daily trading volume ϕ as the dependent variable and the absolute value of our standardized sentiment score ($|Z|$) as the main independent variable. We use this model to test whether more extreme sentiment correlates with higher levels of trading. The regression keeps the press conference dummy variable Γ used in the previous section (5.1.1) as a control variable, and keeps all the same control variables.[24]

[24]The control variables from section 5.1.1 are; deaths due to Covid-19 and stringency both in Sweden and locally, weekday, and time period.

Table 3: Trading Volume & Absolute Sentiment

Volume (ln)	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Abs. Sentiment ($\lvert Z \rvert$)	-0.0315	0.0220	-0.0418	0.0132	-0.0562
	(-0.87)	(0.48)	(-0.88)	(0.31)	(-0.66)
Press Conference (Γ)	0.232^{***}	0.226^{***}	0.0751	0.159^{**}	0.0103
	(3.85)	(2.77)	(1.20)	(2.51)	(0.09)
N	414	407	413	406	405
R^2	0.276	0.373	0.288	0.239	0.413
adj. R^2	0.257	0.352	0.265	0.214	0.393

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily trading volume (ln) and the main independent variables are absolute sentiment($\lvert Z \rvert$) and a press conference dummy variable.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
Results are controlled for death rates and stringency in Sweden and locally. Constant hidden.
Complete results can be found in Appendix 8.5.
* $p < .10$, ** $p < .05$, *** $p < .01$

In table 3 we find no evidence supporting our hypothesis (*iv*) that more extreme sentiment correlates with higher trading volume.[25] To further test our hypothesis (*iv*) we employ the model presented in section 4.4.2, simply replacing the absolute sentiment measure ($\lvert Z \rvert$) used to generate the results in table 3 with the absolute value of our relative sentiment measure ($\lvert \Delta Z \rvert$) and generate the results in table 4 on the next page.

[25] We also note that adding the absolute sentiment measure has reduced the significance of the press conference dummy variable for Copenhagen.

Table 4: Daily Trading Volume & Absolute Relative Sentiment

Volume (ln)	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Abs. Rel. Sent. ($\|\Delta Z\|$)	-0.0251	0.0214	-0.0570*	-0.00000594	-0.00199
	(-0.87)	(0.54)	(-1.72)	(-0.00)	(-0.04)
Press Conference (Γ)	0.223***	0.216***	0.0944	0.160**	-0.0329
	(3.61)	(2.60)	(1.44)	(2.50)	(-0.28)
N	413	406	412	405	404
R^2	0.271	0.366	0.288	0.233	0.411
adj. R^2	0.250	0.345	0.264	0.208	0.392

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily trading volume (ln) and the main independent variables are absolute relative sentiment($|\Delta Z|$) and a press conference dummy variable.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
Results are controlled for death rates and stringency in Sweden and locally. Constant hidden.
Complete results can be found in Appendix 8.6
* $p < .10$, ** $p < .05$, *** $p < .01$

Similar to table 3, table 4 provides no evidence supporting our hypothesis (*iv*) that more extreme relative sentiment ($|\Delta Z|$) would increased trading volume. Here, we can see that only the coefficient of Helsinki is statistically significant ($p < 0.1$), and that both positive and negative coefficients appear of varying magnitudes. Given the relatively high p-value for the coefficient of Helsinki and the fact that we cannot find any other clear trends, we don't draw any conclusions from the results presented in this table. We conclude that neither tables 3 nor 4 provides support for our hypothesis (*iv*) that more extreme measures of sentiment and/or more extreme changes in sentiment will correlate positively with trading volume.[26]

5.2 The Effect of Press Conferences on Market Returns

5.2.1 The Occurrence of a Press Conference & Market Returns

To study our hypothesis (*iii*) that press conferences on average have a negative effect on daily market returns, we use the model described in section 4.4.1. We use daily market returns δ[27] as the dependent variable and our press conference dummy variable (Γ)[28] as the main independent variable, adding the closing price from the previous trading day and market returns over the previous

[26] Again, we note that adding the absolute relative sentiment measure also has reduced the significance of the press conference dummy variable for Copenhagen.
[27] Daily market return is measured as the % change in closing price from the previous trading day, expressed as a decimal value. Daily return is formally defined in section 4.2.
[28] The dummy variable Γ_i is given the value 1 if a press conference is held on day i. The full definition can be found in section 4.2.

7 trading days as control variables, as described in section 4.2.[29] Deaths and stringency within both the studied country and Sweden as well as weekday and time period are maintained as control variables for the reasons described in section 4.2.

Looking at the results in table 5 on the following page, we can see that press conferences decrease predicted daily returns on all Nordic Stock markets. However, these results are only significant for the stock market of Stockholm, Copenhagen ($p < 0.1$) and Helsinki ($p < 0.05$). In these countries, our model predicts a decrease in daily returns of 50, 41 and 51 basis points on their respective stock markets on days when the PHAS holds a press conference. We also note that returns during the previous seven days is significantly positively correlated with current day returns for all Nordic markets ($p < 0.01$) during the period studied, supporting the notion that stock markets are prone to follow trends that last more than one trading day. We also note that our model predicts that market returns are lower when the previous closing price is high, which is in line with what we would expect. This result is highly significant for all markets studied ($p < 0.01$).

[29] The reasons for this include the fact that stock markets are known to follow longer-term trends, and that stock markets are more likely to increase in value when their value is low, and decrease in value when their value is high.

Table 5: Market Return and Press Dummy

Daily Returns	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Press Conf. (Γ)	-0.00501*	-0.00307	-0.00512**	-0.00411*	-0.00188
	(-1.93)	(-1.36)	(-2.18)	(-1.68)	(-0.89)
Previous Close	-0.0000437***	-0.000106***	-0.0000203***	-0.0000403***	-0.0000230***
	(-3.92)	(-6.72)	(-5.77)	(-4.68)	(-3.78)
Prev. 7d Return	0.163***	0.195***	0.139***	0.154***	0.112***
	(5.32)	(7.89)	(3.71)	(5.78)	(4.83)
Deaths Sweden	-0.00000427	0.00000433	0.00000572	-0.00000155	0.00000454
	(-0.84)	(0.75)	(0.65)	(-0.27)	(0.94)
Stringency Sweden	0.00000503	0.0000677	0.00000137	-0.0000873	-0.0000923
	(0.07)	(0.56)	(0.02)	(-1.05)	(-1.56)
Local Deaths	N.A	0.0000788***	-0.0000802*	0.00000615	0.000390
		(2.80)	(-1.68)	(0.28)	(0.60)
Local Stringency	N.A.	-0.000222*	-0.000135	-0.000106	0.000128
		(-1.82)	(-0.84)	(-1.14)	(1.11)
Constant	0.0748***	0.0836***	0.0868***	0.0664***	0.0324***
	(3.74)	(6.40)	(5.78)	(4.80)	(2.87)
N	415	403	409	396	388
R^2	0.190	0.220	0.173	0.204	0.141
adj. R^2	0.166	0.192	0.143	0.174	0.109

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).

Dependent variable is daily returns(decimal) and the main independent variable is a press conference dummy variable.

t statistics in parentheses. Results are controlled for weekday seasonality and time period.

* $p < .10$, ** $p < .05$, *** $p < .01$

5.2.2 Sentiment & Market Returns

Having shown that market returns on the Nordic stock markets tend to be negative on days when press conferences are held by the PHAS, we now investigate whether press conference sentiment is positively correlated with daily market returns (Hypothesis (v)). We employ the model presented in section 4.4.2, using daily returns δ as the dependent variable and our standardized sentiment score Z as the main independent variable. The regression keeps the press conference dummy variable from the previous section as a control, while still employing all control variables used to generate the results in table 5 on the previous page.[30]

Table 6: Market Return and Sentiment Score

Daily Returns	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Sentiment (Z)	0.00256**	0.000369	0.00219**	0.00222**	0.000798
	(2.25)	(0.31)	(2.06)	(2.08)	(0.76)
Press Conf. (Γ)	-0.00459*	-0.00301	-0.00477**	-0.00370	-0.00177
	(-1.77)	(-1.33)	(-2.03)	(-1.53)	(-0.83)
N	415	403	409	396	388
R^2	0.202	0.220	0.182	0.214	0.143
adj. R^2	0.177	0.190	0.151	0.183	0.108

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily returns(decimal) and the main independent variables are sentiment(Z) and a press conference dummy variable.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
Results are controlled for death rates and stringency in Sweden and locally, previous close, and weekly return. Constant hidden.
Complete results can be found in Appendix 8.7
* $p < .10$, ** $p < .05$, *** $p < .01$

As shown in table 6, we find that our sentiment score Z is positively correlated with market returns in all Nordic markets. However, the coefficients are only significant for Stockholm, Helsinki, and Copenhagen ($p < 0.05$). For these three markets respectively our model predicts an increase in daily returns of 26, 22, and 22 basis points respectively for every one standard deviation increase in our standardized sentiment score Z.

Having found evidence that sentiment (Z) is positively correlated with market returns, we further test our hypothesis (iii) that the same holds true for relative changes in sentiment (ΔZ). Using a similar regression model to the one used to generate table 6,[31] but now using relative

[30] These are previous close, returns over the past 7 trading days, deaths and stringency in Sweden and locally, weekday, and time period. Now we also add the press conference dummy variable as a control variable.
[31] The general form of this regression is described in section 4.4.2.

sentiment (ΔZ) as the independent variable, we generate the results in table 7.

