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Effects of strong and weak non-pharmaceutical interventions on stock market returns: A comparative analysis of Norway and Sweden during the initial phase of the COVID-19 pandemic

Ståle Størdal *, Gudbrand Lien, Ørjan Mydland, Erik Haugom

Inland Norway University of Applied Sciences, Inland School of Business and Social Sciences, Lillehammer, Norway

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A B S T R A C T

In this paper, we examine the behaviour of stock market returns in Norway and Sweden during the early days of the COVID-19 pandemic. We test how the different government interventions chosen in Norway and Sweden, including restrictions such as school closures and travel prohibitions along with economic support, affected equity markets in both countries. Our dataset comprises a panel of data for Norway and Sweden over 221 trading days during the period 1 January to 5 November 2020. The result show that while non-pharmaceutical interventions had few or no effects on Norwegian stock market returns, they positively affected the stock market in Sweden, although the strength of this effect weakened with the increasing number of confirmed COVID-19 cases.

1. Introduction

Coronavirus disease (COVID-19) has proved challenging for all countries, with the pandemic affecting not only health-care systems, but also economic and financial systems. Global stock markets have particularly experienced serious setbacks during the first few months of 2020, plummeting due to the initial panic caused by the pandemic. While the approaches used in an attempt to constrain the spread of the virus have been diverse, many countries imposed severe early lockdown policies as part of non-pharmaceutical interventions (NPIs), as was the approach chosen in Norway. On the other hand, the neighbouring country of Sweden initially followed a much looser approach.

Ashraf (2020b) analysed the effect of government responses to COVID-19 on stock market returns in 77 countries using daily data from 22 January to 17 April 2020. The findings indicated that announcements of government social distancing measures had a direct negative effect on stock market returns, whereas there was an indirect positive effect through the reduction in confirmed cases of COVID-19. Other interventions, such as public awareness programmes, testing and quarantining policies, and income support packages, largely increased market returns. On this basis, Ashraf (2020b) concluded that government-mandated social distancing measures have both positive and negative economic impacts.

* Correspondence to: Postboks 400, 2418 Elverum, Norway.
E-mail addresses: stale.stordal@inn.no (S. Størdal), gudbrand.lien@inn.no (G. Lien), orjan.mydland@inn.no (Ø. Mydland), erik.haugom@inn.no (E. Haugom).

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This analysis examines the short- to medium-term financial impacts of two different approaches to NPIs, as exemplified by the cases of Norway and Sweden. We extend Ashraf's (2020b) analysis in that we employ panel data with a longer sample period and analyse the return effects on individual stocks, rather than on broad market indices. To the best of our knowledge, this is the first analysis to use firm-level data to analyse the effects of COVID-19 NPIs on stock market returns. In addition, we apply a novel multi-group framework based on a multifactor asset-pricing model to evaluate statistically the differences in stock market returns across different industries and how these differ between Sweden and Norway.

As argued by Altman (2020), closing down a nation's economy is not necessarily the solution to minimizing death rates. Therefore, a less stringent approach to COVID-19 based on the use of behavioural science and epidemiology to achieve 'herd immunity' was the initial response by the UK and the Netherlands (Sibony, 2020). Such was also the case in Sweden, which has been one country that has been most consistent in issuing a set of recommendations about public behaviour rather than strict lockdown, along with interventions founded on a 'nudging strategy' (Almqvist and Andersson, 2020). This nudging strategy is based on the premise that the authorities can influence people's decisions in predictable ways by the way choices are presented, while at the same time maintaining freedom of choice (e.g., Thaler and Sunstein, 2008). Pierre (2020) argues that the main factor in this strategy was that the "…the liberal strategy emphasizing personal responsibility was believed to be best suited for the Swedish culture and social behaviour" (p. 486).

In neighbouring Norway, however, the government announced a set of NPIs on March 12. These included school closures, restrictions on travel and closing borders, among several other measures. In many respects, the Norwegian approach was similar to that pursued by many other countries, in not only Europe, but also elsewhere. By the start of November 2020, Norway had experienced few causalities related to COVID-19 and there were only moderate infection rates. In contrast, after displaying initially similar infection rates as other countries, Sweden experienced a significant increase in infections during the spring and summer of 2020, eventually attaining the highest death toll in Europe (Altman, 2020).

Different NPIs are clearly likely to have different effects. The behavioural approach using nudges aims to influence the public to choose behaviours that limit the spread of the virus and simultaneously have less influence on the economy than a stricter lockdown policy. In contrast, strict lockdown measures may better control the spread of the virus and save lives, albeit at the cost of severe damage to the economy. Also pertinent from a financial economics viewpoint is that the outbreak of COVID-19 results in a big jump in financial uncertainty, which by itself affects economic activity negatively (Altig et al., 2020). Accordingly, when governments impose NPIs, we expect these to reduce uncertainty, increase confidence and over time increase economic activity, especially if the measures are successful in limiting the spread of the virus.

