technische universität
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# Essays in Finance:
# The Impact of the COVID-19 Crisis on Financial Markets

Dissertation zur Erlangung des akademischen Grades
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# Acknowledgment

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# 1 Introduction

The unexpected and exogenous shock of the COVID-19 health crisis in the beginning of 2020 had dramatic consequences for financial markets. The world's leading stock markets were on an all-time high until mid-February and collapsed by roughly 30% within a few days. This presents an opportunity to investigate reasons, which might have reinforced the stock market crash, and also those characteristics, which might have made specific firms more resilient to the crisis. The underlying thesis covers these two aspects and contributes to the evolving strand of literature. While the first two chapters investigate the impact of the COVID-19 pandemic on financial markets on country-level (see e.g. Albulescu, 2020; Zhang et al., 2020; Zaremba et al., 2020), the remaining three chapters contribute to the growing body of research on characteristics which make firms more immune to the COVID-19 crisis (see e.g. Albuquerque et al., 2020; Ding et al., 2020; Fahlenbrach et al., 2020; Ramelli and Wagner, 2020).

The first question this thesis answers is whether the drop in global stock prices was driven by rational expectations or by higher news attention about the COVID-19 pandemic's economic impact. Chapter 2 employs Google's abnormal search volume for the search term "corona" as a proxy for news attention (Da et al., 2011; Ben-Rephael et al., 2017) and growth rates from two epidemiological standard models as proxies for rational expectations. Investigating a cross-country sample of 64 national stock markets, Chapter 2 shows that the decline in stock markets was primarily associated with higher news attention and only marginally associated with rational expectations about the development of the crisis. The impact of the news hype imposed significant economic costs, $3.5 trillion for the US stock market alone in the first quarter of 2020. Chapter 2 concludes that investors should be more concerned about the news hype than about actual infection growth rates when making their investment decisions.

In contrast to Chapter 2, which primarily focuses on stock market returns, Chapter 3 examines stock market volatility during the COVID-19 crisis. One potential factor that could influence stock market volatility during such a crisis is trust in the countries' executives. While some governments systematically downplayed the dangers of the COVID-19 crisis, other countries' governments applied severe restrictions with a lockdown policy. The different policy responses were controversially discussed and the question occurred which governments were on the right track to overcome the crisis. In this respect, Fukuyama (2020) stresses that trust in a country's government is a key factor of success during the COVID-19 crisis, while Goldstein and Wiedemann (2020) and Mehari (2020) argue that trust in the society following government's guidelines is also critical. Therefore, this chapter investigates whether higher levels of societal trust as well as trust in the countries' governments affected stock market volatility during the COVID-19 crisis. Using a cross-country sample of 47 national stock markets and data on trust from the World Values Survey (WVS), Chapter 3 finds stock market volatility to be significantly lower in high-trust countries in response to COVID-19 case announcements. Chapter 3 also demonstrates that both, trust in the society and trust in the countries' government, are negatively related to global stock market volatility during the COVID-19 crisis.

The remaining three chapters of this thesis focus on the impact of the COVID-19 crisis on firm-level, in particular on characteristics making firms more resilient during times of crisis. Chapter 4 investigates firm efficiency and stock returns. In this respect, two contrasting views on the relationship between firm efficiency and stock performance prevail in the literature. One view is that highly efficient firms should generate less risky future cash flows, and thus exhibit lower default risks and higher market valuations compared to highly inefficient firms (Frijns et al., 2012). The opposite view is that firms, which use their resources inefficiently, exhibit more uncertain future cash flows and thus risk-averse investors require higher return premia (Nguyen and Swanson, 2009). The empirical literature also shows inconclusive results. While Nguyen and Swanson (2009) find a negative relationship between firm efficiency and stock returns, Frijns et al. (2012) argue that highly efficient firms exhibit higher stock returns. The COVID-19 shock serves as a perfect opportunity to further test this relationship as the subsequent economic lockdown resulted in a severe decline in revenues along with higher uncertainties about a firm's ability to generate future cash flows (Fahlenbrach et al., 2020). Chapter 4 therefore empirically investigates the relationship between firm efficiency and stock returns by employing efficiency scores based on Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis (DEA). These methods have also been used in the existing literature (see e.g. Frijns et al., 2012; Habib and Ljungqvist, 2005; Nguyen and Swanson, 2009). Using a large sample of US firms, Chapter 4 shows that firm efficiency has explanatory power for stock returns as highly efficient firms exhibit higher stock returns during the COVID-19 crisis. From an investor's perspective, a long-short portfolio composed of highly efficient and inefficient US firms would have realized positive excess returns when financial markets collapsed in the first quarter of 2020.

Chapter 5 contributes to the discussion of whether engaging in corporate social responsibility (CSR) activities is enhancing or destroying shareholder wealth, particularly during times of crisis. To some extent, research has shown that CSR activities are a manifestation of agency conflicts between a firm's shareholders and managers, who profit from engaging in CSR at the expense of a firm's shareholders (see e.g. Bénabou and Tirole, 2010; Krüger, 2015). In contrast, other studies have highlighted that CSR is creating shareholder wealth because good-quality corporate governance could lead to both, higher corporate earnings and better social conditions (see e.g. Falck and Heblich, 2007; Ferrell et al., 2016; Servaes and Tamayo, 2013). In the context of COVID-19 crisis, Bae et al. (2021) and Demers et al. (2020) find no consistent evidence that CSR is valuable, while Albuquerque et al. (2020) who focus on the US market demonstrate that firms with higher environmental and social ratings experience higher abnormal stock returns and lower stock volatility. Chapter 5 uses a cross-country sample consisting of European firms and shows mixed results consistent with the existing literature. Particularly, Chapter 5 finds some indication that high ESG-rated European firms are associated with slightly higher abnormal returns and lower stock volatility during the COVID-19 crisis. Further, Chapter 5 stresses that CSR could be even more valuable in certain countries depending on the countries' characteristics.

Finally, Chapter 6 emphasizes the importance of good-quality investor relations (IR) during the COVID-19 crisis. As outlined in Chapter 2, the large amount of negative and unfiltered news has reinforced the decline in stock prices and shaped the investors' perceptions about the pandemic's economic impact; and thus could have led to information frictions. IR departments intend to establish an effective two-way communication between the firm, investors, and financial intermediaries in order to communicate a firm's crisis strategy with the purpose to reduce information frictions. In the existing literature, Brennan and Tamarowski (2000) and Brochet et al. (2020)

document that firms with better-quality IR experience better stock market performance. So far, there is however no consistent evidence that effective IR particularly pays off during times of crisis. Chapter 6 fills this gap and empirically investigates whether firms with better-quality IR have outperformed those with lower-quality IR when the COVID-19 crisis hit financial markets in the first quarter of 2020. Chapter 6 employs IR rankings for a large sample of European firms from Institutional Investor and shows that firms with better-quality IR exhibit between five and eight percentage points higher stock returns than those with lower-quality IR over the crisis period. The results in Chapter 6 also show that firms with strong IR are particularly associated with higher investor loyalty and attracted significantly more institutional investors. Good-quality IR therefore appears to be value-enhancing by increasing credibility with a firm's shareholders and by diversifying a firm's shareholder base. Further, Chapter 6 also examines which function of IR particularly drives the results. After the decomposition of IR into its public and private channels, Chapter 6 indicates that a firm's private IR functions, e.g. meetings with senior management, are of significant importance during the COVID-19 crisis, whereas the public component of IR, e.g. public corporate events, are of minor importance. Additionally, this chapter provides evidence that effective IR is even more valuable in countries with lower-quality legal institutions, in countries with lower levels of trust in the society, and in countries where the society has difficulties to deal with uncertainties.