Table 7: Market Return and Change in Sentiment

Daily Returns	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Rel. Sent. (ΔZ)	0.00159**	0.000636	0.00111	0.00171**	0.000479
	(1.99)	(0.74)	(1.52)	(2.26)	(0.67)
Press Conf. (Γ)	-0.00500*	-0.00300	-0.00511**	-0.00387	-0.00207
	(-1.93)	(-1.32)	(-2.17)	(-1.58)	(-0.97)
N	414	402	408	395	387
R^2	0.185	0.219	0.161	0.209	0.138
adj. R^2	0.159	0.189	0.129	0.178	0.103

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily returns(decimal) and the main independent variables are relative sentiment(ΔZ) and a press conference dummy variable.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
Results are controlled for death rates and stringency in Sweden and locally, previous close, and weekly return. Constant hidden.
Complete results can be found in Appendix 8.8
* $p < .10$, ** $p < .05$, *** $p < .01$

From table 7 we can tell that daily returns is also positively correlated with relative changes in sentiment (ΔZ) for all Nordic markets. However, this positive correlation is only statistically significant for the stock markets in Stockholm and Copenhagen ($p < 0.05$). Unlike in table 6, we find no significant results in Helsinki, meaning that our sentiment score Z has significant explanatory value there, while our relative sentiment score ΔZ does not. In Denmark and Sweden our model predicts that if the sentiment score Z is one standard deviation higher than during the previous press conference, daily returns are expected to increase with 16 and 17 basis points on their respective stock markets.

5.3 Robustness Checks

So far we have provided evidence that both the occurrence of a press conference and its sentiment have a significant effect on trading volume or market returns in several Nordic countries. In this section we will investigate whether or not these effects differ across different periods of the pandemic.[32] First, we will estimate the effects separately across different time periods.[33] Second, we

[32] As described in section 4.4.3, we use the dummy variable Λ^t to separate effects across different time periods and Π^t to separate effects over periods of different death tolls.

[33] In short, these four periods are defined as four following "waves" throughout the pandemic. A more precise definition is provided in section 4.2.

estimate the effects for periods of different severity throughout the pandemic.[34]

5.3.1 Volume across Time Periods

Using the method described in section 4.4.3, we divide the press conference dummy variable into four separate dummy variables, each taking on the value of 1 when a press conference occurs during a certain period of the pandemic.[35] Having done so, we employ the MLR-model described in section 4.4.3, using daily trading volume[36] as the dependent variable and our four period-separated press conference dummy variables $\Lambda^t\Gamma$ as the main independent variables. The control variables used are the same as for our previous regressions, without separation across time periods.[37]

Table 8: Trading Volume and Press Conference Dummy Across Time

Volume (ln)	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Press Conf. p.1 ($\Lambda^1\Gamma$)	0.336***	0.445***	0.0358	0.305***	0.167
	(4.80)	(3.47)	(0.47)	(4.52)	(1.02)
Press Conf. p.2 ($\Lambda^2\Gamma$)	0.130*	0.0866	0.0723	0.132	-0.0890
	(1.80)	(1.06)	(0.77)	(1.64)	(-0.55)
Press Conf. p.3 ($\Lambda^3\Gamma$)	0.174***	0.163*	0.115	0.117*	-0.233
	(2.76)	(1.71)	(1.30)	(1.65)	(-1.57)
Press Conf. p.4 ($\Lambda^4\Gamma$)	0.105	0.193**	-0.0446	0.0624	-0.108
	(1.43)	(2.27)	(-0.55)	(0.89)	(-0.79)
N	414	407	413	406	405
R^2	0.291	0.390	0.290	0.255	0.418
adj. R^2	0.268	0.366	0.263	0.227	0.396

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily trading volume (ln) and the main independent variables are press conference dummy variables segmented by period.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
Complete results can be found in Appendix 8.9
* $p < .10$, ** $p < .05$, *** $p < .01$

As shown in table 8, press conferences predict increased trading volume on all markets studied during the first period of the pandemic. The results are statistically significant for Denmark,

[34] These periods are defined as periods of high, moderate or low death tolls in Sweden during the past seven days. For a more formal explanation, please see section 4.2.

[35] The periods we refer to were defined to represent the four "waves" of the pandemic in Sweden. The methodology for this is covered in section 4.2.

[36] Trading Volume is still measured as the natural logarithm of the weighted average of trades made on each stock in the measured indices, as described in section 4.2.

[37] For reference, these are death toll and stringency in both Sweden and the country studied, as well as time period and weekday.

Norway and Sweden ($p < 0.01$), with a predicted increase of 35.66%, 56.05% and 39.93% on their respective stock markets. Press conferences also predict a significant increase in trading volume in period three of 12.41%, 17.70% and 19.01% in Denmark, Norway and Sweden respectively ($p < 0.01$). Furthermore, we find that the coefficient for the first period is significantly larger than the coefficients for all other periods for the same markets.[38]

As the only significant results found during period two is for Sweden, and the only significant result during period three is found in Norway, we show that our original results from section 5.1, showing that the press conference dummy variable Γ had a significant effect, only partially hold during these periods. However, we can confirm that the results are significant for the same countries as they originally were in section 5.1 during period one and three.

Having shown that the predicted increase in trading volume from press conference was significantly greater in the first period compared to later periods, we find evidence in support of our hypothesis (vi) that the effect will be greater when uncertainty is high. Since we can see significant increases in trading volume in both Norway and Denmark on days with press conferences during two periods, we also find partial support for the hypothesis (i) that effects would be present in all Nordic countries.

5.3.2 Returns across Time Periods

Continuing our robustness check we again employ the model described in section 4.4.3, now using daily returns as the dependent variable. We use both our sentiment variable Z and our press conference dummy Γ separated across the four periods as independent variables.[39] This gives us the eight independent variables $\Lambda^t Z$ and $\Lambda^t \Gamma$.[40] The control variables used are the same as for our previous regressions.[41]

Our result concerning how sentiment (Z) predicts market returns in all Nordic countries can be seen in table 9 on page 34. We can see that our sentiment score Z is positively correlated with market returns on all stock markets studied during the first period of the pandemic. This result is statistically significant for all markets, providing support for our hypothesis (v) that sentiment was positively correlated with market returns. It also provides some support of hypothesis (i) that stock market effects will be seen in all Nordic countries.

The same can not be said for later periods, where we find no significant correlation between market returns and our sentiment score Z in period two and four. During the third period we only

[38]We use χ^2-tests to test if individual coefficients are the same. A more formal description is provided in section 4.4. Test results can be found in Appendix 8.13.

[39]Periods are defined roughly as the "waves" throughout the pandemic, for a more precise definition, please see section 4.2.

[40]Since we have four time periods t we have four different dummy variables Λ^t. For example, when we combine it with Γ it gives us four variables: $\Lambda^1\Gamma$, $\Lambda^2\Gamma$, $\Lambda^3\Gamma$ and $\Lambda^4\Gamma$.

[41]For memory, these are previous market close, market returns over the previous 7 days, death toll and stringency-both Sweden and the country studied, as well as time period and weekday.

find two significant (positive) correlations, namely in Sweden and Finland. We also note that our χ^2-tests show that the coefficients of period one are significantly greater than for period two for all markets except for Denmark.[42] This is in line with our hypothesis (*vi*) that effects are greater when uncertainty is high, since we assume uncertainty to be higher during the initial stages of the pandemic.

Looking at the effect our press conference dummy variable Γ has on daily returns over the different periods, we first note that all countries but Iceland show a significant negative correlation between daily returns and press conferences during period one. During this period, our model predicts a decrease in daily returns of between 81 and 117 basis points on these markets, ($p < 0.05$) for Norway, ($p < 0.01$) for others. During period two we see a significant negative effect for all countries but Iceland and Norway. During this period, our model predicts a decrease in daily returns of between 66 and 78 basis points for the countries with significant results. For period 3 and 4 we find no significant correlation for any country and note that coefficients appear to be smaller than during earlier periods and have different signs across countries. Furthermore, our χ^2-tests show that the coefficient is significantly larger for period one than period four in all countries studied except Iceland.[43] In sum, this provides evidence for both hypothesis (*iii*) that returns tend to be negative on days with a press conference, and (*vi*) that effects are larger in periods of high uncertainty. Since we have significant results for all countries but Iceland during the first period, we also find partial support for hypothesis (*i*) that effects would be the same across all Nordic countries.

[42] The results from all χ^2-tests can be found in Appendix 8.13. The tests also show many other differences, including that the coefficient for Sweden, Finland and Iceland is significantly larger for period one than four. All tests can be seen in Appendix 8.13.

[43] Other significant findings include that the coefficient for period one is significantly larger than the coefficient for period three in Sweden, Norway and Denmark. All χ^2-test results can be seen in Appendix 8.13.