Therefore, the question remains of how relatively strong or weak NPIs affect financial markets in both the short and long term. Norway and Sweden are particularly suitable countries to analyse for this purpose, not only because they chose different strategies to combat COVID-19, but also because they are close neighbours and share many demographic features.

In order to analyse the effects of NPIs on the economy, the stock market provides a unique view of expected future development. Stock market data make it possible to analyse effects down to the level of individual companies, and thus capture any variation in the effects from the differencing interventions, in both industries within the same country and between countries. These decisions are at the level of individual firms; thus, analysing the effects of firm behaviour from such shocks would call for the use of firm-specific data (Bloom, 2009; Christiano et al., 2014).

Recent studies indicate that countries with more individual freedom (Erdem, 2020) and higher societal trust and trust in a country's government among citizens (Enghelhardt et al., 2021) reduce the adverse effect of the COVID-19 pandemic on stock markets. Ashraf (2021) compare stock market returns with measures for uncertainty avoidance and find that the decline in stock market returns is stronger if the level of investors' uncertainty avoidance is higher. It is concluded that cultural biases are important in order to understand investors overreaction to adverse shocks. These factors might affect both how strong NPIs that are imposed and the effect the outbreak have on investors' behaviour. While the perceived societal trust and freedom of choice and control is relatively similar in the two countries,[1] the same is not the case for uncertainty avoidance: Sweden has a very low uncertainty avoidance; scores for Norway do not indicate specific preferences on this.[2] Juranek et al. (2020) suggested that the strictness of NPIs was not irrelevant in terms of labour market performance and that the stricter interventions in Denmark and Norway had greater negative impacts than the less-strict approaches taken in other countries like Sweden. Zaremba et al. (2020) also investigated the relationship between policy responses to the COVID-19 pandemic and stock market volatility and found that stringent policy responses increased the volatility of returns in international stock markets and that this effect was independent of the role of the coronavirus pandemic itself.

This paper is organized as follows. Section 2 describes the data used and the methods applied. Section 3 develops a theoretical framework for the empirical analysis and Section 4 present the results followed by a discussion of the findings. Section 5 concludes with some policy implications.

[1] See Inglehart et al. (2014).

[2] A main reference to different countries' uncertainty avoidance is Hofstede (1980, 2001). See https://www.hofstede-insights.com/country-comparison/norway,sweden/ for implementation. Norway has a factor of 50, while Sweden has 29 which is considered very low.

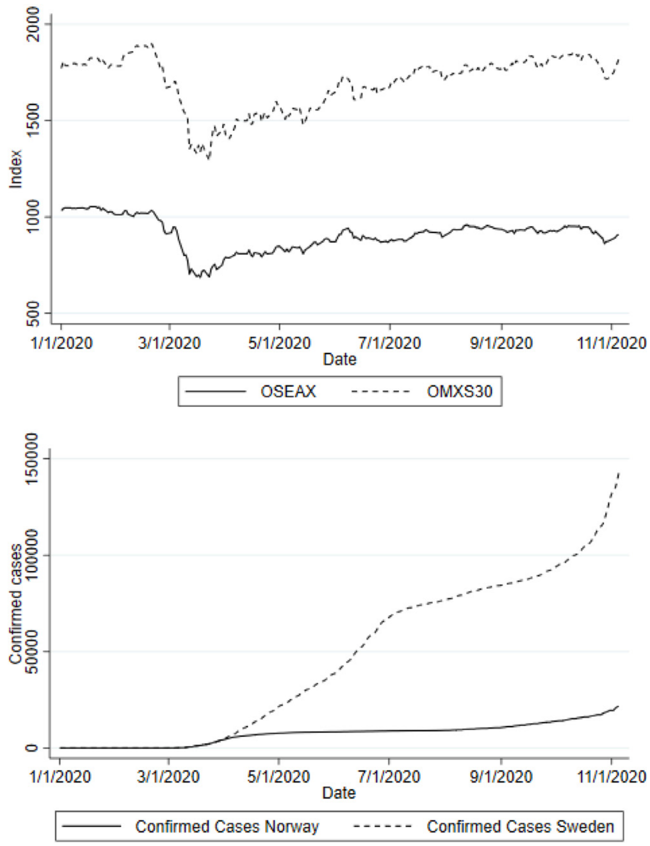

Fig. 1. Upper panel: Changes in the Swedish OMX 30 Stock Market Index (OMXS30) and the Oslo Stock Exchange All Share Index (OSEAX). Lower panel: Accumulated confirmed cases for Norway and Sweden.