## 1.1 Publication Details

**Paper I (Chapter 2):**

What Drives Stocks during the Corona-Crash? News Attention vs. Rational Expectation

**Authors:**

Nils Engelhardt, Miguel Krause, Daniel Neukirchen, Peter N. Posch

**Abstract:**

We explore if the corona-crash 2020 was driven by news attention or rational expectations about the pandemic's economic impact. Using a sample of 64 national stock markets covering 94% of the world's GDP, we find the stock markets' decline to be mainly associated with higher news attention and less with rational expectation. We estimate the economic cost from the news hype to amount to USD 3.5 trillion for the US and USD 200 billion on average for the rest of the G8 countries.

**Publication Details:**

Sustainability (2020), 12(12), 5014.
https://doi.org/10.3390/su12125014

**Paper II (Chapter 3):**

TRUST AND STOCK MARKET VOLATILITY DURING THE COVID-19 CRISIS

**Authors:**

Nils Engelhardt, Miguel Krause, Daniel Neukirchen, Peter N. Posch

**Abstract:**

We investigate if trust affects global stock market volatility during the COVID-19 pandemic. Using a sample of 47 national stock markets, we find the stock markets' volatility to be significantly lower in high-trust countries (in reaction to COVID-19 case announcements). Both trust in fellow citizens as well as in the countries' governments are of significant importance.

**Publication Details:**

Finance Research Letters (2021), 38, 101873.
https://doi.org/10.1016/j.frl.2020.101873

**Paper III (Chapter 4):**

Firm Efficiency and Stock Returns during the COVID-19 Crisis

**Authors:**

Daniel Neukirchen, Nils Engelhardt, Miguel Krause, Peter N. Posch

**Abstract:**

We investigate the relationship between firm efficiency and stock returns during the COVID-19 pandemic. We find that highly efficient firms experienced at least 9.44 percentage points higher cumulative returns during the market collapse. A long-short portfolio consisting of efficient and inefficient firms would have also yielded a significantly positive weekly return of 3.53% on average. Overall, our results show that firm efficiency has significant explanatory power for stock returns during the crisis period.

**Publication Details:**

Finance Research Letters (2021), 102037.

https://doi.org/10.1016/j.frl.2021.102037

**Paper IV (Chapter 5):**
ESG Ratings and Stock Performance during the COVID-19 Crisis

**Authors:**
Nils Engelhardt, Peter N. Posch

**Abstract:**
We investigate the association between Environmental, Social, and Governance (ESG) ratings and stock performance during the COVID-19 crisis. Although there is mixed evidence in the literature whether ESG is valuable in times of crisis, we find that high ESG-rated European firms are associated with higher abnormal returns and lower stock volatility. We argue that ESG is value-enhancing in low-trust countries, and in countries with poorer security regulations and where lower disclosure standards prevail.

**Publication Details:**
Working paper.

**Paper V (Chapter 6):**

The Value of (Private) Investor Relations during the COVID-19 Crisis

**Authors:**

Daniel Neukirchen, Nils Engelhardt, Miguel Krause, Peter N. Posch

**Abstract:**

We investigate the impact of investor relations (IR) and find firms with strong IR to experience between five and eight percentage points higher stock returns than those with weak IR during the COVID-19 crisis. Firms with better-quality IR are also associated with higher investor loyalty and attracted significantly more institutional investors over the crisis period. This suggests that a firm's IR contributes to value generation by enhancing credibility with shareholders and by diversifying its shareholder base. After decomposing IR into public and private transmission channels, we find the private IR function to be the main driver of our results.

**Publication Details:**

Submitted to the Journal of Banking & Finance.

# 2 What Drives Stocks during the Corona-Crash? News Attention vs. Rational Expectation

The following is based on Engelhardt et al. (2020a).

## 2.1 Introduction

The spread of the coronavirus Sars-CoV-2 causing the disease called COVID-19 hit the world's economy unprepared. The increasing number of infections has not only led to countermeasures by the affected countries' governments but also resulted in a severe decline in stock markets. For instance, the S&P500 dropped by 33% from its all-time high during the corona stock market crash (see Figure 2.1).

While several recent studies show negative stock market reactions to the most severe pandemic since the spanish flu in 1918 (Liu et al., 2020; Zhang et al., 2020; Sharif et al., 2020), the question still remains to what extend this was driven by (bounded) rational expectations. In this paper we explore whether such expectations prevail over a news hype which could have driven traders into panic mode. Our aim is to study the short-term effects on global financial markets during the ongoing COVID-19 crisis.

As proxies for bounded rational expectation we use both the growth rates from the exponential fit as well as the epidemiologists' susceptible-infectious-recovered (SIR) model by Hethcote (1989). This is because without countermeasures in place a pandemic grows exponentially (De Silva et al., 2012), while in later stages the growth of infections starts following a logistic function with increasing herd immunity. We refer to the concept of bounded rationality, because if models are not correctly specified by individuals with cognitive limitations, they might result in non-rational expectations (De Grauwe, 2012; De Grauwe and Gerba, 2018). However, we believe that the underlying models used in this study represent the best alternatives to approximate the severity of the current COVID-19 pandemic. For brevity, we denote our measures of bounded rational expectation as rational expectation throughout the paper.

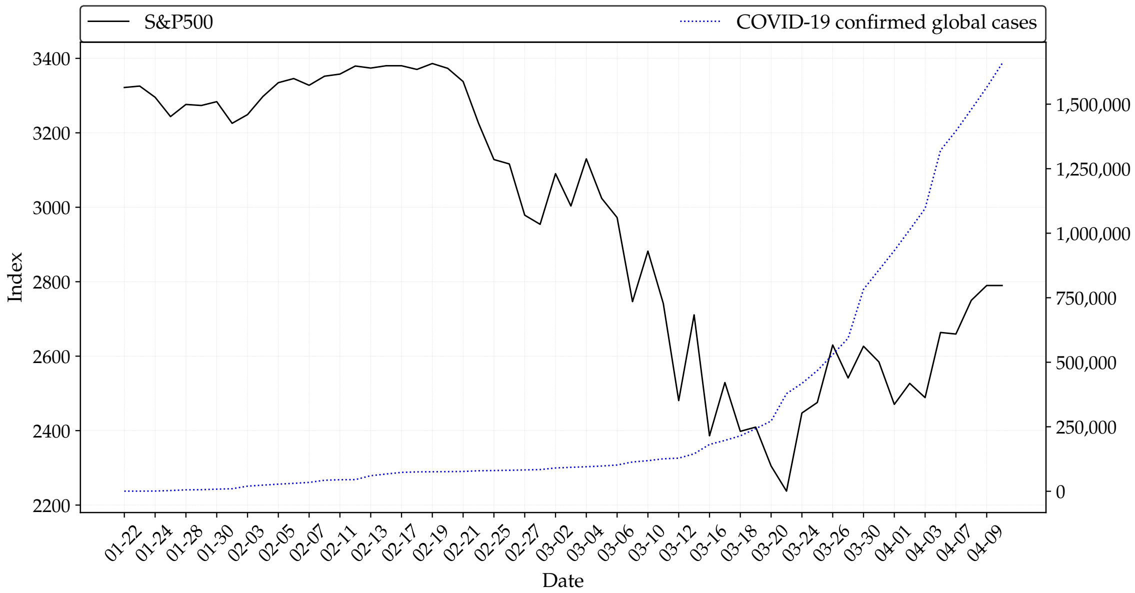
News attention is proxied by Google's abnormal search volume (Da et al., 2011). We hereby refer to the concept of rational inattention. Although news may be biased and incomplete, investors and especially retail investors may nonetheless rely on them to make their investment decisions because fitting models on real data is time consuming and requires cognitive effort which may be too costly (Huang and Liu, 2007). However, when relying on news as the primary source of information for investment decision making, investors are confronted with the negativity bias. As psychological literature shows, people pay increased attention to negative information (Baumeister et al., 2001; Cacioppo and Gardner, 1999; Rozin and Royzman, 2001). In the economic context, Carroll (2003) and Garz (2013) even highlight repeated media coverage leading the public into forming rather pessimistic "expectations" than rational expectations.