Table 9: Market Returns and Sentiment Across Time

Daily Returns	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Sent. in Period 1 ($\Lambda^1 Z$)	0.00590***	0.00339*	0.00490***	0.00329**	0.00445**
	(3.05)	(1.91)	(2.78)	(2.55)	(2.06)
Sent. in Period 2 ($\Lambda^2 Z$)	-0.00104	-0.00297	-0.000968	0.00164	-0.000492
	(-0.82)	(-1.60)	(-0.53)	(0.84)	(-0.34)
Sent. in Period 3 ($\Lambda^3 Z$)	0.00587*	0.00249	0.00550***	0.00490	-0.00225
	(1.71)	(0.76)	(2.69)	(1.36)	(-0.72)
Sent. in Period 4 ($\Lambda^4 Z$)	-0.000192	-0.00140	-0.000209	0.00132	-0.00172
	(-0.13)	(-0.54)	(-0.12)	(0.56)	(-1.41)
Press Conf. p.1 ($\Lambda^1 \Gamma$)	-0.0112***	-0.00812**	-0.00961***	-0.0117***	-0.00556
	(-3.08)	(-2.28)	(-2.87)	(-3.76)	(-1.45)
Press Conf. p.2 ($\Lambda^2 \Gamma$)	-0.00703**	-0.00485	-0.00779**	-0.00655**	-0.00415
	(-2.40)	(-1.63)	(-2.51)	(-2.22)	(-1.32)
Press Conf. p.3 ($\Lambda^3 \Gamma$)	-0.00196	-0.00151	-0.00416	0.00124	-0.00111
	(-0.59)	(-0.48)	(-1.44)	(0.32)	(-0.37)
Press Conf. p.4 ($\Lambda^4 \Gamma$)	0.000164	0.000162	-0.000575	0.00268	0.000367
	(0.06)	(0.06)	(-0.20)	(0.88)	(0.14)
N	415	403	409	396	388
R^2	0.238	0.246	0.207	0.253	0.168
adj. R^2	0.201	0.205	0.164	0.211	0.121

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily returns(decimal) and the main independent variables are sentiment(Z) and conference dummy variables, both segmented by period.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
Results are controlled for death rates and stringency in Sweden and locally, previous close, and weekly return. Constant hidden.
Complete results can be found in Appendix 8.11
* $p < .10$, ** $p < .05$, *** $p < .01$

5.3.3 Volume across Different Death Tolls

To analyze how trading volume is affected by press conferences in periods of differing death tolls in Sweden, we employ the model described in section 4.4.3, using daily trading volume ϕ as the dependent variable. We use our press conference dummy variable Γ separated across the three periods of different death tolls in Sweden as our main independent variables.[44] This gives us the three independent variables $\Pi^t\Gamma$.[45] We control for the same variables as in previous regressions with trading volume as the dependent variable.[46]

Table 10: Trading Volume and Press Conference Dummy Across Deaths

Volume (ln)	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
P.C. High ($\Pi^3\Gamma$)	0.225***	0.426***	0.0391	0.264***	0.105
	(3.41)	(4.04)	(0.48)	(3.50)	(0.71)
P.C. Moderate ($\Pi^2\Gamma$)	0.240***	0.216***	0.103*	0.153***	-0.160
	(4.10)	(3.16)	(1.68)	(2.81)	(-1.46)
P.C. Low ($\Pi^1\Gamma$)	0.0917	0.00786	-0.109	0.0583	0.0318
	(1.31)	(0.10)	(-1.57)	(1.02)	(0.20)
N	414	407	413	406	405
R^2	0.284	0.396	0.299	0.251	0.419
adj. R^2	0.263	0.375	0.274	0.225	0.398

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily trading volume (ln) and the main independent variables are press conference dummy variables segmented by death rates.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
Results are controlled for death rates and stringency in Sweden and locally.
Complete results can be found in Appendix 8.10
* $p < .10$, ** $p < .05$, *** $p < .01$

As shown in table 10, we find that press conferences predict higher trading volume in all Nordic countries during periods when death tolls are high, although all coefficients are not statistically significant. We find significant increases in trading volume during periods of moderate and high death tolls for Sweden, Norway and Denmark ($p < 0.01$). Furthermore, our χ^2-test show that the coefficient is larger during periods of moderate death tolls than during periods when death tolls are

[44] Periods are defined roughly as either High, Moderate or Low death tolls during the previous 7 days in Sweden. For further information, see section 4.2.

[45] Since we have three time periods t we have three different dummy variables Π^t. For example, when we combine it with Γ it gives us four variables: $\Pi^1\Gamma$, $\Pi^2\Gamma$ and $\Pi^3\Gamma$.

[46] For reference, these are death toll and stringency in both Sweden and the country studied as well as time period and weekday.

low.[47]

As we find significant results for Sweden, Norway, and Denmark during times of high and moderate Swedish death tolls, but not during periods of low death tolls, we show that our original results from section 5.1 hold best when death tolls in Sweden are high or moderate. We also note that Finland shows a significant positive coefficient during periods of moderate Swedish death tolls ($p < 0.1$).[48]

The fact that we find significant increases in trading volume on days with press conferences only during periods of high or moderate death tolls is in line with our hypothesis (*vi*) that the effects will be greater when uncertainty is high. This, in combination with the results from our χ^2-tests provides support for the mentioned hypothesis.

5.3.4 Returns across Different Death Tolls

We finish our investigation of results across different periods by examining whether the effect of a press conference on market returns differs across periods of different death tolls. To do this, we use daily market returns δ as our dependent variable in the model described in section 4.4.3. We use both our sentiment variable Z and our press conference dummy Γ separated across the three periods of different death tolls[49] as our main independent variables. This gives us the six independent variables $\Pi^t Z$ and $\Pi^t \Gamma$.[50] We control for the same variables as in previous regressions.[51]

[47] We also show that the coefficient for periods of high death tolls is larger than the corresponding coefficient during periods of low Swedish death tolls in Denmark and Norway, but fail to do so for Sweden. Finally, we show that the coefficient for high periods is greater than for moderate periods in Norway.

[48] Finland has previously not shown a significant correlation between trading volume and our press conference dummy Γ. We find no significance in table 8 on page 31 or in table 2 on page 23.

[49] Death tolls are defined as the number of deaths in Sweden over a rolling 7-day period, where the classifications high and low include the highest and lowest 25% of death tolls and moderate including the middle 50%. See section 4.2 for the formal definition.

[50] Since we have three time periods t we have three different dummy variables Π^t. For example, when we combine it with Γ it gives us four variables: $\Pi^1\Gamma$, $\Pi^2\Gamma$ and $\Pi^3\Gamma$.

[51] These are: previous market close, previous 7 day market returns, death toll and stringency in both Sweden and the country studied as well as time period and weekday.

Table 11: Market Returns and Sentiment Score Across Deaths

Daily Returns	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Sent. High Deaths ($\Pi^3 Z$)	0.00406	0.00226	0.00220	0.00296*	0.00151
	(1.58)	(0.99)	(0.98)	(1.96)	(0.68)
Sent. Moderate Deaths ($\Pi^2 Z$)	0.00104	-0.00154	0.00197	0.000236	0.0000744
	(0.76)	(-1.00)	(1.41)	(0.17)	(0.05)
Sent. Low Deaths ($\Pi^1 Z$)	0.00355**	0.00139	0.00271	0.00590***	0.00143
	(2.52)	(0.71)	(1.48)	(3.64)	(0.92)
P.C. High ($\Pi^3 \Gamma$)	-0.00588*	-0.00413	-0.00585*	-0.00883***	-0.00332
	(-1.72)	(-1.36)	(-1.75)	(-2.89)	(-1.14)
P.C. Moderate ($\Pi^2 \Gamma$)	-0.00382	-0.00297	-0.00401	-0.000361	-0.00146
	(-1.28)	(-1.12)	(-1.45)	(-0.13)	(-0.56)
P.C. Low ($\Pi^1 \Gamma$)	-0.00554*	-0.00322	-0.00493*	-0.00477*	-0.000720
	(-1.87)	(-1.14)	(-1.72)	(-1.68)	(-0.26)
N	415	403	409	396	388
R^2	0.208	0.228	0.183	0.248	0.146
adj. R^2	0.174	0.189	0.143	0.210	0.102

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily returns (decimal) and the main independent variables are sentiment (Z) and press conference dummy variables, both segmented by death rates.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
Results are controlled for death rates and stringency in Sweden and locally.
Complete results can be found in Appendix 8.12
* $p < .10$, ** $p < .05$, *** $p < .01$

We see in table 11 that all coefficients for our sentiment measure Z except for one[52] are positive, just as we would expect. However, we cannot draw any definitive conclusions regarding when our sentiment measure Z is more or less useful for predicting daily returns from this table. The same goes for the occurrence of a press conference, since we fail to find any clear difference in response to our press conference dummy Γ between periods of differing death tolls.

5.4 Limitations & Future Research

Although this paper provides considerable evidence regarding interesting behavior of stock markets, it does not provide a full explanation to the behaviors observed. Importantly, this text does not delve into what type of actors are trading on the information unveiled through press conferences held by the PHAS. We have not studied exactly when actors trade on the information; whether

[52]Norway, when death tolls in Sweden are moderate

investors trade before, during or after press conferences, and how quick they are to act on new information are all areas where future research can expand on our findings using intra-day trading data.

As the proxies for the Nordic stock markets chosen for this study only contain a narrow set of stocks, they likely don't capture how the Nordic markets as a whole reacted to press conferences.[53] Although the proxies used are likely very correlated with the behavior of the wider markets, the narrow indices limit what conclusions we can draw from this study. Replicating this study with broader indices could therefore be an interesting subject for future research, allowing for broader conclusions to be drawn. Potentially, future studies could also investigate whether the pandemic affected companies of different industries, sizes, ages, etc. differently.