2. Data

The data used in this study are from two sources. First, the daily closing data for individual stocks (adjusted for dividends) listed on the Oslo and Stockholm stock exchanges over the period 1 January to 5 November 2020 are from the Refinitiv Datastream database. With the individual daily stock data, we calculate the daily logarithmic returns and group the individual stocks for both countries into 11 industries according to the Industry Classification Benchmark.[3] Second, we download the government response indices from the Oxford COVID-19 Government Response Tracker (OxCGRT) website.[4] OxCGRT collects information on the common policy responses governments worldwide have taken to respond to the pandemic across 17 indicators, including daily infection rates and deaths by COVID-19.

Fig. 1 plots the changes in the stock market indices and the number of confirmed cases in Norway and Sweden, with the Swedish OMX 30 Stock Market Index (OMXS30) and the Oslo Stock Exchange All Share Index (OSEAX) in the upper panel, and the accumulated confirmed COVID-19 cases for Norway and Sweden in the lower panel.

We merged these two datasets to obtain a consistent set of panel data for stock market returns, policy indicators, and health and containment indicators for Norway and Sweden during the first 10 months of 2020. The complete dataset consists of the log returns on stock prices and stock market indices. Using the OxCGRT data, we calculate the change (change from day $t-1$ to day t) in the following parameters: (i.) number of confirmed cases; (ii.) a stringency index estimated using principal component analysis (PCA) of the indices for school closures, workplace closures, cancelling of public events, restrictions on gatherings, closing of public transport, stay-at-home requirements, restrictions on internal movement and international travel controls; (iii.) a health index estimated using PCA of the indices for public information campaigns, testing policy and contact tracing; and (iv.) an economic support index estimated by PCA of the indices for income support and debt contract relief.

3 FTSE Russell's Industry Classification Benchmark: https://www.ftserussell.com/data/industry-classification-benchmark-icb.

4 The latest datasets for the Blavatnik School of Government at the University of Oxford's COVID-19 Government Response Tracker are available at the following URL: https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker#data.

Table 1
Companies in the sample.

Industries	Norway	Sweden
Basic Materials	8	42
Consumer Discretionary	17	107
Consumer Staples	16	24
Energy	53	20
Financials	51	59
Health Care	18	139
Industrials	54	154
Real Estate	7	84
Technology	16	97
Telecommunications	3	28
Utilities	2	5
Total	245	759

Table 2
Summary statistics.

Variable	Mean	Standard deviation	Minimum	Maximum
Norway				
Excess return	−0.002	0.050	−1.741	0.948
Market return	−0.002	0.019	−0.104	0.058
12 March (before 12 March = 1, after 12 March = 0)	0.225	0.418	0.000	1.000
Stringency index	0.021	0.411	−2.415	3.800
Health index	0.020	0.164	0.000	1.651
Economic support index	0.007	0.337	−3.332	3.332
Growth in confirmed cases	0.067	0.337	0.000	3.750
Sweden				
Excess return	0.001	0.050	−1.597	1.630
Market return	0.001	0.019	−0.117	0.071
12 March (before 12 March = 1, after 12 March = 0)	0.228	0.419	0.000	1.000
Stringency index	0.027	0.199	−0.720	2.035
Health index	0.019	0.182	−0.388	1.851
Economic support index	0.015	0.159	0.000	1.701
Growth in confirmed cases	0.072	0.291	0.000	3.667

The full dataset contains information on 759 companies in Sweden and 245 in Norway for 221 trading days. In total, we have 166,442 and 52,418 individual data points for Sweden and Norway, respectively, linking each to one of 11 industries, the country-specific indices of the daily change in confirmed cases and the government response indices.

Table 1 provides details on the number of company stocks in our dataset for Norway and Sweden by industry. Table 2 reports the summary statistics of the data used in the analysis, and Fig. 2 depicts the development of the various indices.

Fig. 2 well illustrates the different approaches taken in Norway and Sweden in terms of government restrictions (*Stringency index* in the upper panel), and support (*Economic support index* in the lower panel). In the initial period, the Norwegian government struck harder than the Swedish government in imposing restrictions and support. The economic support index is higher in Norway over the entire period, while halfway through the period the stringency index in Norway decreased, leading to a higher stringency index in Sweden than in Norway, explained by the *Health index* in the middle panel of Fig. 2. At the same time as the health index in Norway rose above the Swedish health index halfway through the period, the restrictions in Norway were relaxed.