Using stock market indices from 64 countries, covering 94% of the world's GDP, we find the stock markets' decline to be mainly associated with higher news attention and less with rational expectation. Over our entire observation period, a one standard deviation increase in news attention leads to a decrease of 0.279 standard deviations of market returns, while a one standard deviation increase in our rational expectation measure results in a decrease of 0.131 standard deviations of market returns. This imposes significant economic costs. For instance, we estimate the economic cost for the US stock market resulting from the news hype to amount to USD 3.5 trillion until April 2020.

Our findings also imply investors should rather focus on news attention than on rational expectation when making their investment decisions during a crisis. Comparing three different investment strategies, we find a strategy focusing on news attention during the corona crisis to outperform both a buy and hold strategy and a strategy based on rational expectation. This is in line with the findings from psychology highlighting the increased attention to negative information.

The remainder of this paper is structured into a literature review, a description of the data and methodology used, followed by a discussion of the results, and a final conclusion.

**Figure 2.1:** This figure shows the S&P500 stock market index and global confirmed COVID-19 cases for the period from 2020-01-22 to 2020-04-09. The figure is our own contribution based on stock market data from Trading Economics and COVID-19 infection data from Johns Hopkins University.




## 2.2 Literature Review

There is an evolving strand of literature on the impact of COVID-19 on global financial markets. Baker et al. (2020), Liu et al. (2020), Zhang et al. (2020), and Ali et al. (2020) show the COVID-19 pandemic having induced an enormous level of uncertainty accompanied by high market volatility and significant negative market returns across all affected countries. Zaremba et al. (2020) even show that countries' policy interventions increase stock market volatility.

Higher growth rates of confirmed COVID-19 cases also result in negative effects for companies as investors and analysts became extremely concerned about corporate debt and liquidity (Al-Awadhi et al., 2020; Ramelli and Wagner, 2020; Boubaker and Sensoy, 2020). Especially, companies whose corporate identity is related to the term 'corona' are experiencing additional pressure and exhibit abnormal losses (Corbet et al., 2020).

Contagion effects of the crisis have been analyzed by McGee and Conlon (2020), Corbet et al. (2020) and Chen and Yan (2020) who focus on cryptocurrencies, gold, and commodity futures. During the COVID-19 pandemic Bitcoin does not act as a safe-haven nor does it offer any hedging opportunities. Gold and soybean futures, however, are seen as safe-havens in the current crisis. Moreover, Sharif et al. (2020) examine the relationship between the COVID-19 outbreak, the oil price and the US stock market. They show that news concerning oil prices and the pandemic appear to be a driver of the US financial market. This is in line with the paper by Mamaysky (2020) who shows news sentiment to explain volatility among several asset classes in the US.

Based on the studies mentioned above investigating the stock markets' reaction to the crisis, our paper contributes by disentangling potential drivers, namely news attention and rational expectation. Furthermore, we contribute to the literature by measuring the economic costs resulting from news attention.

## 2.3 Data and Methodology

We obtain daily data on confirmed COVID-19 cases per country from January 22, 2020 to April 9, 2020 from Johns Hopkins University and daily Google search volume (SVI) for the keyword "corona" for each affected country as well as daily closing prices of the country's lead stock market index from Trading Economics. Our final sample consists of daily data for 64 countries covering 94% of the world's GDP. Table A1 in the appendix holds a list of countries covered.

To estimate the news attention we calculate an abnormal Google search volume index (ASVI), which is also commonly used to measure retail investor attention (Da et al., 2011; Ben-Rephael et al., 2017). Plante (2019) shows search volume to strongly correlate with news attention as the amount of news the public is confronted with translates into a rise of related Google searches. Since we investigate a rather small time window, we adjust the measure proposed by Da et al. (2011) by calculating our news coverage variable ($NC_t$) as the natural log of the search volume on trading day $t-1$ minus the natural log of the median search volume over the previous five trading days.

$$NC_t = \log(SVI_{t-1}) - \log(med(SVI_{t-2}, ..., SVI_{t-6})) \tag{2.3.1}$$

To estimate rational expectations of the corona pandemic we turn to epidemiological models. For infectious diseases such as COVID-19 the spread of infections is initially characterized by an exponential growth in time (Anderson and May, 1990). Using the data from Johns Hopkins University, we fit the number of infections to an exponential growth model $P(t) = a \cdot \exp(b \cdot t)$ with $P(t)$ being the number of infections at time $t$, $P(0) = a$ being the initial value of $P$, and $b$ being the exponential growth rate. We calculate daily exponential growth rates by fitting the exponential growth model and use the change in growth rates between two days as proxy for a rational investor's expectation.

In later stages of the pandemic and as countermeasures unfold, the exponential growth is weakened and the infections start following a logistic function. This is incorporated in the epidemiological standard model - the Susceptible-Infectious-Recovered model (SIR) (Hethcote, 1989; Kermack and McKendrick, 1991). This model uses both the number of infected individuals and the number of susceptible and recovered individuals in a population. Based on the assumption of immunity of recovered individuals the SIR model derives from a set of differential equations as the transmissions between the groups of individuals are formulated as derivatives. Following Ma (2020) the model equations are

$$\begin{aligned} \frac{dS(t)}{dt} &= -\frac{\beta}{N} I(t) S(t) \\ \frac{dI(t)}{dt} &= \frac{\beta}{N} I(t) S(t) - \gamma I(t) \\ \frac{dR(t)}{dt} &= \gamma I(t) \end{aligned} \tag{2.3.2}$$

where $S(t)$ is the number of susceptible individuals at time $t$, $I(t)$ is the number of infected individuals at time $t$, $R(t)$ is the number of recovered individuals, $\beta$ is the transmission rate per infectious individual, and $\gamma$ is the recovery rate. The overall number of individuals $N = S(t) + I(t) + R(t)$ is considered as a constant. The expected growth rate of the SIR model can be calculated as $\lambda = \beta - \gamma$. As above, we also fit the SIR model at each time step and use the changes in growth rates between $t$ and $t + 1$ as an independent variable for a rational investor's expectation in additional regression models.

Table 2.1 provides descriptive statistics for the variables in our sample. Mean daily log returns of the stock market indices are negative over our observation period indicating the massive impact of the COVID-19 pandemic. The lower mean of $-0.4\%$ compared to the median of $-0.02\%$ is related to large drops on single days, especially on "Black Thursday" March 12, 2020 where the S&P500 dropped by 10% marking the worst day since the stock market crash in 1987 (McCabe and Ostroff, 2020). The changes of the exponential growth rates and SIR growth rates exhibit a positive mean. News coverage based on the ASVI for the keyword "corona" has a positive mean of 4.69%.

**Table 2.1:** The table reports descriptive statistics for the entire sample. The sample contains a total of 3366 observations. We observe 64 countries over a time period of 51 trading days starting from 2020-01-30 to 2020-04-09. The market return variable is defined by the log return series of each stock market index. For the rational investor's expectation we use the changes of the exponential growth rates and as an alternative the changes of the SIR growth rates. We calculate our news attention variable as the ASVI for the keyword "corona". The stock market data come from Trading Economics. COVID-19 data for the fitted growth rates come from Johns Hopkins University.

| | Observations | Minimum | Maximum | Mean | Median | Std. |
|---|---|---|---|---|---|---|
| Market Return | 3366 | −0.1854 | 0.1554 | −0.0040 | −0.0002 | 0.0294 |
| Exponential Growth Rate | 3366 | −1.3481 | 2.2777 | 0.0006 | −0.0022 | 0.1527 |
| SIR Growth Rate | 3366 | −1.7375 | 2.5254 | 0.0047 | 0 | 0.2450 |
| News Attention | 3366 | −1.9459 | 3.4012 | 0.0469 | 0 | 0.4284 |

To examine the impact of news attention and rational investor expectation on the development of stock markets during the COVID-19 crisis, we consider the following straightforward regression model

$$MKT_{i,t} = \rho MKT_{i,t-1} + \beta_1 EXP_{i,t} + \beta_2 NC_{i,t} + \varepsilon_{i,t} \tag{2.3.3}$$

where $i$ is the country and $t$ denotes the trading day. $MKT_{i,t}$ is the stock market return for country $i$ at time $t$. The expected exponential growth rate $EXP_{i,t}$ is used as our measure for rational expectation, while $NC_{i,t}$ measures news attention for the keyword "corona". We use the lagged log returns of the national stock market indices $MKT_{i,t-1}$ to control for all other market effects (Cochrane, 2000).