Further on the topic of data, future research can improve upon our study by collecting more comprehensive data on the press conferences studied. Such data could include things such as whether or not new regulations were announced, whether or not any specific subject was discussed, or by creating a more sophisticated sentiment measure. Improving the sentiment measure could potentially be complemented with some form of proxy for other data which could be relevant, such as ambiguity or information uncertainty.[54]

Finally, our primary motivation for covering all Nordic countries was their cultural and geographical proximity. As we find that Swedish press conferences significantly affected market activity in some way on all markets studied, we cannot discuss where the relevance of Swedish Covid-19 information ends and why that is so. Future research can build upon our findings by considering a wider set of countries to find where the relevance of Swedish press conferences ends, and subsequently investigate why that may be the case.

6 Conclusion

The paper examines how press conferences held by the Public Health Agency of Sweden and their sentiment affect daily trading volume and returns on the Nordic stock exchanges. Sentiment is measured using the number of positive and negative two-word combinations found within each press conference, and the countries' main indices are used as proxies for the Nordic stock markets.

We find strong evidence supporting our hypothesis (*ii*) that trading volume increases on days when a press conference is held, where our model predicts a significant increase in trading volume of 23.2% in Sweden, 27.6% in Norway, and 18.4% in Denmark. Furthermore, we find evidence supporting our hypothesis (*iii*) that press conferences cause negative daily returns. Our model estimates that a press conference predicts a negative effect on daily returns on all five markets

[53] All indices contain 20-30 stocks (Fusion Media Limited, 2022).

[54] It has been shown that information uncertainty can cause stock markets to behave differently (Zhang, 2006) and that crises, often characterized by increased uncertainty, affect market behavior (See section 3).

studied. However, the results are only statistically significant for the markets of Denmark, Finland, and Sweden, where our model predicts a decrease in daily returns of 41, 51 and 50 basis points respectively.

We also draw interesting conclusions regarding the sentiment of press conferences. We find no evidence that extreme measures of sentiment, nor more extreme changes in sentiment between press conferences, predicts higher trading volume. This finding is contrary to our hypothesis (*iv*) and what previous literature suggests. However, we do find support for our hypothesis (*v*) that sentiment is positively correlated with daily returns. Our model predicts that positive (negative) sentiment and positive (negative) changes in sentiment predict positive (negative) daily returns on all five Nordic markets, with significant results for the stock markets of Denmark, Finland and Sweden.[55] Our model predicts that a one standard deviation increase (decrease) in press conference sentiment increases (decreases) expected daily returns on these markets with 22, 22 and 26 basis points respectively. We also show that the correlation between market returns and the change in sentiment from the previously held press conference is significant for Denmark and Sweden. On these markets, a one standard deviation increase (decrease) in sentiment from the previous press conference predicts an increase (decrease) in daily returns of 17 and 16 basis points respectively.

Since all of our significant results are significant for several, but not all, countries outside of Sweden, we find partial support for our hypothesis (*i*) that the same effects will be seen across all Nordic markets. Furthermore, we find support for our hypothesis (*vi*) that the explanatory value of our independent variables is larger in times of high uncertainty. More concretely, we find that on the markets which showed significant increases in trading volume on days with press conferences only show significant results during the first and third wave of the pandemic. We also show that the effect was significantly higher during the first wave than in later periods.[56] We also find that increases in volume are significant only in periods when death tolls are high or moderate. Finally, we show that during the first period of the pandemic, sentiment positively correlated with returns in all Nordic countries, and that they all, except for Iceland, experienced a negative pressure on market returns when a press conference was held. Both the explanatory value of our sentiment measure and the negative pressure on returns decreased throughout the pandemic.

[55] If we look at only the first period of the pandemic, this correlation is statistically significant for all Nordic stock markets.

[56] "Wave 1" and "wave 3" of the pandemic are formally defined as period 1 and period 3 as in section 4.2.

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8 Appendix

8.1 Sentiment Analysis Algorithm

Here we give a more formal and precise description of the algorithm used for giving all press-conferences P_i a standardized sentiment-value Z_i:

Let $L_i = \{\xi_1, \xi_2, ..., \xi_N\}$ be the ordered list of the N words contained in press conference P_i. We then let $C_i = \{(\xi_j,\ \xi_{j+1}) \mid \xi_j, \xi_{j+1} \in L_i\}$ be the set of ordered two-word combinations made up of words adjacent in L_i. Furthermore, let C^+ be the set of two-word combinations assigned a positive sentiment-value, and C^- be the set of two-word combinations assigned a negative value, as defined below.

$$C^+ = \{(\xi_k,\ \xi_{k+1}) \mid (\xi_k,\ \xi_{k+1}) \text{ is assigned a positive sentiment-value}\}$$
$$C^- = \{(\xi_k,\ \xi_{k+1}) \mid (\xi_k,\ \xi_{k+1}) \text{ is assigned a negative sentiment-value}\}$$

We can use this to define the set C_i^+ of combinations in C_i assigned a positive value, and the set C_i^- of combinations in C_i assigned a negative value:

$$C_i^+ = \{(\xi_j,\ \xi_{j+1}) \mid (\xi_j,\ \xi_{j+1}) \in C_i \cap C^+\}$$
$$C_i^- = \{(\xi_j,\ \xi_{j+1}) \mid (\xi_j,\ \xi_{j+1}) \in C_i \cap C^-\}$$

Using these definitions, we have defined the sentiment-value ζ_i of a press conference P_i as follows:

$$\zeta_i = \frac{|C_i^+| - |C_i^-|}{N}$$

For easy interpretation of the results given by our regressions, we use a standardized value Z_i for ζ_i in our regression. The variable Z_i is defined as follows:

$$Z_i = \frac{\zeta_i - \mu_\zeta}{s_\zeta}, \quad \text{where} \quad s_\zeta = \sqrt{\frac{\sum_{l=1}^{N}(\zeta_i - \mu_\zeta)^2}{N-1}} \tag{4}$$

and μ_ζ is the mean of all sentiment-values ζ_l in our sample, and s_ζ is the sample estimate of the standard deviation of our test statistic ζ.

8.2 Distribution Press Conferences across Weekdays

Table 12: Weekdays and Press Conference Frequency

Weekday	No. Press Conferences
Monday	13
Tuesday	51
Wednesday	13
Thursday	76
Friday	11
Saturday	0
Sunday	0

Source: Author-generated variables based on data from Public Health Agency of Sweden (2022).

8.3 Half-Days Excluded from the Swedish Index

Table 13: Holiday-related Half-days Excluded from Data

Holiday	Date
Day Before Maundy Thursday*	
	8 April 2020
	31 March 2021
Maundy Thursday	
	9 April 2020
	1 April 2021
Walpurgis Night	
	30 April 2020
	30 April 2021
Ascension Day	
	20 May 2020
	12 May 2021
Halloween	
	30 October 2020
	5 November 2021
Twelfth Night	
	5 January 2021
	5 January 2022

*Half-days in Norway, the others are in Sweden.

Source: Nasdaq Nordic (2022) .

8.4 Distribution of Segmented Dummy Variables

Table 14: Death Segmented Dummy Variables

Death Tolls	No.
High	66
Moderate	65
Low	24
Total	155

Source: Author-generated variables based on data from Public Health Agency of Sweden (2022).
The sum of these dummy variables differs from the number of press conferences
and from the period segmented dummy variables due to lack of death data
early in the pandemic.

Table 15: Period Segmented Dummy Variables

Death Tolls	No.
Period 1	82
Period 2	33
Period 3	25
Period 4	24

Source: Author-generated variables based on author-defined time periods.
The sum of these dummy variables coincides with the number of press conferences
during the study period. It differs from the number of sentiment scores
as three transcripts were missing from the data, and from the deathsegmented
dummy variables due to lack of death data early in the pandemic.

8.5 Daily Trading Volume & Absolute Sentiment

Table 16: Trading Volume and Absolute Sentiment

Volume (ln)	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Absolute Sentiment ($\lvert Z \rvert$)	-0.0315	0.0220	-0.0418	0.0132	-0.0562
	(-0.87)	(0.48)	(-0.88)	(0.31)	(-0.66)
Press Conference (Γ)	0.232^{***}	0.226^{***}	0.0751	0.159^{**}	0.0103
	(3.85)	(2.77)	(1.20)	(2.51)	(0.09)
Deaths Sweden	0.000384^{***}	0.000681^{***}	0.000101	0.000596^{***}	0.00130^{***}
	(4.13)	(4.64)	(0.55)	(4.65)	(5.66)
Stringency Sweden	-0.00772^{***}	-0.0104^{***}	-0.00442^{**}	-0.00447^{**}	-0.0148^{***}
	(-4.95)	(-4.22)	(-2.19)	(-2.46)	(-3.87)
Local Deaths	N.A.	-0.00196^{**}	0.000536	-0.00119^{**}	0.0242
		(-2.42)	(0.49)	(-2.58)	(0.89)
Local Stringency	N.A.	0.00397^{*}	0.00777^{***}	0.00463^{**}	0.0144^{**}
		(1.77)	(3.05)	(2.21)	(2.56)
Constant	18.55^{***}	18.15^{***}	17.46^{***}	16.32^{***}	17.94^{***}
	(184.59)	(157.95)	(129.92)	(131.32)	(48.93)
N	414	407	413	406	405
R^2	0.276	0.373	0.288	0.239	0.413
adj. R^2	0.257	0.352	0.265	0.214	0.393

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily trading volume (ln) and the main independent variables are absolute sentiment($\lvert Z \rvert$) and a press conference dummy variable.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
* $p < .10$, ** $p < .05$, *** $p < .01$