3. Theory and model specification

3.1. Theory

The capital asset pricing model (CAPM) states that the systematic risk of risky assets determines their expected return (Sharpe, 1964; Lintner, 1965; Mossin, 1966). Following the later arbitrage pricing theory of Ross (1976), the return of a risky asset is not only a function of its expected return, modelled by CAPM, but also a factor intensity structure, such that:

$$r_i = E\left(r_i\right) + \Lambda f_n + \tilde{\epsilon}_i,\ E\left\{\tilde{\epsilon}_i\right\} = 0 \tag{1}$$

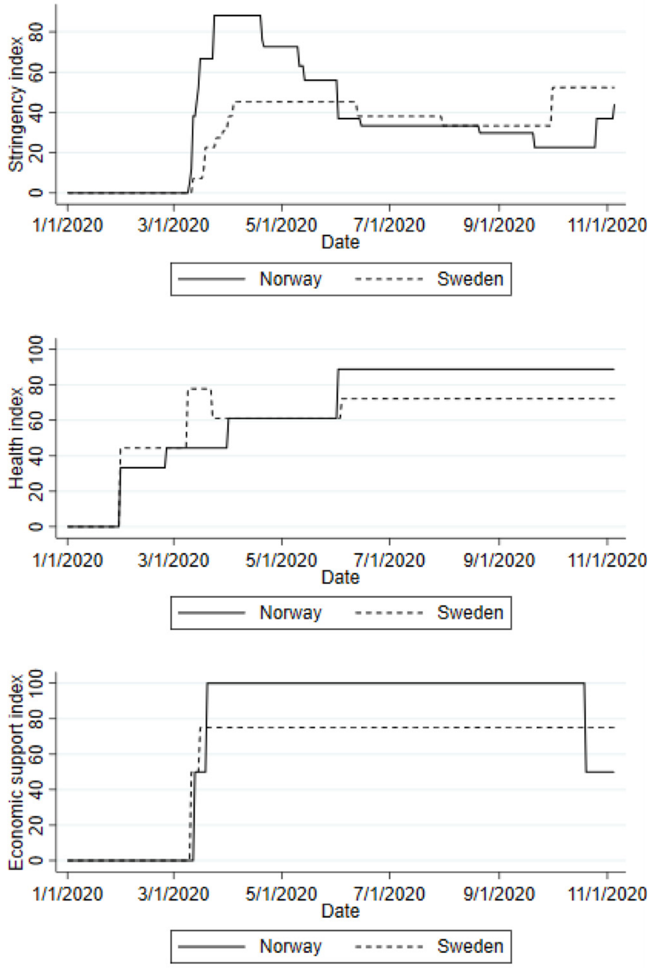

Fig. 2. Comparison of the NPIs in Norway and Sweden.

where r_i is the return of the ith security, and its expected return by CAPM, so that $E(r_i) = r_f + \beta_i\lambda$, where β_i refers to the response of the security to market movements so that $\beta_i = \sigma^2_{im}/\sigma^2_m$, where λ is the market risk premium. Further, f are factors affecting the returns and $\boldsymbol{\Lambda}$ is the matrix of factor loadings. The error term, $\tilde{\epsilon}$, is the unsystematic risk which follows a multivariate normal distribution with expected mean of zero. From Eq. (1), it follows that in a CAPM world, $E\{\boldsymbol{\Lambda}\}$ would also be zero.

Rearranging equation (1) gives:

$$y_i = \beta_i\lambda + \boldsymbol{\Lambda} f_n + \tilde{\epsilon}_i, E\{\tilde{\epsilon}_i\} = 0 \tag{2}$$

The excess return of the security, $y_i = r_i - r_f$, is given by the compensation for risk, $\beta_i\lambda$, the impact of the factor intensity structure and firm-specific unsystematic risk. Given that in practice we cannot identify all systematic factors that should be included in the factor intensity structure, the effect of additional factors can be assumed to be found in a constant term, α. In fact, this provides a basis for the testable regression function applied in this analysis:

$$y_i = \alpha + \beta_i\lambda + \boldsymbol{\Lambda} f_n + \tilde{\epsilon}_i, E\{\tilde{\epsilon}_i\} = 0 \tag{3}$$

Eq. (3) provides a basis for empirical analyses of the effect of NPIs relating to the COVID-19 pandemic on stock market returns. If the model is correctly specified for the two countries, Norway (c_1) and Sweden (c_2), it should be possible to test whether the performance of a given company was different in the two countries, that is: $y_i|c_1 \neq y_i|c_2$.

Therefore, one important task is to isolate the factors affecting the security returns. If the NPIs have a negative impact, this should be evident from the results of the regressions when controlling for variables such as confirmed cases and time for the NPIs to come into force. Moreover, the effect of interventions may change over time and thus be time-varying.

A point made by Sibony (2020) is that the UK government, in order to support their wait-and-see policy, argued that 'behavioural fatigue' (p. 354) could kick in and undermine the effectiveness of interventions.