Since with a lagged dependent variable the regressors are no longer exogenous and the OLS estimator is biased and inconsistent (e.g. Grubb and Symons, 1987), we estimate the model using the generalized method of moments (GMM) estimator, which provides consistent and unbiased estimates for dynamic panel data models - especially for panel datasets with small time periods $T$ relative to the number of individuals $N$ (Hansen, 1982; Arellano and Bond, 1991).

## 2.4 Results and Discussion

Table 2.2 shows the regression results where for the purpose of comparison, all variables are scaled to have a standard deviation of one and weighted by their country's GDP.

In Model (1), we use the expected exponential growth rate and news attention as our main independent variables. We also include the one-day lagged market return as an independent variable. As the results show, all regression coefficients are negative and statistically significant. However, the coefficient on news attention is larger in magnitude than the coefficient on our rational expectation variable; thus indicating news attention to be the dominant driver of the drop in stock prices over the entire observation period. To put this into perspective, a one standard deviation increase in news attention leads to a decrease of 0.279 standard deviations of market returns, while a one standard deviation increase in our rational expectation variable results in a decrease of 0.131 standard deviations of market returns. Further, the coefficient on the one-day lagged market return is larger in magnitude compared to our rational expectation variable. This implies yesterday's market development to have a larger impact than the rational expectation for tomorrow.

In Model (2), we estimate the model using the changes in growth rates of our SIR model as the independent variable. The coefficients on the one-day lagged market return and news attention are negative, similar in size, and also statistically significant. The coefficient on our rational expectation variable, however, is not statistically significant. This is mostly in line with our results found in Model (1) indicating the large impact of news attention on stock markets during the COVID-19 crisis.

Figure 2.2 displays statistically significant coefficients from expanding window regressions using the GMM estimator with the same model specification as used in Model (1). The variables are also weighted by GDP and scaled to have a standard deviation of one. For better orientation, we also show the development of the S&P500 and present major news events during the corona crisis as points of reference.

Our first estimation window contains data for the period from January 30, 2020 through February 12, 2020. From this point on, we gradually expand our sample by adding data for one additional trading day. Hence, the last estimation is based on our entire sample for the period from January 30, 2020 through April 9, 2020. As shown in Figure 2.2, we find negative and statistically significant coefficients on news attention for almost all window sizes, which are also larger in magnitude compared to our rational expectation variable. Thus, this supports our findings from Table 2.2 showing news attention to have an important impact on the stock price development during the COVID-19 crisis.

**Table 2.2:** The effect of news attention and rational investor expectation on global stock markets. This table provides regression results from the estimation of the model: $MKT_{i,t} = \rho MKT_{i,t-1} + \beta_1 EXP_{i,t} + \beta_2 NC_{i,t} + \varepsilon_{i,t}$, where $i$ is the country and $t$ denotes the trading day starting from 2020-01-30 to 2020-04-09. We use the GMM estimator from Arellano and Bond (1991). The dependent variable is the log return of each stock market index $MKT_t$. The control variable is the lagged log return of each stock market index $MKT_{t-1}$. The expected exponential growth rate $EXP_{i,t}$ is our measure for rational expectation in Model (1), while $NC_{i,t}$ measures news attention for the keyword "corona" (based on ASVI). In Model (2) we use the expected SIR growth rate for rational expectation. The instrument in the GMM estimation is $MKT_{t-1}$. The stock market data come from Trading Economics. COVID-19 data for the fitted growth rates come from Johns Hopkins University. Robust standard errors are reported in parentheses. *, **, *** denote significance at the 10%, 5% and 1% level.

| Dependent variable: Market Return | Model (1) | Model (2) |
|---|---|---|
| Lagged Market Return | −0.216** | −0.212** |
| | (0.090) | (0.094) |
| Expected Exponential Growth Rate | −0.131*** | |
| | (0.033) | |
| Expected SIR Growth Rate | | −0.019 |
| | | (0.054) |
| News Attention | −0.279*** | −0.293*** |
| | (0.017) | (0.016) |
| Observations | 3264 | 3264 |
| Countries | 64 | 64 |
| Trading days | 51 | 51 |
| Estimation method | GMM | GMM |
| Robust Standard Errors | yes | yes |
| Country fixed effects | yes | yes |
| Time fixed effects | no | no |

**Figure 2.2:** The effect of news attention and rational investor expectation on global stock markets. This figure provides expanding window regression results from the estimation of the model: $MKT_{i,t} = \rho MKT_{i,t-1} + \beta_1 EXP_{i,t} + \beta_2 NC_{i,t} + \varepsilon_{i,t}$, where $i$ is the country and $t$ denotes the trading day starting from 2020-01-30 to 2020-04-09 with a minimum window size of 10. We use the GMM estimator from Arellano and Bond (1991). The dependent variable is the log return of each stock market index $MKT_t$. The control variable is the lagged log return of each stock market index $MKT_{t-1}$. The expected exponential growth rate $EXP_{i,t}$ is our measure for rational expectation, while $NC_{i,t}$ measures news attention for the keyword "corona" (based on ASVI). The instrument in the GMM estimation is $MKT_{t-1}$. GMM coefficients are reported with a significance level of 5%. The figure is our own contribution based on stock market data from Trading Economics and COVID-19 infection data from Johns Hopkins University.