8.6 Daily Trading Volume & Absolute Relative Sentiment

Table 17: Daily Trading Volume and Absolute Relative Sentiment

Volume (ln)	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Abs. Rel. Sent. ($\lvert\Delta Z\rvert$)	-0.0251	0.0214	-0.0570*	-0.00000594	-0.00199
	(-0.87)	(0.54)	(-1.72)	(-0.00)	(-0.04)
Press Conference (Γ)	0.223***	0.216***	0.0944	0.160**	-0.0329
	(3.61)	(2.60)	(1.44)	(2.50)	(-0.28)
Deaths Sweden	0.000399***	0.000703***	0.000134	0.000614***	0.00133***
	(4.31)	(4.80)	(0.72)	(4.87)	(5.89)
Stringency Sweden	-0.00764***	-0.00982***	-0.00415**	-0.00425**	-0.0150***
	(-4.90)	(-3.99)	(-2.08)	(-2.35)	(-3.90)
Local Deaths	N.A.	-0.00189**	0.000544	-0.00122***	0.0248
		(-2.35)	(0.50)	(-2.64)	(0.91)
Local Stringency	N.A.	0.00327	0.00693***	0.00416**	0.0143**
		(1.45)	(2.74)	(2.00)	(2.54)
Constant	18.54***	18.15***	17.47***	16.33***	17.95***
	(184.34)	(157.94)	(130.04)	(131.91)	(48.94)
N	413	406	412	405	404
R^2	0.271	0.366	0.288	0.233	0.411
adj. R^2	0.250	0.345	0.264	0.208	0.392

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily trading volume (ln) and the main independent variables are absolute relative sentiment($\lvert\Delta Z\rvert$) and a press conference dummy variable.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
* $p < .10$, ** $p < .05$, *** $p < .01$

8.7 Market Returns & Sentiment

Table 18: Market Returns and Sentiment

Daily Returns	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Sentiment (Z)	0.00256**	0.000369	0.00219**	0.00222**	0.000798
	(2.25)	(0.31)	(2.06)	(2.08)	(0.76)
Press Conf. (Γ)	-0.00459*	-0.00301	-0.00477**	-0.00370	-0.00177
	(-1.77)	(-1.33)	(-2.03)	(-1.53)	(-0.83)
Previous Close	-0.0000436***	-0.000106***	-0.0000202***	-0.0000403***	-0.0000230***
	(-3.94)	(-6.70)	(-5.81)	(-4.69)	(-3.79)
Prev. 7d Growth	0.157***	0.194***	0.135***	0.150***	0.112***
	(5.10)	(7.73)	(3.60)	(5.63)	(4.85)
Deaths Sweden	-0.00000455	0.00000429	0.00000552	-0.00000169	0.00000434
	(-0.89)	(0.75)	(0.63)	(-0.30)	(0.89)
Stringency Sweden	0.0000124	0.0000693	0.00000743	-0.0000796	-0.0000899
	(0.18)	(0.57)	(0.09)	(-0.94)	(-1.51)
Local Deaths	N.A.	0.0000795***	-0.0000797*	0.00000663	0.000368
		(2.82)	(-1.67)	(0.30)	(0.56)
Local Stringency	N.A.	-0.000223*	-0.000137	-0.000115	0.000134
		(-1.82)	(-0.85)	(-1.24)	(1.17)
Constant	0.0736***	0.0837***	0.0858***	0.0661***	0.0318***
	(3.71)	(6.39)	(5.80)	(4.76)	(2.81)
N	415	403	409	396	388
R^2	0.202	0.220	0.182	0.214	0.143
adj. R^2	0.177	0.190	0.151	0.183	0.108

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).

Dependent variable is daily returns(decimal) and the main independent variables are sentiment(Z) and a press conference dummy variable.

t statistics in parentheses. Results are controlled for weekday seasonality and time period.

* $p < .10$, ** $p < .05$, *** $p < .01$

8.8 Market Returns & Relative Sentiment

Table 19: Market Returns and Relative Sentiment

Daily Returns	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Rel. Sent. (ΔZ)	0.00159**	0.000636	0.00111	0.00171**	0.000479
	(1.99)	(0.74)	(1.52)	(2.26)	(0.67)
Press Conf. (Γ)	-0.00500*	-0.00300	-0.00511**	-0.00387	-0.00207
	(-1.93)	(-1.32)	(-2.17)	(-1.58)	(-0.97)
Previous Close	-0.0000420***	-0.000107***	-0.0000198***	-0.0000400***	-0.0000222***
	(-3.69)	(-6.72)	(-5.51)	(-4.51)	(-3.62)
Prev. 7d Growth	0.158***	0.196***	0.136***	0.154***	0.112***
	(5.14)	(7.88)	(3.56)	(5.86)	(4.86)
Deaths Sweden	-0.00000398	0.00000412	0.00000646	-0.00000151	0.00000479
	(-0.78)	(0.70)	(0.72)	(-0.26)	(0.99)
Stringency Sweden	0.00000913	0.0000698	0.00000816	-0.0000813	-0.0000886
	(0.13)	(0.55)	(0.10)	(-0.96)	(-1.49)
Local Deaths	N.A.	0.0000805***	-0.0000786	0.00000498	0.000417
		(2.82)	(-1.64)	(0.22)	(0.64)
Local Stringency	N.A.	-0.000224*	-0.000152	-0.000109	0.000113
		(-1.73)	(-0.93)	(-1.16)	(0.97)
Constant	0.0716***	0.0840***	0.0851***	0.0658***	0.0316***
	(3.51)	(6.39)	(5.62)	(4.62)	(2.77)
N	414	402	408	395	387
R^2	0.185	0.219	0.161	0.209	0.138
adj. R^2	0.159	0.189	0.129	0.178	0.103

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily returns(decimal) and the main independent variables are relative sentiment(Z) and a press conference dummy variable.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
* $p < .10$, ** $p < .05$, *** $p < .01$

8.9 Daily Trading Volume & Period Segmented Press Conference Dummy

Table 20: Trading Volume and Period Segmented Press Conference Dummy

Volume (ln)	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Press Conf. p.1 ($\Lambda^1\Gamma$)	0.336***	0.445***	0.0358	0.305***	0.167
	(4.80)	(3.47)	(0.47)	(4.52)	(1.02)
Press Conf. p.2 ($\Lambda^2\Gamma$)	0.130*	0.0866	0.0723	0.132	-0.0890
	(1.80)	(1.06)	(0.77)	(1.64)	(-0.55)
Press Conf. p.3 ($\Lambda^3\Gamma$)	0.174***	0.163*	0.115	0.117*	-0.233
	(2.76)	(1.71)	(1.30)	(1.65)	(-1.57)
Press Conf. p.4 ($\Lambda^4\Gamma$)	0.105	0.193**	-0.0446	0.0624	-0.108
	(1.43)	(2.27)	(-0.55)	(0.89)	(-0.79)
Deaths Sweden	0.000345***	0.000602***	0.000127	0.000514***	0.00123***
	(3.55)	(3.86)	(0.69)	(3.83)	(5.40)
Stringency Sweden	-0.00773***	-0.00872***	-0.00496**	-0.00422**	-0.0144***
	(-4.96)	(-3.46)	(-2.43)	(-2.35)	(-3.70)
Local Deaths	N.A.	-0.00163*	0.000479	-0.000986**	0.0213
		(-1.95)	(0.44)	(-2.09)	(0.77)
Local Stringency	N.A.	0.00230	0.00800***	0.00347*	0.0149***
		(1.02)	(2.92)	(1.66)	(2.64)
Constant	18.47***	18.01***	17.48***	16.29***	17.77***
	(180.26)	(131.41)	(130.52)	(128.22)	(46.59)
N	414	407	413	406	405
R^2	0.291	0.390	0.290	0.255	0.418
adj. R^2	0.268	0.366	0.263	0.227	0.396

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily trading volume (ln) and the main independent variables are press conference dummy variables segmented by period.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
* $p < .10$, ** $p < .05$, *** $p < .01$

8.10 Daily Trading Volume & Death Segmented Press Conference Dummy

Table 21: Trading Volume and Death Segmented Press Conference Dummy

Volume (ln)	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
P.C. High ($\Pi^3\Gamma$)	0.225***	0.426***	0.0391	0.264***	0.105
	(3.41)	(4.04)	(0.48)	(3.50)	(0.71)
P.C. Moderate ($\Pi^2\Gamma$)	0.240***	0.216***	0.103*	0.153***	-0.160
	(4.10)	(3.16)	(1.68)	(2.81)	(-1.46)
P.C. Low ($\Pi^1\Gamma$)	0.0917	0.00786	-0.109	0.0583	0.0318
	(1.31)	(0.10)	(-1.57)	(1.02)	(0.20)
Deaths Sweden	0.000336***	0.000320*	0.0000843	0.000382**	0.00111***
	(2.76)	(1.80)	(0.43)	(2.44)	(3.99)
Stringency Sweden	-0.00751***	-0.00911***	-0.00416**	-0.00420**	-0.0153***
	(-4.69)	(-3.67)	(-2.04)	(-2.28)	(-4.00)
7D Deaths Local	N.A.	-0.00156 sym*	0.000441	-0.000984**	0.0277
		(-1.90)	(0.41)	(-2.13)	(1.00)
Stringency Local	N.A.	0.00317	0.00783***	0.00433**	0.0159***
		(1.42)	(2.96)	(2.04)	(2.85)
Constant	18.54***	18.14***	17.44***	16.33***	17.90***
	(181.52)	(155.70)	(130.96)	(130.13)	(49.57)
N	414	407	413	406	405
R^2	0.284	0.396	0.299	0.251	0.419
adj. R^2	0.263	0.375	0.274	0.225	0.398