Other lessons from behavioural economics are optimism bias (a low contamination rate can lead people to believe they are less likely to get the disease) and reactance (doing the opposite of what we are told when we feel our freedom of choice is being limited). The latter could differ across countries because the baseline level of reactance is a cultural trait (Sibony, 2020). The framing effect may also cause more risk taking over time. All of these arguments support differences in the factor intensity structure in Eq. (3) and are time-varying.

3.2. Empirical specification

As Ashraf (2020a) argues, panel data analysis is preferred in a study of COVID-19 effects because the spread of the virus evolves over days and panel data are better at capturing the time-varying relationships between dependent and independent variables. Panel data regressions also reduce estimation bias and multicollinearity as well as individual heterogeneity (Al-Awadhi et al., 2020). Following initial statistical testing below, we specify a pooled panel ordinary least squares model for each country,[5] such that:

$$\begin{aligned} y_{ic,t} &= \alpha_c + \beta_{ic}\lambda_c + \gamma_{1c}T + \gamma_{2c}SI_{c,t} + \gamma_{3c}HI_{c,t} + \gamma_{4c}EI_{c,t} + \gamma_{5c}CC_{c,t} + \gamma_{6c}\left(SI_{c,t} \times CC_{c,t}\right) + \gamma_{7c}\left(HI_{c,t} \times CC_{c,t}\right) \\ &\quad + \gamma_{8c}\left(EI_{c,t} \times CC_{c,t}\right) + \varepsilon_{ic,t} \end{aligned} \tag{4}$$

where $y_{ic,t}$ is the logarithmic daily excess return of stock i in country c on trading day t, λ_c is the country-specific market risk premium and T is a dummy variable that takes a value of one before March 12 and zero after. $SI_{c,t}$, $HI_{c,t}$ and $EI_{c,t}$ are the daily change of the country-specific stringency, health and economic support indices, respectively, $CC_{c,t}$ is the percentage change of number of confirmed cases for each country at time t, and $\varepsilon_{ic,t}$ is the error term. To show how the stock market reacted to the growth in COVID-19-confirmed cases depending on government actions, we include three interaction terms ($\left(SI_{c,t} \times CC_{c,t}\right)$, $\left(HI_{c,t} \times CC_{c,t}\right)$, $\left(EI_{c,t} \times CC_{c,t}\right)$) in Eq. (4).

Next, we estimate the same regression for each of the individual industries. Using this model, we are able to empirically test for any differences in returns in the same industry across countries. That is, we can test for differences in the impact of NPIs on companies, irrespective of the industry structure in the two countries. We use Stata 16 for the estimations. The multi-group analyses employ the seemingly unrelated estimator 'suest' as a post-estimation procedure in Stata.

4. Results

We performed a range of statistical tests before selecting the final estimation model.[6] Based on these tests, we chose a pooled panel ordinary least squares model adjusted for heteroskedasticity. Table 3 presents the results from the country-specific estimation of overall stock market performance (Eq. (4)). As shown, the effect of *Market return* on overall stock market performance in Norway and Sweden is 0.798 and 0.707, respectively. These figures are effectively the beta values in the CAPM and describe the response of asset return to changes in the return of the market index. As we included all stocks in this estimation against the market index, we would theoretically expect the estimate of the market parameter to be one. However, the indices we employed are market weighted, while the stocks included in our model are unweighted.[7]

As shown, none of the indices is significantly different from zero in Norway, whereas in Sweden, a unit change in the stringency index results in a 0.6% change in excess market return. However, the interaction terms between the stringency index and number of confirmed cases are negative and significant for both Norway and Sweden, indicating the positive stringency effect on stock returns decreases with an increase in confirmed cases. This effect is larger in Sweden than in Norway, but the positive direct effect of the stringency policy is also at a higher level in Sweden as discussed. The findings here are in line with Ashraf (2020b).

In Sweden, a unit increase in the health index results in a 0.5% increase in excess market returns. The interaction terms between health and confirmed cases are negative and significant for Sweden, but not for Norway. Our results also show

5 We conducted the estimation at the aggregate level, that is, estimates for a whole market at a time in the one regression model. An alternative would be estimation at the firm level and then calculate the average of the individual results (the firm-specific coefficients, the values of R^2, etc.) at aggregate level. We undertook this in the preliminary estimations and the coefficients at the mean (of all firms) were consistently about the same as the results for our chosen approach, although the average R^2 was higher with firm-level estimation. However, the purpose of our analysis is not prediction, but rather to provide a broad picture of government intervention effects on stock market returns.