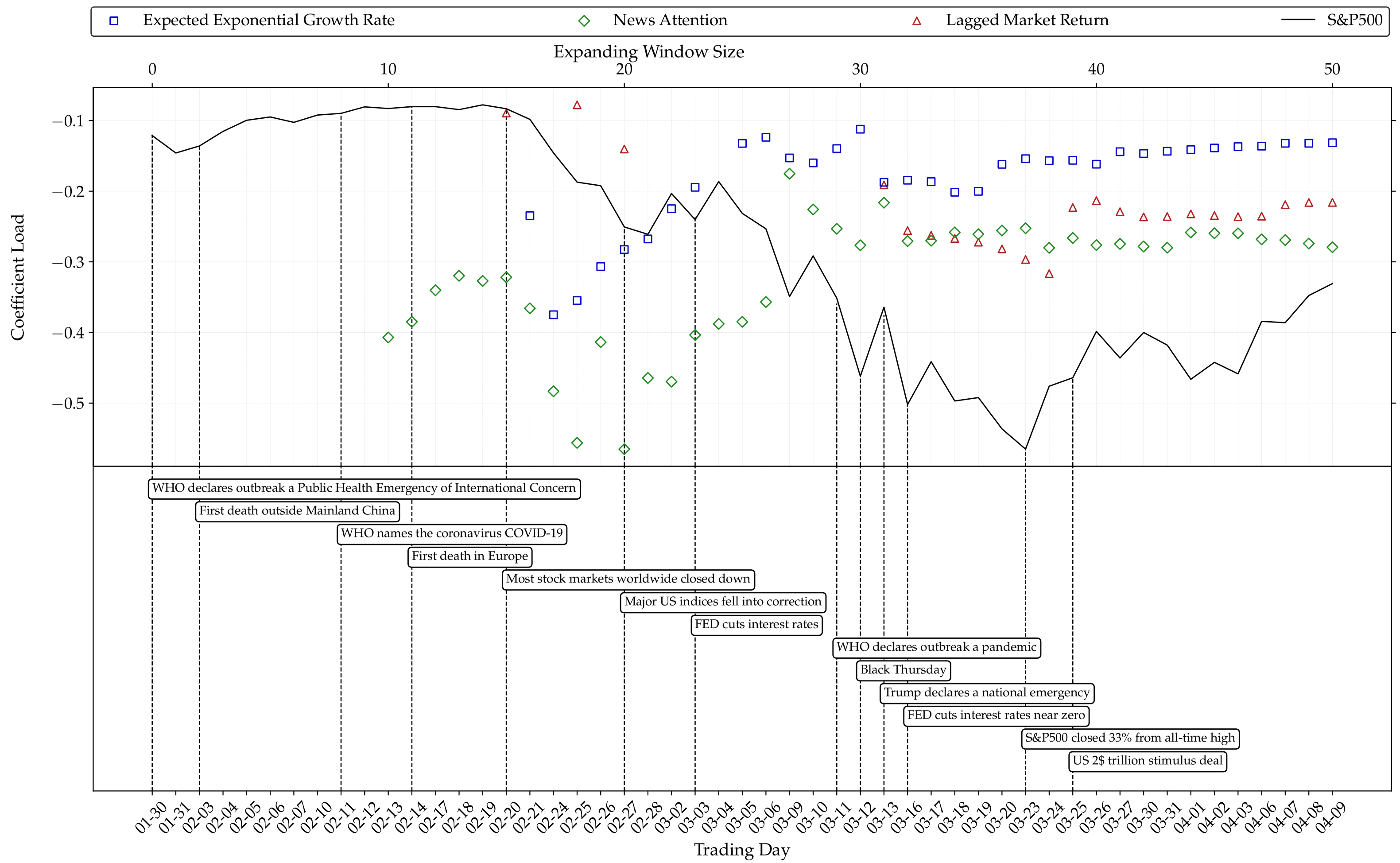


Figure 2.2 also shows, for small window sizes ranging from 10 to 15, the rational expectation variable not to be statistically significant in our model. By extending the window sizes (16 to 30), the coefficients on our rational expectation variable become significant, which goes along with the drop in stock markets. However, the coefficients on news attention are nonetheless larger in magnitude for most window sizes. Furthermore, by extending our window size the coefficients on our variables exhibit less volatility.

### 2.4.1 Investment Strategies

To test whether an investor focusing on news attention rather than rational expectation is more successful during the corona crisis, we construct three different portfolios: a buy and hold portfolio, which invests into the stock market index only, a "news attention" portfolio, and a "rational expectation" portfolio. We assume no transaction costs and do not allow short selling. The news attention investor, as well as the rational expectation investor, buys each stock market index at the beginning and uses buy and sell signals for her investment decisions until the end of the time period. Each investor only holds one stock market index in her portfolio instead of building an efficient portfolio which contains all the companies of the respective stock market index. We use the coefficients from the expanding window regressions in Figure 2.2 as buy and sell signals. Both the news attention and the rational investor increase or decrease their portfolio holdings according to the trading signal at each point in time.

Table 2.3 reports the mean returns of the three different portfolios. Panel A compares the mean returns of the buy and hold portfolio with the mean returns of the news attention portfolio. Although both portfolios realize a negative mean return during the crisis, the loss from the news attention portfolio is at least 5.1 percentage points smaller than the loss from the buy and hold portfolio. In Panel B we compare the buy and hold portfolio with the rational investor portfolio. Again both portfolios realize a negative return, but the mean return of the rational expectation portfolio is higher.

Finally, Panel C compares the mean returns of the news attention portfolio with the mean returns of the rational investor portfolio. The loss from the news attention portfolio is at least 1.5 percentage points smaller compared to the rational investor portfolio. This stresses an investor focussing on news attention during the corona crisis to outperform both a buy and hold investor as well as a rational expectation investor.

**Table 2.3:** Trading strategies of three different types of investors. This table shows mean returns of each investor's portfolio covering 64 stock market indices for the period from 2020-02-21 through 2020-04-09. We assume no transaction costs and no short selling. The buy and hold investor buys a stock market index at the beginning and sells it at the end of the time period. The news attention investor as well as the rational expectation investor buys each stock market index at the beginning and uses buy and sell signals until the end of the time period. As trading signals we primarily use the coefficients from the expanding window regressions in Figure 2.2. Both the news attention and the rational investor increase or decrease their portfolio by X% (according to the trading signal) at each point in time. For robustness purposes, we also use weighted coefficients and the change in coefficients as additional trading signals. We perform a two-sided t-test to test whether the portfolio mean returns of the strategies significantly differ from each other. Additionally, we perform a one-sided t-test to test whether the difference of the mean returns of the two strategies significantly differs from zero. *, **, *** denote significance at the 10%, 5% and 1% level.

| | Trading signal | | |
|---|---|---|---|
| | *coefficient* | *weighted coefficient* | *coefficient change* |
| **Panel A** | | | |
| Buy and hold portfolio | −0.2001*** | −0.2001*** | −0.2001*** |
| News attention portfolio | −0.0255*** | −0.0412*** | −0.1492*** |
| Difference | −0.1747*** | −0.1590*** | −0.0510*** |
| **Panel B** | | | |
| Buy and hold portfolio | −0.2001*** | −0.2001*** | −0.2001*** |
| Rational investor portfolio | −0.0405*** | −0.1049*** | −0.1636** |
| Difference | −0.1597*** | −0.0952*** | −0.0366*** |
| **Panel C** | | | |
| Rational investor portfolio | −0.0405*** | −0.1049*** | −0.1636 |
| News attention portfolio | −0.0255*** | −0.0412*** | −0.1492 |
| Difference | −0.0150*** | −0.0637*** | −0.0144 |

Further, it underlines the findings from psychology literature showing the increased attention to negative information.

## 2.4.2 Economic Costs

To estimate the economic costs resulting from the focus on news rather than rational expectation, we first perform one-day ahead predictions per country using our econometric model's estimators:

$$\begin{aligned} \mathbb{E}[MKT_{i,t+1}] &= \hat{\rho} MKT_{i,t} + \hat{\beta}_1 EXP_{i,t} + \hat{\beta}_2 NC_{i,t} \\ \mathbb{E}[MKT_{i,t+1}] &= \hat{\rho} MKT_{i,t} + \hat{\beta}_1 EXP_{i,t} \end{aligned} \tag{2.4.1}$$

As shown above, we estimate a model including our coefficient for news attention as well as a model excluding our coefficient for news attention. We then accumulate the estimated returns and calculate the difference to separate the effect of trading based on news attention from trading based on rational expectation. Finally, we multiply this difference with the market capitalization of the respective stock market to estimate the economic costs per country. Table 2.4 reports the results for the G8 countries.

**Table 2.4:** Economic costs of news attention during the corona crisis. This table reports the results for the G8 countries. We perform one-day ahead predictions per country for the period from February 21, 2020 through April 9, 2020 using the following models and our coefficients from the GMM estimation: Model (1) includes our coefficient for news attention ($\mathbb{E}[MKT_{i,t+1}] = \hat{\rho}MKT_{i,t-1} + \hat{\beta}_1 EXP_{i,t} + \hat{\beta}_2 NC_{i,t}$), while Model (2) excludes our coefficient for news attention ($\mathbb{E}[MKT_{i,t+1}] = \hat{\rho}MKT_{i,t-1} + \hat{\beta}_1 EXP_{i,t}$). We then cumulate the estimated returns and calculate the difference to separate the effect of trading based on news attention from trading based on rational expectation. We multiply this difference with the market capitalization of the respective stock market to estimate the economic costs per country. Market capitalization data come from Compustat Capital IQ.

| Country | Market Capitalization (in million USD) | Economic Cost (in million USD) | Economic Cost (in %) |
|---|---|---|---|
| Canada | 1,592,169 | −173,742 | −10.91 |
| France | 2,022,046 | −284,826 | −14.09 |
| Germany | 1,252,274 | −276,017 | −22.04 |
| Italy | 352,545 | −34,631 | −9.82 |
| Japan | 3,458,684 | −166,053 | −4.80 |
| Russia | 691,092 | −73,904 | −10.69 |
| United Kingdom | 3,182,449 | −419,499 | −13.18 |
| United States | 28,256,391 | −3,469,174 | −12.28 |

As the results show, trading based on news attention during the corona crisis has a large impact on the respective stock markets. For instance, the economic cost for the US stock market amount to approx. USD 3,469,174 million. In relation to the market capitalization, the effect is even larger for Germany where the economic cost due to trading based on news attention amount to approx. USD 276,017 million.