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily trading volume (ln) and the main independent variables are press conference dummy variables segmented by deaths.
t statistics in parentheses. Results are controlled for weekday seasonality and time period.
* $p < .10$, ** $p < .05$, *** $p < .01$

8.11 Market Returns & Period Segmented Sentiment

Table 22: Returns and Period Segmented Sentiment

Daily Returns	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Sent. p.1 ($\Lambda_i^1 Z_i$)	0.00590***	0.00339*	0.00490***	0.00329**	0.00445**
	(3.05)	(1.91)	(2.78)	(2.55)	(2.06)
Sent. p.2 ($\Lambda_i^2 Z_i$)	-0.00104	-0.00297	-0.000968	0.00164	-0.000492
	(-0.82)	(-1.60)	(-0.53)	(0.84)	(-0.34)
Sent. p.3 ($\Lambda_i^3 Z_i$)	0.00587*	0.00249	0.00550***	0.00490	-0.00225
	(1.71)	(0.76)	(2.69)	(1.36)	(-0.72)
Sent. p.4 ($\Lambda_i^4 Z_i$)	-0.000192	-0.00140	-0.000209	0.00132	-0.00172
	(-0.13)	(-0.54)	(-0.12)	(0.56)	(-1.41)
Press Conf. p.1 ($\Lambda^1\Gamma$)	-0.0112***	-0.00812**	-0.00961***	-0.0117***	-0.00556
	(-3.08)	(-2.28)	(-2.87)	(-3.76)	(-1.45)
Press Conf. p.2 ($\Lambda^2\Gamma$)	-0.00703**	-0.00485	-0.00779**	-0.00655**	-0.00415
	(-2.40)	(-1.63)	(-2.51)	(-2.22)	(-1.32)
Press Conf. p.3 ($\Lambda^3\Gamma$)	-0.00196	-0.00151	-0.00416	0.00124	-0.00111
	(-0.59)	(-0.48)	(-1.44)	(0.32)	(-0.37)
Press Conf. p.4 ($\Lambda^4\Gamma$)	0.000164	0.000162	-0.000575	0.00268	0.000367
	(0.06)	(0.06)	(-0.20)	(0.88)	(0.14)
Previous Close	-0.0000467***	-0.000108***	-0.0000206***	-0.0000449***	-0.0000256***
	(-4.27)	(-6.75)	(-5.92)	(-5.17)	(-4.11)
Prev. 7D Return	0.167***	0.195***	0.139***	0.160***	0.113***
	(5.37)	(7.87)	(3.61)	(6.16)	(4.88)
7D Deaths Sweden	-0.00000130	0.00000761	0.00000655	0.00000232	0.00000715
	(-0.24)	(1.26)	(0.72)	(0.40)	(1.34)
Stringency Sweden	0.00000340	0.0000336	-0.00000369	-0.0000907	-0.000110*
	(0.05)	(0.28)	(-0.05)	(-1.09)	(-1.83)
7D Deaths Local	N.A.	0.0000676**	-0.0000832*	-0.00000246	0.000410
		(2.44)	(-1.71)	(-0.12)	(0.65)
Stringency Local	N.A.	-0.000192	-0.0000837	-0.0000741	0.000122
		(-1.55)	(-0.50)	(-0.80)	(1.13)
Constant	0.0824***	0.0878***	0.0880***	0.0745***	0.0383***
	(4.22)	(6.49)	(5.90)	(5.24)	(3.16)
N	415	403	409	396	388
R^2	0.238	0.246	0.207	0.253	0.168
adj. R^2	0.201	0.205	0.164	0.211	0.121

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily returns(decimal) and the main independent variables are sentiment(Z) and conference dummy variables, both segmented by period.
t statistics in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

8.12 Market Returns & Death Segmented Sentiment

Table 23: Returns and Death Segmented Sentiment

Daily Returns	Stockholm	Oslo	Helsinki	Copenhagen	Reykjavík
Sent. High Deaths ($\Pi^3 Z$)	0.00406	0.00226	0.00220	0.00296*	0.00151
	(1.58)	(0.99)	(0.98)	(1.96)	(0.68)
Sent. Moderate Deaths ($\Pi^2 Z$)	0.00104	-0.00154	0.00197	0.000236	0.0000744
	(0.76)	(-1.00)	(1.41)	(0.17)	(0.05)
Sent. Low Deaths ($\Pi^1 Z$)	0.00355**	0.00139	0.00271	0.00590***	0.00143
	(2.52)	(0.71)	(1.48)	(3.64)	(0.92)
P.C. High ($\Pi^3 \Gamma$)	-0.00588*	-0.00413	-0.00585*	-0.00883***	-0.00332
	(-1.72)	(-1.36)	(-1.75)	(-2.89)	(-1.14)
P.C. Moderate ($\Pi^2 \Gamma$)	-0.00382	-0.00297	-0.00401	-0.000361	-0.00146
	(-1.28)	(-1.12)	(-1.45)	(-0.13)	(-0.56)
P.C. Low ($\Pi^1 \Gamma$)	-0.00554*	-0.00322	-0.00493*	-0.00477*	-0.000720
	(-1.87)	(-1.14)	(-1.72)	(-1.68)	(-0.26)
Prev. Close	-0.0000428***	-0.000106***	-0.0000201***	-0.0000395***	-0.0000235***
	(-3.75)	(-6.54)	(-5.71)	(-4.66)	(-3.76)
Prev. 7d Return	0.160***	0.201***	0.136***	0.150***	0.115***
	(5.15)	(8.03)	(3.57)	(5.87)	(4.95)
Deaths Sweden_weekly	-0.00000287	0.00000595	0.00000701	0.00000698	0.00000700
	(-0.51)	(0.99)	(0.80)	(1.02)	(1.21)
Stringency Sweden	0.0000125	0.0000747	0.00000740	-0.0000774	-0.0000943
	(0.18)	(0.62)	(0.09)	(-0.94)	(-1.56)
Local Deaths	N.A.	0.0000794***	-0.0000815*	-0.00000519	0.000364
		(2.74)	(-1.69)	(-0.23)	(0.54)
Local Stringency	N.A.	-0.000234*	-0.000131	-0.0000752	0.000124
		(-1.94)	(-0.79)	(-0.81)	(1.11)
_cons	0.0723***	0.0838***	0.0850***	0.0621***	0.0330***
	(3.55)	(6.24)	(5.73)	(4.51)	(2.83)
N	415	403	409	396	388
R^2	0.208	0.228	0.183	0.248	0.146
adj. R^2	0.174	0.189	0.143	0.210	0.102

Source: Author-generated regression table using STATA and data from Fusion Media Limited (2022), Public Health Agency of Sweden (2022), and Ritchie et al. (2020).
Dependent variable is daily returns(decimal) and the main independent variables are sentiment(Z) and conference dummy variables, both segmented by deaths.
t statistics in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

8.13 Period Tests

8.13.1 Period Tests, Denmark

Table 24: Period Tests, Denmark

χ^2-test for Γ-volume coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.0575*	0.0219**	0.0040***
Period 2	0.0575*	-	0.8674	0.4206
Period 3	0.0219**	0.8674	-	0.5216
Period 4	0.0040***	0.4206	0.5216	-

χ^2-test for Γ-volume coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.1128	0.0107**
Moderate Deaths	0.1128	-	0.0802*
Low Deaths	0.0107**	0.0802*	-

χ^2-test for Z-returns coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.4813	0.6689	0.4633
Period 2	0.4813	-	0.4147	0.9176
Period 3	0.6689	0.4147	-	0.4012
Period 4	0.4633	0.9176	0.4012	-

χ^2-test for Z-returns coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.1840	0.1821
Moderate Deaths	0.1840	-	0.0074***
Low Deaths	0.1821	0.0074***	-

χ^2-test for Γ-returns coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period1	-	0.1188	0.0018***	0.0000***
Period 2	0.1188	-	0.0513	0.0046***
Period 3	0.0018***	0.0513	-	0.7008
Period 4	0.0000***	0.0046***	0.7008	-

χ^2-test for Γ-returns coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.5284	0.4380
Moderate Deaths	0.5284	-	0.7977
Low Deaths	0.4380	0.7977	-

Source: Author-generated tables of χ^2-tests conducted in STATA.

8.13.2 Period Tests, Finland

Table 25: Period Tests, Finland

χ^2-test for Γ-volume coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.7426	0.4474	0.4133
Period 2	0.7426	-	0.7247	0.3288
Period 3	0.4474	0.7247	-	0.1341
Period 4	0.4133	0.3288	0.1341	-

χ^2-test for Γ-volume coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.4308	0.1456
Moderate Deaths	0.4308	-	0.0016***
Low Deaths	0.1456	0.0016***	-

χ^2-test for Z-returns coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.0232**	0.8186*	0.0405**
Period 2	0.0232**	-	0.0189**	0.7651
Period 3	0.8186*	0.0189**	-	0.0359**
Period 4	0.0405**	0.7651	0.0359**	-

χ^2-test for Z-returns coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.9334	0.8603
Moderate Deaths	0.9334	-	0.7425
Low Deaths	0.8603	0.7425	-

χ^2-test for Γ-returns coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.6156	0.1116	0.0131**
Period 2	0.6156	-	0.2324	0.0281**
Period 3	0.1116	0.2324	-	0.1985
Period 4	0.0131**	0.0281**	0.1985	-

χ^2-test for Γ-returns coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.5850	0.8028
Moderate Deaths	0.5850	-	0.7628
Low Deaths	0.8028	0.7628	-

Source: Author-generated tables of χ^2-tests conducted in STATA.