6 We tested for stationarity in the panel data using the Fisher-type test following Choi (2001). These tests supported the null hypothesis that all the panels are stationary. Because serial correlation in linear panel data models biases the standard errors and causes the estimates to be less accurate, we tested for serial correlation in the error term of our panel data model. For this purpose, we used the test by Wooldridge (2002) for serial correlation in panel data models and found no error term autocorrelation. The test of the choice of pooled or fixed effects panel data estimators supported ignoring firm effects. The Breusch and Pagan (1979) test for heteroscedasticity was significant, indicating non-constant variance. We used the Huber–White procedure to obtain heteroscedasticity-consistent standard errors (White, 1980). The variance inflation factors (VIF) were all less than 1.2, indicating the absence of potentially harmful multicollinearity.

7 As a check, we also used a weighted regression estimator for our model, where the market values of shares served as weights for the dependent excess return variable. There, the estimate of the 'beta' parameter was very close to one as expected given the presence of (almost) the same variable on both the left- and right-hand sides of the regression equation.

Table 3
Comparative results at aggregate level of Norway and Sweden for the period 2 January to 5 November 2020. Excess return is the dependent variable. Robust standard errors in parentheses.

	Norway b/se	Sweden b/se	Significance of difference Nor–Swe
Market return	0.798***	0.707***	*
	(0.034)	(0.014)	
12 March	−0.003***	−0.002***	*
	(0.000)	(0.000)	
Stringency index	0.001	0.006***	***
	(0.001)	(0.001)	
Health index	−0.002	0.005***	***
	(0.001)	(0.001)	
Economic support index	0.002	0.064***	***
	(0.001)	(0.008)	
Stringency index × Confirmed cases	−0.015***	−0.112***	***
	(0.002)	(0.008)	
Health index × Confirmed cases	−0.272	−0.008***	***
	(0.212)	(0.001)	
Economic support index × Confirmed cases	0.007	−0.239***	***
	(0.008)	(0.024)	
Confirmed cases	0.000	0.001	
	(0.001)	(0.000)	
Intercept	0.000	0.001***	**
	(0.000)	(0.000)	
R^2	0.117	0.096	
N (firms)	245	759	
T (trading days)	220	220	

Significance
***$p < 0.001$.
**$p < 0.01$.
*$p < 0.05$.

that a unit increase in the economic support index results in a 6.4% increase in Swedish excess market returns. In line with the effect of the stringency index, the effect of the economic support index decreases with an increase in confirmed cases in Sweden, but again is not significant in Norway. We note that the numbers of confirmed cases alone in Sweden and Norway have low statistically and insignificant effects.

Testing for differences between countries, we find that stock market performance was more negative in Norway than Sweden prior to 12 March. The stringency, health and economic support indices are all significantly more positive in Sweden than in Norway. The interaction between the health index and number of confirmed cases, suggesting the greater impact of the health index on stock market returns with an increasing number of confirmed cases, is also higher in Sweden than in Norway. In contrast, the interactions between the stringency and economic support indices and the number of confirmed cases are both more negative in Sweden than in Norway, suggesting a more rapidly growing importance relative to the growing number of confirmed cases in Sweden than in Norway.

Table 4 details the results from the industry-specific regressions in Eq. (4). In what follows, we only comment on the significant results. The Energy industry has a higher estimated beta value in Norway than in Sweden. For the Financials and Industrials industries, we find more effects that are negative before March 12 in Norway than in Sweden. In Sweden, the before March 12 dummy has a positive effect on the Health Care and Industrials industries. Furthermore, the effects of the numbers of confirmed cases are more negative in Norway than Sweden for the Consumer Discretionary, Consumer Staples and Energy industries.

However, for the Health Care industry, we identify a more positive effect for the number of confirmed cases in Norway than in Sweden. When it comes to the effects of the individual NPIs, the stringency index has a more positive effect in Sweden for the Energy, Health Care, Industrials and Technology industries. The Health index is more positive in Sweden for the Financials and Industrials industries. The same applies to the economic support index and the Financials, Industrials and Technology industries.

Most of the interaction variables across industries and countries are also significant. The interactions between the stringency index and number of confirmed cases are negative for all industries and countries, except for the Energy industry in Norway, where the coefficient is not significant. Also, for all industries, the effects in Sweden are also more negative. Even though most effects were negative, there appears no significant impact from the interaction effect between the health index and the number of confirmed cases. This interaction effect is more negative in Norway for the Energy, Financials and Industrials industries. There is the same direction in the interaction effect for the Consumer Discretionary industry, although there is no significant difference between the two countries.

Table 4
Comparative multi-factor model results at industry level for Norway and Sweden for the period 2 January–5 November 2020 (221 trading days). Robust standard errors in parentheses.