### 2.4.3 Robustness

For robustness purposes, we also estimate OLS regressions using the log returns of the national stock market indices as the dependent variable, while using our rational expectation variable and news attention as the main independent variables of interest. We also include the lagged log return of the S&P500 as a control variable. Using the lagged log return of the S&P500 allows us to receive consistent OLS coefficient estimates because there is no dynamic adjustment in the econometric model. Moreover, empirical literature since the 1990s has shown a considerable comovement between national stock market indices; especially when global shocks affect markets (Brooks and Del Negro, 2004; Karolyi and Stulz, 1996; Longin and Solnik, 1995). As the US stock market is the most influential in the world (Eun and Shim, 1989; Madaleno and Pinho, 2012), we expect the lagged log return of the S&P500 to be an appropriate predictor for the performance of the national stock market indices on the next trading day. Table 2.5 presents the regression results.

**Table 2.5:** The effect of news attention and rational investor expectation on global stock markets. This table provides regression results from the estimation of the model: $MKT_{i,t} = \rho MKT_{t-1}^{S\&P500} + \beta_1 EXP_{i,t} + \beta_2 NC_{i,t} + \varepsilon_{i,t}$, where $i$ is the country and $t$ denotes the trading day starting from 2020-01-30 to 2020-04-09. The dependent variable is the log return of each stock market index $MKT_t$. The control variable is the lagged log return of the S&P500 stock market index $MKT_{t-1}^{S\&P500}$. The expected exponential growth rate $EXP_{i,t}$ is our measure for rational expectation in Model (1), while $NC_{i,t}$ measures news attention for the keyword "corona" (based on ASVI). In Model (2) we use the expected SIR growth rate as our rational expectation variable. The stock market data come from Trading Economics. COVID-19 data for the fitted growth rates come from Johns Hopkins University. Robust standard errors are reported in parentheses. *, **, *** denote significance at the 10%, 5% and 1% level.

| Dependent variable: Market Return | Model (1) | Model (2) |
|---|---|---|
| Lagged S&P500 Market Return | −0.006 | −0.006 |
| | (0.045) | (0.044) |
| Expected Exponential Growth Rate | −0.039** | |
| | (0.019) | |
| Expected SIR Growth Rate | | −0.012 |
| | | (0.012) |
| News Attention | −0.226*** | −0.231*** |
| | (0.019) | (0.021) |
| Observations | 3264 | 3264 |
| Countries | 64 | 64 |
| Trading days | 51 | 51 |
| Estimation method | OLS | OLS |
| Robust Standard Errors | yes | yes |
| Country/Time fixed effects | no | no |

The results show a similar picture to the one found in the GMM regressions. In Model (1), where the rational expectation variable based on the exponential growth model is used as an independent variable, we find negative and statistically significant coefficients on the variables news attention and rational expectation. In line with the results of the GMM regressions, news attention has a greater influence compared to the rational investor expectation. In Model (2), where the rational expectation variable based on the SIR model is used as an independent variable, we only find a statistically significant coefficient on news attention. In both models, however, we do not find statistically significant coefficients on the lagged log return of the S&P500.

As further robustness checks, we first use the keyword "coronavirus" to construct our news attention variable and estimate all GMM and OLS regressions once more. Second, we adjust the way we calculate our measure for news attention. Instead of using the search volume over the previous five trading days to calculate our news attention measure, we consider the average search volume over the entire sample period. The results do not change qualitatively compared to our previous findings.

## 2.5 Conclusion

Financial markets have been on an unprecedented decline during the COVID-19 crisis, indicating wide implications for market participants and policy makers. In this paper, we have analyzed whether the current drop in financial markets is mainly driven by news attention or rational investor expectation.

By investigating a sample of 64 national stock markets, news attention has a significantly negative impact on financial markets. This effect is larger in magnitude compared to the impact of a rational investor's expectation. This imposes significant economic costs. For instance, we estimate the economic cost for the US stock market resulting from the news hype to amount to USD 3.5 trillion until April 2020.

We contribute to the evolving body of research in several ways. We not only disentangle the potential drivers of the stock market reactions but also quantify the impact of news attention on financial markets. Our findings also imply investors should rather focus on news attention than on rational expectation when making their investment decisions during a crisis. Especially, professional investors should, apart from searching for safe-havens, adjust their investment strategy accordingly in order to minimize potential losses.

Finally, as with all research studies our paper has certain limitations. Since we investigate a rather small time window, we are only able to measure the short term effect of news attention and investors' rational expectation on global stock markets during the COVID-19 crisis. Further, although we checked the robustness of our news attention measure, there might also be additional proxies which might capture news attention.

# 3 Trust and Stock Market Volatility during the COVID-19 Crisis

The following is based on Engelhardt et al. (2020b).

# 4 Firm Efficiency and Stock Returns during the COVID-19 Crisis

The following is based on Neukirchen et al. (2021a).

# 5 ESG Ratings and Stock Performance during the COVID-19 Crisis

The following is based on Engelhardt and Posch (2021).

## 5.1 Introduction

In the literature there is a debate of whether engaging in corporate social responsibility (CSR) activities is beneficial (see e.g. Flammer, 2015; Ferrell et al., 2016; Gillan et al., 2021). Some studies have shown that CSR activities are solely a manifestation of agency conflicts between a firm's shareholders and managers, who particularly benefit from engaging in CSR at the expense of a firm's shareholders (Bénabou and Tirole, 2010; Krüger, 2015), while other research has shown that engaging in environmental, social, and governance (ESG) is value-enhancing due to the hypothesis that well-governed corporations can achieve both, higher profits and better social conditions (see e.g. McWilliams and Siegel, 2001; Falck and Heblich, 2007; Ferrell et al., 2016; Servaes and Tamayo, 2013).

In line with these arguments, there is mixed evidence in the literature regarding the relationship between a firm's CSR activities and its stock performance, especially during times of crisis. Albuquerque et al. (2020), Lins et al. (2017) and Ding et al. (2020) find that high CSR-rated firms are associated with better stock performance in terms of higher stock returns and lower stock volatility during times of crisis. In contrast, Bae et al. (2021) and Demers et al. (2020) stress that a firm's CSR performance is unrelated to its stock performance after the COVID-19 crisis unfolded, thus CSR does not make firms more resilient in times when market uncertainty is high.

In this paper, we therefore re-investigate whether there is a link between CSR activities and a firm's stock performance in the beginning of 2020 because the unexpected and exogenous COVID-19 shock serves as a brilliant opportunity to test this relationship.

We employ a sample of 1452 firms from 16 different European countries to examine whether high CSR-rated firms outperformed those with very low CSR ratings. To do so, we obtain Refinitiv's ESG ratings from Thomson Reuters Eikon as they are primarily used in the CSR literature (see e.g. Albuquerque et al., 2020; Bae et al., 2021; Demers et al., 2020), and also financial data from Compustat/Capital IQ.