8.13.3 Period Tests, Iceland

Table 26: Period Tests, Iceland

χ^2-test for Γ-volume coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.2308	0.0461**	0.1379
Period 2	0.2308	-	0.4504	0.9157
Period 3	0.0461**	0.4504	-	0.4659
Period 4	0.1379	0.9157	0.4659	-

χ^2-test for Γ-volume coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.0614*	0.7101
Moderate Deaths	0.0614*	-	0.1794
Low Deaths	0.7101	0.1794	-

χ^2-test for Z-returns coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.0624**	0.0761*	0.0128**
Period 2	0.0624**	-	0.6167	0.5227
Period 3	0.0761*	0.6167	-	0.8756
Period 4	0.0128**	0.5227	0.8756	-

χ^2-test for Z-returns coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.5821	0.9753
Moderate Deaths	0.5821	-	0.5120
Low Deaths	0.9753	0.5120	-

χ^2-test for Γ-returns coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.7405	0.2910	0.1386
Period 2	0.7405	-	0.3962	0.1657
Period 3	0.2910	0.3962	-	0.6046
Period 4	0.1386	0.1657	0.6046	-

χ^2-test for Γ-returns coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.5284	0.4380
Moderate Deaths	0.5284	-	0.7977
Low Deaths	0.4380	0.7977	-

Source: Author-generated tables of χ^2-tests conducted in STATA.

8.13.4 Period Tests, Norway

Table 27: Period Tests, Norway

χ^2-test for Γ-volume coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.0076***	0.0518*	0.0718*
Period 2	0.0076***	-	0.4591	0.2383
Period 3	0.0518*	0.4591	-	0.7820
Period 4	0.0718*	0.2383	0.7820	-

χ^2-test for Γ-volume coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.0197**	0.0001***
Moderate Deaths	0.0197**	-	0.0023***
Low Deaths	0.0001***	0.0023***	-

χ^2-test for Z-returns coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.0141**	0.8107	0.1343
Period 2	0.0141**	-	0.1404	0.6244
Period 3	0.8107	0.1404	-	0.3543
Period 4	0.1343	0.6244	0.3543	-

χ^2-test for Z-returns coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.1615	0.7702
Moderate Deaths	0.1615	-	0.2280
Low Deaths	0.7702	0.2280	-

χ^2-test for Γ-returns coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.3764	0.0851*	0.0219**
Period 2	0.3764	-	0.3277	0.1317
Period 3	0.0851*	0.3277	-	0.5971
Period 4	0.0219**	0.1317	0.5971	-

χ^2-test for Γ-returns coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.7101	0.7895
Moderate Deaths	0.7101	-	0.9165
Low Deaths	0.7895	0.9165	-

Source: Author-generated tables of χ^2-tests conducted in STATA.

8.13.5 Period Tests, Sweden

Table 28: Period Tests, Sweden

χ^2-test for Γ-volume coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.0216**	0.0528*	0.0121**
Period 2	0.0216**	-	0.5610	0.7574
Period 3	0.0528*	0.5610	-	0.3700
Period 4	0.0121**	0.7574	0.3700	-

χ^2-test for Γ-volume coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.8242	0.1323
Moderate Deaths	0.8242	-	0.0339**
Low Deaths	0.1323	0.0339**	-

χ^2-test for Z-retunrs coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.0033***	0.9947	0.0126**
Period 2	0.0033***	-	0.0583*	0.6637
Period 3	0.9947	0.0583*	-	0.1045
Period 4	0.0126**	0.6637	0.1045	-

χ^2-test for Z-returns coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.3037	0.8622
Moderate Deaths	0.3037	-	0.1802
Low Deaths	0.8622	0.1802	-

χ^2-test for Γ-returns coefficient by time period, p-values.

p-value	*Period 1*	*Period 2*	*Period 3*	*Period 4*
Period 1	-	0.2328	0.0180**	0.0019***
Period 2	0.2328	-	0.1119	0.0126**
Period 3	0.0180**	0.1119	-	0.4922
Period 4	0.0019***	0.0126**	0.4922	-

χ^2-test for Γ-returns coefficient by 7d rolling deaths, p-values.

p-value	*High Deaths*	*Moderate Deaths*	*Low Deaths*
High Deaths	-	0.5332	0.9220
Moderate Deaths	0.5332	-	0.5393
Low Deaths	0.9220	0.5393	-

Source: Author-generated tables of χ^2-tests conducted in STATA.