Industry		Beta	12. March	Stringency index (SI)	Health index (HI)	Economic support index (EI)	SI × CC	HI × CC	EI × CC	Confirmed cases (CC)	Intercept	R^2	N (firms)
Consumer Discretionary													
NOR	Coef.	0.586***	−0.005***	0.000	−0.004	0.002	−0.026*	1.370	−0.007	−0.006*	0.001	0.07	17
	Std. err.	(0.117)	(0.002)	(0.005)	(0.004)	(0.004)	(0.011)	(1.736)	(0.032)	(0.003)	(0.001)		
SWE	Coef.	0.716***	−0.003***	0.008	0.008*	0.042	−0.128***	−0.007**	−0.172*	0.002	0.002***	0.08	107
	Std. err.	(0.037)	(0.001)	(0.006)	(0.003)	(0.023)	(0.029)	(0.002)	(0.071)	(0.001)	(0.000)		
	Diff.							***		**			
Consumer Staples													
NOR	Coef.	0.576***	−0.002*	0.002	0.002	0.002	−0.012**	1.089	0.009	−0.005*	0.000	0.13	16
	Std. err.	(0.039)	(0.001)	(0.002)	(0.004)	(0.003)	(0.004)	(0.683)	(0.022)	(0.002)	(0.001)		
SWE	Coef.	0.514***	−0.002*	0.009*	0.001	−0.011	−0.097*	−0.004	−0.004	0.003	0.000	0.07	24
	Std. err.	(0.059)	(0.001)	(0.004)	(0.004)	(0.042)	(0.038)	(0.005)	(0.129)	(0.002)	(0.001)		
	Diff.								*	*			
Energy													
NOR	Coef.	1.243***	−0.002	−0.003	−0.003	0.004	0.001	−0.901**	−0.005	−0.001	−0.002*	0.16	53
	Std. err.	(0.089)	(0.001)	(0.002)	(0.003)	(0.003)	(0.005)	(0.333)	(0.020)	(0.002)	(0.001)		
SWE	Coef.	0.978***	−0.004***	−0.001	0.004	0.084	−0.184***	−0.022***	−0.308*	0.005*	0.000	0.18	20
	Std. err.	(0.064)	(0.001)	(0.008)	(0.004)	(0.048)	(0.029)	(0.005)	(0.145)	(0.002)	(0.001)		
	Diff.	**				**		***	***	*	*		
Financials													
NOR	Coef.	0.537***	−0.003***	0.004**	0.000	0.000	−0.021***	−0.489	0.006	−0.002	0.000	0.11	51
	Std. err.	(0.058)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.273)	(0.011)	(0.001)	(0.000)		
SWE	Coef.	0.671***	−0.001	0.003	0.005**	0.084***	−0.089***	−0.008***	−0.272***	0.000	0.001	0.13	59
	Std. err.	(0.088)	(0.001)	(0.002)	(0.002)	(0.019)	(0.022)	(0.002)	(0.061)	(0.001)	(0.000)		
	Diff.		*		**	**		***	***				
Health Care													
NOR	Coef.	0.809***	−0.004*	0.003	−0.009	0.003	−0.020*	0.160	0.007	0.006*	0.002**	0.11	18
	Std. err.	(0.106)	(0.002)	(0.004)	(0.006)	(0.003)	(0.010)	(0.754)	(0.029)	(0.003)	(0.001)		
SWE	Coef.	0.713***	−0.002**	0.009***	0.003	0.021	−0.126***	−0.009***	−0.118*	0.000	0.002***	0.09	139
	Std. err.	(0.026)	(0.001)	(0.002)	(0.002)	(0.017)	(0.017)	(0.002)	(0.052)	(0.001)	(0.000)		
	Diff.						*	***	**	*			
Industrials													
NOR	Coef.	0.805***	−0.004***	0.002	−0.002	0.000	−0.016***	−0.728	0.026	0.002	0.001	0.14	54
	Std. err.	(0.051)	(0.001)	(0.002)	(0.003)	(0.004)	(0.004)	(0.441)	(0.019)	(0.001)	(0.000)		
SWE	Coef.	0.752***	−0.002***	0.002	0.004**	0.071***	−0.091***	−0.006***	−0.261***	0.000	0.001***	0.12	136
	Std. err.	(0.032)	(0.000)	(0.001)	(0.001)	(0.018)	(0.016)	(0.002)	(0.059)	(0.001)	(0.000)		
	Diff.		**		**	*		***	***				
Technology													
NOR	Coef.	0.765***	−0.004*	−0.002	0.001	0.008	−0.028*	−0.567	0.018	0.007*	0.002	0.10	16
	Std. err.	(0.09)	(0.002)	(0.004)	(0.007)	(0.005)	(0.012)	(0.421)	(0.039)	(0.003)	(0.001)		
SWE	Coef.	0.720***	−0.003***	0.009***	0.000	0.139***	−0.146***	−0.010**	−0.470***	0.002	0.002***	0.08	97
	Std. err.	(0.037)	(0.001)	(0.002)	(0.002)	(0.027)	(0.022)	(0.003)	(0.083)	(0.001)	(0.000)		
	Diff.			**		***	***		***				

Significance
***$p < 0.001$.
**$p < 0.01$.
*$p < 0.05$.