Our research design is closely related to Albuquerque et al. (2020), Bae et al. (2021), and Lins et al. (2017). Specifically, we employ several multivariate regression models where the dependent variable is either a firm's cumulative raw stock return or a firm's cumulative abnormal stock return during the so-called "collapse period" from February 3, 2020 until March 23, 2020 proposed by Fahlenbrach et al. (2020) where the COVID-19 pandemic hit financial markets. Additionally, we use a firm's volatility and idiosyncratic volatility over the collapse period as dependent variables to test whether effective CSR is associated with a reduction in stock volatility. As our main independent variables of interest, we use the raw ESG scores and a dummy variable set to one if a firm's ESG score is larger than the median score within the respective country, and zero otherwise.

Our results are mixed, consistent with the related literature. Comparable to the results found in Bae et al. (2021) and Demers et al. (2020), we do not find statistically significant coefficients on our ESG measures when we employ a firm's cumulative raw stock return as the dependent variable. However, our results are in line with Albuquerque et al. (2020), when using market adjusted abnormal stock returns in our regressions. We find positive and highly statistically significant coefficients on our ESG measures indicating that a one standard deviation increase in ESG scores is associated with on average a 2.59% higher abnormal return during the collapse period. Further, we document that firms with higher ESG scores are also associated with lower idiosyncratic volatility. We find our results to be robust to different observation periods and when controlling for several firm characteristics as used in related studies (Albuquerque et al., 2020; Bae et al., 2021; Fahlenbrach et al., 2020; Lins et al., 2017). We also employ industry and country fixed effects to ensure the validity of our results.

In additional tests, we examine whether ESG is even more value-enhancing in specific countries. Particularly, we find that ESG is of significant importance in low-trust countries, and in countries which exhibit poorer security regulations and where lower disclosure standards prevail. Our results differ in some extent from those found in Lins et al. (2017) who show that CSR is more important in high-trust US regions during the global financial crisis (GFC). However, Bae et al. (2021) find only weak support for this hypothesis during the COVID-19 crisis. In this respect, Engelhardt et al. (2020b) investigate a cross-country setting and find that financial volatility is significantly higher in low-trust countries in response to COVID-19 cases. Thus, our results indicate that engaging in ESG activities in low-trust countries may reduce uncertainty among market participants during the COVID-19 pandemic.

Our paper contributes to the mixed evidence in the evolving literature. Closely related to Albuquerque et al. (2020) and Lins et al. (2017), who primarily investigate the US market, we find that European firms with better ESG ratings are more immune to the COVID-19 shock regarding abnormal stock returns and lower idiosyncratic stock volatility, while we also find no association using raw returns as in Bae et al. (2021) and Demers et al. (2020). Further, this is the first paper investigating whether ESG is more valuable depending on several country characteristics. Our study also relates to the growing body of literature investigating financial markets during the COVID-19 crisis (see e.g. Engelhardt et al., 2020b; Glossner et al., 2020; Landier and Thesmar, 2020; Neukirchen et al., 2021b; Zhang et al., 2020). In this respect, firms with higher financial flexibility had better stock performance (Fahlenbrach et al., 2020; Ramelli and Wagner, 2020), while firms with lower credit ratings exhibited higher drops in stock prices during the COVID-19 stock market crash (Acharya and Steffen, 2020). In contemporaneous work, Cheema-Fox et al. (2020), Cepoi (2020) and Engelhardt et al. (2020a) find that stock returns were particularly related to media coverage and news sentiment during the crisis. Ozik et al. (2020) argue that retail investors could incrementally stabilize financial markets, and Pástor and Vorsatz (2020) find that passive benchmarks outperformed actively managed funds during the market crash.

The remainder of this paper is structured as follows. Section 2 describes our dataset. Section 3 presents our results. In Section 4, we perform robustness checks and Section 5 concludes.

## 5.2 Data

Our sample consists of 1452 publicly-listed European firms from 16 different European countries. To measure a firm's ESG performance, we obtain Refinitiv's ESG ratings from Thomson Reuters Eikon which have also been used in the CSR literature (see e.g.

Albuquerque et al., 2020; Demers et al., 2020). Particularly, we collect Refinitiv's ESG ratings for the year 2019. Refinitiv measures corporate environmental, social, and governance performance into several sub-dimensions. A firm's environmental performance is covered by the categories resource use, emissions, and innovation. Social performance is measured by the sub-dimensions workforce, human rights, community, and product responsibility, and governance performance is evaluated in the sub-dimensions management, stakeholders, and CSR strategy (Refinitiv, 2020). We then extend our dataset by adding stock and accounting data from Compustat/Capital IQ.

Our main independent variable of interest is *ESG Score* which measures a firm's ESG performance. Additionally, we construct the dummy variable *High ESG*, which is set to one if a firm's ESG score is larger than the median score within the respective country, and zero otherwise. Our main dependent variables of interest are a firm's cumulative raw stock return as well as a firm's cumulative abnormal stock return for the period from February 3, 2020 until March 23, 2020. This period is the so-called "collapse period" as proposed by Fahlenbrach et al. (2020) where the COVID-19 pandemic hit financial markets. We calculate abnormal returns based on a market model estimation similar to Albuquerque et al. (2020). Specifically, a firm's abnormal stock return is the difference between the logarithmic stock return and the expected stock return[1].

We also employ several control variables which have also been used in the existing literature (see e.g. Albuquerque et al., 2020; Bae et al., 2021; Fahlenbrach et al., 2020; Lins et al., 2017) and provide definitions of these variables in Table D1 in the appendix.

After merging our datasets, our final sample consists of 1452 European firms, for which we gather data on ESG ratings and data on stock performance. Regarding control variables, there are several observations missing which is the reason why we take several regression specifications into account. Table 5.1 presents summary statistics for our final dataset.

Mean cumulative stock returns are highly negative ($-45.72\%$) and the respective standard deviation is 28.08% which indicates that firms' stock prices experience large fluctuations during the collapse period from February 3, 2020 until March 23, 2020. Although Fahlenbrach et al. (2020) consider a dataset consisting of US firms, we find

[1] The expected stock return is the CAPM beta times the market return of the respective country where we estimate beta factors based on the firm's stock returns and the respective market return for the year 2019.

very similar summary statistics regarding firms' cumulative stock returns. Further, the mean ESG score amounts to 53.29% with a standard deviation of 20.48%. In terms of control variables, the average firm in our dataset has a size of $11.91 billion, a cash over assets ratio of 12.61%, and a financial leverage of 26.72%.

**Table 5.1:** This table presents summary statistics for the variables used in this paper. Our sample consists of 1452 firms from 16 different European countries. The construction of our variables is provided in appendix Table D1.

| | Obs. | Minimum | Maximum | Mean | Median | Std. |
|---|---|---|---|---|---|---|
| Raw Returns | 1452 | −1.8442 | 0.3906 | −0.4572 | −0.4322 | 0.2808 |
| Abnormal Returns | 1452 | −1.6992 | 0.9349 | −0.1681 | −0.1448 | 0.2960 |
| Volatility | 1452 | 0.0010 | 0.2092 | 0.0454 | 0.0415 | 0.0185 |
| Idiosyncratic Volatility | 1452 | 0.0020 | 0.2123 | 0.0361 | 0.0322 | 0.0183 |
| ESG Score | 1452 | 0.0152 | 0.9449 | 0.5329 | 0.5449 | 0.2048 |
| Size | 1143 | 1.4734 | 11.9168 | 7.7315 | 7.7096 | 1.8530 |
| ROE | 1427 | −0.5024 | 0.4126 | 0.0393 | 0.0453 | 0.1005 |
| Profitability | 1450 | −0.3257 | 0.3784 | 0.0995 | 0.0985 | 0.0904 |
| Cash / Assets | 1143 | 0.0046 | 0.8140 | 0.1261 | 0.0917 | 0.1314 |
| Short-term Debt / Assets | 1406 | 0 | 0.2811 | 0.0531 | 0.0367 | 0.0563 |
| Long-term Debt / Assets | 1438 | 0 | 0.6723 | 0.2129 | 0.1932 | 0.1549 |
| Leverage | 1404 | 0 | 0.7231 | 0.2672 | 0.2598 | 0.1712 |
| Market-to-Book | 1427 | −2.9155 | 32.1355 | 3.4840 | 1.9650 | 4.8151 |
| Historical Volatility | 1452 | 0.1162 | 1.0665 | 0.3037 | 0.2717 | 0.1438 |
| Momentum | 1452 | −1.0887 | 1.0300 | 0.1572 | 0.1844 | 0.3168 |

Before we examine the association between corporate ESG performance and stock returns in a multivariate setting, we first perform a correlation analysis in Table 5.2. Regarding pairwise correlations, we find that the correlations are generally weak, except for the positive correlations between *Size* and our ESG measures and *ROE* and *Profitability*. Further, we find a negative correlation of −0.28 between *ESG Score* and *Historical Volatility* and a correlation of −0.38 between *Momentum* and *Historical Volatility*.