8.14 Sentiment Algorithm, Code (Python)

```
# Gustav Ring & Zacharias Veiksaar, 2022-05-14
import time
import xlsxwriter
import pdfplumber

class Presskonferens():
    def __init__(self, datestring):
        self.datestring = datestring
        self.name = datestring
        self.positives = 0
        self.negatives = 0

        # Decides what part of the sentiment analysis to run
        self.deaths = True
        self.infected_spread = True
        self.hospitalized = True
        self.immunity = True
        self.infectiousness = True
        self.deadliness = True

        # For removing other characters
        allowedcharacters = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j','k', 'l',
        ↪  'm', 'n', 'o', 'p', 'q', 'r', 's', 't', 'u', 'v', 'w', 'x', 'y', 'z', 'A', 'B',
        ↪  'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R',
        ↪  'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', 'å', 'Å', 'ä', 'Ä', 'ö', 'Ö', "1", "2",
        ↪  "3", "4", "5", "6", "7", "8", "9"]

        placestring = f"###DATA_FOLDER###{datestring}.pdf"

        def manualsentiment():
            for i in range(self.length_words):
                word = self.words[i]
                if i < len(self.words) - 1:
                    nextword = self.words[i + 1]
                if i > 0:
                    lastword = self.words[i - 1]

                # Check sentiment related to deaths
                if self.deaths:
```

```
    if word in ["avlidna", "döda", "dödsfall", "dödstal", "dödstalen",
    ↪  "avlider", "avlidit", "dör", "avlider"]:
        if lastword in ["fler", "många", "höga", "stigande"] or nextword in
        ↪  ["ökar", "ökat", "stigit", "stiger", "tilltar"]:
            self.negatives += 1
        if lastword in ["färre", "få", "låga", "sjunkande"] or nextword in
        ↪  ["minskar", "sjunker", "avtar", "avtagit", "minskat",
        ↪  "sjunkit", "minskat"]:
            self.positives += 1

# Check sentiment related to the number of infected people and general
↪  spread
if self.infected_spread:
    if word in ["infekteras", "infekterade", "smitta", "smittade",
    ↪  "drabbade", "fall", "patienter", "sjukdomsfall", "smittofall",
    ↪  "smittospridning", "spridning", "spridningen", "smittan",
    ↪  "smittspridningen", "smittspridning", "smittospridning",
    ↪  "smittar"]:
        if lastword in ["ökad", "ökande", "tilltagande", "stigande",
        ↪  "högre", "höga", "hög", "stor", "större", "stigande", "fler",
        ↪  "många"] or nextword in ["ökat", "stigit", "ökade", "ökat",
        ↪  "tilltar", "hög", "många", "fler", "flera"]:
            self.negatives += 1
        if lastword in ["lägre", "sjunkande", "avtagande", "mindre",
        ↪  "minskade", "låg", "låga", "liten", "mindre", "färre", "få"] or
        ↪  nextword in ["sjunkit", "minskat", "avtagit", "minskar",
        ↪  "sjunker", "avtar", "ner", "få", "färre", "mindre", "låg"]:
            self.positives += 1

# Check sentiment related to the number of hospitalized people
if self.hospitalized:
    if word in ["vårdade", "ivavårdade", "inlagda", "akutvårdade",
    ↪  "behandlas", "vårdas", "beläggning", "vård", "akutvård",
    ↪  "intensivvård", "ivavård"]:
        if lastword in ["många", "fler", "hög", "ökande", "stigande",
        ↪  "behöver", "får"] or nextword in ["ökar", "ökat", "stigit",
        ↪  "stiger", "tilltar", "tilltagit"]:
            self.negatives += 1
```

```
        if lastword in ["få", "färre", "låg", "sjunkande", "avtagande"] or
        ↪  nextword in ["sjunker", "minskar", "sjunkit", "minskat",
        ↪  "avtar", "avtagit"]:
            self.positives += 1

# Check sentiment related to level of immunity
if self.immunity:
    if word in ["immunitet", "immuniteten", "skydd", "vaccination",
    ↪  "vaccinationstakt", "vaccinationsgrad", "vaccinerade", "immunitet",
    ↪  "skyddade", "vaccinationsgraden"]:
        if lastword in ["ökad", "ökande", "hög", "starkt", "bra",
        ↪  "stigande", "tilltagande", "fler", "många", "lovande", "bra",
        ↪  "bättre", "starkare"] or nextword in ["ökat", "tilltagit",
        ↪  "stigit", "hög", "bra", "stiger", "ökar"]:
            self.positives += 1
        if lastword in ["dålig", "låg", "sjunkande", "få", "färre",
        ↪  "otillräcklig", "sämre", "minskande", "avtagande", "låg",
        ↪  "svag", "sämre", "svagare"] or nextword in ["sjunkit",
        ↪  "avtagit", "minskat", "otillräcklig", "sämre", "sjunker",
        ↪  "avtar", "dålig", "låg"]:
            self.negatives += 1

# Check sentiment related to the infectiousness of the virus
if self.infectiousness:
    if word in ["smittsam", "smittsamhet", "infektiös", "virulent",
    ↪  "smittosam", "smittsamheten", "infektionsrisk", "smittsamhet",
    ↪  "infektionsrisken", "smittsamheten"]:
        if lastword in ["inte", "låg", "mindre", "lägre", "låg"] or
        ↪  nextword in ["sjunker", "minskar", "avtar", "avtagit"]:
            self.positives += 1
        if lastword in ["väldigt", "extremt", "mycket", "hög", "högre",
        ↪  "mer", "stigande", "stor"] or nextword in ["ökar", "tilltar",
        ↪  "stiger", "tilltagit"]:
            self.negatives += 1
    if word in ["smittorisk", "smittorisken"]:
        if lastword in ["lägre", "låg", "sjunkande","avtagande", "mindre"]
        ↪  or nextword in ["sjunker", "minskar"]:
            self.positives += 1
        if lastword in ["hög", "högre", "stigande", "tilltagande"] or
        ↪  nextword in ["stiger", "ökar", "ökat", "tilltagit"]:
```

```
                    self.negatives += 1

            # Check sentiment related to the deadliness of the virus
            if self.deadliness:
                if self.hospitalized:
                    if word in ["dödlighet", "mortalitet", "dödsfrekvens", "dödsrisk",
                    ↪  "överdödlighet", "överdödligheten", "mortaliteten"]:
                        if lastword in ["låg", "lägre", "minskade", "avtagande",
                        ↪  "minskande", "sjunkande"] or nextword in ["minskat", "låg",
                        ↪  "sjunkit", "avtagit"]:
                            self.positives += 1
                        if lastword in ["hög", "högre", "förhöjd", "ökande",
                        ↪  "stigande", "tilltagande", "oroväckande"] or nextword in
                        ↪  ["ökat", "hög", "stigit", "tilltagit"]:
                            self.negatives += 1

    text = ""
    # Open PDF-file, make one long text of all pages.
    pdf = pdfplumber.open(placestring)
    for i in range(len(pdf.pages)):
        page = pdf.pages[i]
        newtext = page.extract_text()
        text = text + newtext

    self.cleanwords = []

    # Add all words to a list (in order)
    self.words = text.split()
    self.length_words = len(self.words)

    # Run sentiment analysis, calculate sentiment (normalized by length)
    manualsentiment()
    self.diff_quote = ((self.positives - self.negatives) / self.length_words)
```

```
filenames = ['2020-03-25.pdf', '2020-03-30.pdf', '2020-03-31.pdf', '2020-04-01.pdf',
↪  '2020-04-02.pdf', '2020-04-03.pdf', '2020-04-06.pdf', '2020-04-07.pdf',
↪  '2020-04-08.pdf', '2020-04-09.pdf', '2020-04-10.pdf', '2020-04-13.pdf',
↪  '2020-04-15.pdf', '2020-04-16.pdf', '2020-04-17.pdf', '2020-04-20.pdf',
↪  '2020-04-21.pdf', '2020-04-22.pdf', '2020-04-23.pdf', '2020-04-24.pdf',
↪  '2020-04-27.pdf', '2020-04-28.pdf', '2020-04-29.pdf', '2020-05-04.pdf',
↪  '2020-05-05.pdf', '2020-05-06.pdf', '2020-05-07.pdf', '2020-05-08.pdf',
↪  '2020-05-11.pdf', '2020-05-12.pdf', '2020-05-13.pdf', '2020-05-14.pdf',
↪  '2020-05-15.pdf', '2020-05-18.pdf', '2020-05-19.pdf', '2020-05-20.pdf',
↪  '2020-05-25.pdf', '2020-05-26.pdf', '2020-05-27.pdf', '2020-05-28.pdf',
↪  '2020-05-29.pdf', '2020-06-01.pdf', '2020-06-02.pdf', '2020-06-03.pdf',
↪  '2020-06-04.pdf', '2020-06-05.pdf', '2020-06-08.pdf', '2020-06-09.pdf',
↪  '2020-06-11.pdf', '2020-06-16.pdf', '2020-06-18.pdf', '2020-06-23.pdf',
↪  '2020-06-25.pdf', '2020-06-30.pdf', '2020-07-02.pdf', '2020-07-07.pdf',
↪  '2020-07-09.pdf', '2020-07-14.pdf', '2020-07-16.pdf', '2020-07-21.pdf',
↪  '2020-07-23.pdf', '2020-07-28.pdf', '2020-07-30.pdf', '2020-08-04.pdf',
↪  '2020-08-06.pdf', '2020-08-11.pdf', '2020-08-13.pdf', '2020-08-18.pdf',
↪  '2020-08-20.pdf', '2020-08-25.pdf', '2020-08-27.pdf', '2020-09-01.pdf',
↪  '2020-09-03.pdf', '2020-09-08.pdf', '2020-09-10.pdf', '2020-09-15.pdf',
↪  '2020-09-17.pdf', '2020-09-24.pdf', '2020-09-29.pdf', '2020-10-01.pdf',
↪  '2020-10-06.pdf', '2020-10-08.pdf', '2020-10-13.pdf', '2020-10-15.pdf',
↪  '2020-10-20.pdf', '2020-10-22.pdf', '2020-10-27.pdf', '2020-10-29.pdf',
↪  '2020-11-03.pdf', '2020-11-05.pdf', '2020-11-12.pdf', '2020-11-17.pdf',
↪  '2020-11-19.pdf', '2020-11-24.pdf', '2020-11-26.pdf', '2020-12-01.pdf',
↪  '2020-12-03.pdf', '2020-12-08.pdf', '2020-12-10.pdf', '2020-12-15.pdf',
↪  '2020-12-22.pdf', '2020-12-26.pdf', '2021-01-05.pdf', '2021-01-07.pdf',
↪  '2021-01-12.pdf', '2021-01-14.pdf', '2021-01-26.pdf', '2021-01-28.pdf',
↪  '2021-02-02.pdf', '2021-02-04.pdf', '2021-02-09.pdf', '2021-02-18.pdf',
↪  '2021-02-23.pdf', '2021-02-25.pdf', '2021-03-02.pdf', '2021-03-04.pdf',
↪  '2021-03-09.pdf', '2021-03-11.pdf', '2021-03-16.pdf', '2021-03-18.pdf',
↪  '2021-03-25.pdf', '2021-03-30.pdf', '2021-04-01.pdf', '2021-04-06.pdf',
↪  '2021-04-08.pdf', '2021-04-13.pdf', '2021-04-20.pdf', '2021-04-22.pdf',
↪  '2021-04-27.pdf', '2021-04-29.pdf', '2021-05-06.pdf', '2021-05-11.pdf',
↪  '2021-05-20.pdf', '2021-05-27.pdf', '2021-06-10.pdf', '2021-06-17.pdf',
↪  '2021-06-24.pdf', '2021-07-01.pdf', '2021-08-12.pdf', '2021-08-19.pdf',
↪  '2021-09-02.pdf', '2021-09-09.pdf', '2021-09-16.pdf', '2021-09-23.pdf',
↪  '2021-09-30.pdf', '2021-10-07.pdf', '2021-10-14.pdf', '2021-10-21.pdf',
↪  '2021-10-28.pdf', '2021-11-04.pdf', '2021-11-11.pdf', '2021-11-18.pdf',
↪  '2021-11-25.pdf', '2021-12-02.pdf', '2021-12-09.pdf', '2021-12-16.pdf',
↪  '2022-01-05.pdf', '2022-01-13.pdf', '2022-01-20.pdf', '2022-01-27.pdf',
↪  '2022-02-03.pdf']
```

```
print(f"Total number of files: {len(filenames)}")

alloweddates = []

# Collect dates for all press conferences, from names of files
for filename in filenames:
    date = filename.strip(".pdf")
    alloweddates.append(date)

allwords = []
objects = []
object_count = 0

# Open workbook to save files in
workbook = xlsxwriter.Workbook('###RESULT_FILENAME###.xlsx')
worksheet = workbook.add_worksheet()

row = 1
t = 0
start = time.time()

# Iterate over all press conferences, run sentiment analysis & add to workbook
for filename in filenames:
    object_count += 1
    share_done = object_count / len(filenames) #161
    print(f"\nWorking on file: {filename}")
    print(f"Total progress: {round(share_done * 100, 2)} %, estimated time left: {round(((t
    ↪  / object_count) * ((161 - object_count))), 2)}s")
    datestring = filename.strip(".pdf")
    obj = Presskonferens(datestring)
    objects.append(obj)
    print(f"Positives: {obj.positives}, Negatives: {obj.negatives}, P-N_Quote:
    ↪  {round(obj.diff_quote,6)}")
    for word in obj.cleanwords:
        allwords.append(word)
    end = time.time()
    t = (end - start)

    worksheet.write(row, 0, datestring)
```

```
    worksheet.write(row, 1, obj.diff_quote)
    row += 1

# Close & save workbook. Done!
workbook.close()
print(f"\nSentiment analysis complete!\nTotal time passed: {round(t, 2)}s")
```