The interaction between the economic support index and the number of confirmed cases follows the same pattern as the other interaction variables in that they are mostly negative. We find more negative interaction effects between the economic support index and the number of confirmed cases in Sweden for the Energy, Financials and Industrials industries. The effect of the interaction variable for the Consumer Discretionary industry is significantly negative for Sweden, but not for Norway. Overall, while we observe fewer and less significant results at the industry level than the aggregate market level, the signs and differences in the estimated coefficients for Sweden and Norway are largely consistent.

5. Discussion and conclusion

For Norway, our results suggested that the NPIs had no effect on stock market returns. At the industry level, there is only one positive effect of the stringency index on the Financials industry. There are no significant effects for economic support, while the health index mainly has a negative effect at the industry level. This is an indication that the interventions in Norway did not affect stock market returns. In contrast, for Sweden, our results suggest that all NPIs had a positive impact on stock market returns. The three indices of *stringency*, *health* and *economic support* are positive and highly significant, but the effect falls with the increasing number of confirmed cases. This means that the effects of intervention were highest at the beginning of the pandemic.

Our analyses indicate that a more careful lockdown inspired by the nudging strategy seems to have contributed to better stock market performance in the pandemic initially. One explanation for the difference between Norway and Sweden is that if we use public interventions on something not perceived as a major problem, the interventions will not have the same effect as when used in a country where the problem is significantly larger, as is the case in Sweden.

Our findings also show that at the industry level in general, the different NPIs positively affected Sweden in terms of market returns, but this was not the case in Norway. However, the Consumer Staples, Consumer Discretionary and Health Care industries were only a little or unaffected by the NPIs in either of the two countries nor was there any difference in the effects between the countries. These industries were to a certain degree less affected by the lockdowns and interventions, at least in the early stages of the pandemic. In fact, we would expect that the Health Care and Consumer Staples industries will exhibit more positive trends over the longer term than many other industries. As the Consumer Discretionary industry includes non-essential consumer goods, we would expect it to perform worse. We defer these analyses for future research.

Looking at the trend in gross domestic product (GDP) in the two countries during the first 9 months of 2020 (Fig. A.1 in the Appendix), Norway has generally performed better than Sweden. This might be the result of the stricter lockdown policy and because of that, increased domestic trade at the same time as imported goods became more expensive. However, GDP are backward-looking accounting figures whereas our analysis draws on stock market returns, which as leading indicators say something more about expected or future changes in GDP.

To summarize, our findings seem to support the Swedish approach of limiting the introduction of strict NPIs when it comes to the impact on stock market returns. Our findings also indicate that most companies would have performed better under the Swedish policy than under that in Norway. Differences in cultural factors such as uncertainty avoidance might be an explanation. However, we have not yet seen the end of the COVID-19 pandemic, and so we cannot yet say anything about what the results will be at the conclusion of the pandemic. Focusing on stock market returns only, our results support the view that the Swedish approach is better in the short term.

Further, we have shown that different levels of interventions have differing impacts on the number of confirmed cases and death rates. If the numbers of confirmed cases and death rates from the COVID-19 pandemic increase over time and get out of control, which could be the case if there is a lack of government interventions, it is likely that we will eventually observe some negative effects in stock market returns. In our analysis, Sweden performs better, but there is certainly a need for additional analyses in the future to shed light over the long-term effects of public interventions in financial markets.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

See Fig. A.1.

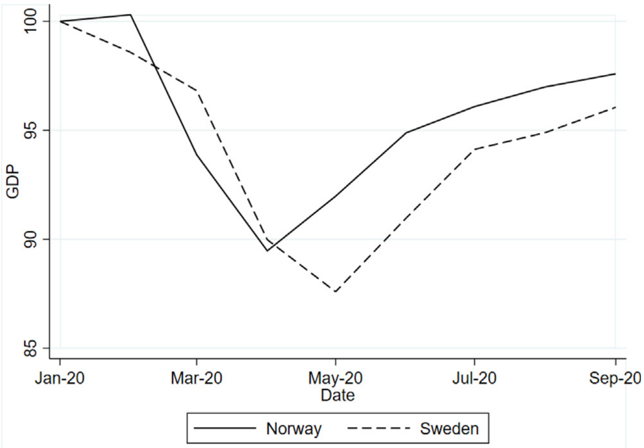

Fig. A.1. Development of gross domestic product (GDP) in Norway and Sweden for the period from January to September 2020. Index base: January = 100.
Source: Statistics Norway and Statistics Sweden.

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