**Table 5.2:** This table presents the correlation coefficients for the variables used in this paper. * denotes statistical significance at the 5% level. The construction of our variables is provided in appendix Table D1.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Raw Returns | 1.00* | | | | | | | | | | | | | | | |
| (2) Abnormal Returns | 0.05* | 1.00* | | | | | | | | | | | | | | |
| (3) Volatility | −0.65* | −0.05* | 1.00* | | | | | | | | | | | | | |
| (4) Idiosyncratic Volatility | −0.58* | −0.07* | 0.95* | 1.00* | | | | | | | | | | | | |
| (5) High ESG | −0.03* | 0.04* | −0.06* | −0.15* | 1.00* | | | | | | | | | | | |
| (6) ESG Score | 0.01* | 0.04* | −0.12* | −0.23* | 0.83* | 1.00* | | | | | | | | | | |
| (7) Size | −0.02* | 0.05* | −0.17* | −0.27* | 0.53* | 0.63* | 1.00* | | | | | | | | | |
| (8) ROE | 0.16* | 0.01* | −0.14* | −0.17* | 0.09* | 0.13* | 0.19* | 1.00* | | | | | | | | |
| (9) Profitability | 0.02* | −0.04* | −0.12* | −0.12* | 0.06* | 0.09* | 0.19* | 0.35* | 1.00* | | | | | | | |
| (10) Cash / Assets | 0.07* | 0.01* | 0.06* | 0.07* | −0.12* | −0.17* | −0.34* | −0.11* | −0.24* | 1.00* | | | | | | |
| (11) Short-term Debt / Assets | −0.09* | 0.05* | 0.03* | 0.00 | 0.10* | 0.10* | 0.21* | −0.01* | −0.03* | −0.17* | 1.00* | | | | | |
| (12) Long-term Debt / Assets | −0.10* | 0.02* | 0.12* | 0.08* | 0.10* | 0.15* | 0.15* | −0.05* | 0.02* | −0.27* | 0.09* | 1.00* | | | | |
| (13) Market-to-Book | 0.15* | −0.01* | −0.13* | −0.11* | −0.15* | −0.13* | −0.16* | −0.02* | 0.24* | 0.20* | −0.04* | −0.03* | 1.00* | | | |
| (14) Negative Market-to-Book | −0.08* | −0.01* | 0.10* | 0.12* | 0.05* | 0.04* | −0.04* | −0.08* | 0.04* | −0.02* | 0.05* | 0.23* | −0.22* | 1.00* | | |
| (15) Historical Volatility | −0.17* | −0.03* | 0.33* | 0.37* | −0.21* | −0.28* | −0.39* | −0.36* | −0.28* | 0.25* | 0.02* | −0.10* | −0.02* | 0.09* | 1.00* | |
| (16) Momentum | 0.13* | 0.00 | −0.12* | −0.14* | 0.01* | 0.00 | 0.01* | 0.19* | 0.14* | 0.10* | −0.16* | −0.03* | 0.24* | −0.05* | −0.38* | 1.00* |

We additionally present univariate tests in Table 5.3 to compare firm characteristics of *High ESG* and *Low ESG* firms. Concerning firm size, *High ESG* firms are on average significantly larger than *Low ESG* firms. *High ESG* firms exhibit significantly higher financial leverage and higher long-term debt over assets ratios, while we find that *High ESG* firms tend to have a significantly lower *Tobin's Q*, a lower cash over assets ratio, a lower market-to-book ratio, and a lower historical stock volatility.

**Table 5.3:** This table reports the results from univariate statistics. A firm is classified as a *High ESG* firm if the firm's ESG score is above the median score within the respective country. The construction of our variables is provided in appendix Table D1. We perform a *t*-test to check whether the difference in means between *High ESG* and *Low ESG* firms is significantly different from zero, where ***, **, * denotes statistical significance at the 1%, 5%, and 10% level.

| | High ESG | | Low ESG | | |
|---|---|---|---|---|---|
| | Observations | Mean | Observations | Mean | Difference |
| Tobin's Q | 734 | 1.7961 | 693 | 2.2803 | −0.4842*** |
| Size | 596 | 8.5689 | 547 | 6.8190 | 1.7499*** |
| ROE | 734 | 0.0428 | 693 | 0.0357 | 0.0071 |
| Profitability | 744 | 0.1022 | 706 | 0.0968 | 0.0054 |
| Cash / Assets | 596 | 0.1094 | 547 | 0.1443 | −0.0349*** |
| Short-term Debt / Assets | 731 | 0.0543 | 675 | 0.0518 | 0.0025 |
| Long-term Debt / Assets | 745 | 0.2207 | 693 | 0.2046 | 0.0161* |
| Leverage | 731 | 0.2773 | 673 | 0.2562 | 0.0211** |
| Market-to-Book | 734 | 2.9714 | 693 | 4.0270 | −1.0556*** |
| Historical Volatility | 745 | 0.2830 | 707 | 0.3255 | −0.0425*** |
| Momentum | 745 | 0.1604 | 707 | 0.1539 | 0.0064 |

## 5.3 Empirical Results

### 5.3.1 ESG Ratings and Stock Returns

To study the association between a firm's ESG performance and stock returns, we estimate the following ordinary least squares (OLS) regression:

$$\begin{aligned} Stock\ Performance_i = \beta_0 + \beta_1 ESG\ Score_i &+ \sum \beta_k Firm\ Controls \\ &+ \sum \beta_l Industry\ Fixed\ Effects \\ &+ \sum \beta_m Country\ Fixed\ Effects + \varepsilon_i \end{aligned} \tag{5.3.1}$$

where $i$ is the firm and $\varepsilon_i$ is the error term. The dependent variable is a firm's stock performance which is either the cumulative stock return or the cumulative abnormal stock return from February 3, 2020 to March 23, 2020. Our main independent variable of interest is *ESG Score* which measures a firm's ESG performance. In additional regression, we also employ the dummy variable *High ESG*, which is set to one if the firm's ESG score is above the median score within the respective country, and zero otherwise. As shown in specification (5.3.1), we include a variety of firm controls as well as industry fixed effects and country fixed effects in our regression models. In terms of industry fixed effects, we use the Global Industry Classification Standard's (GICS) 11 sectors as proposed in Neukirchen et al. (2021b). We additionally cluster the standard errors by country as done in Lins et al. (2013) and Petersen (2009) since firm controls might be correlated between firms within the respective country.

Table 5.4 presents our baseline results. In Panel A we employ both, a firm's cumulative stock return (columns (1) and (3)) and a firm's cumulative abnormal stock return (columns (2) and (4)) as the dependent variables. The variable *ESG Score* is our main independent variable of interest. While we find statistically insignificant coefficients on *ESG Score* when considering a firm's cumulative raw stock return as the dependent variable (columns (1) and (3)), the coefficients on *ESG Score* are positive and highly statistically significant when we employ the cumulative abnormal stock return as the dependent variable (columns (2) and (4)). In columns (2) and (4), the coefficients on *ESG Score* are comparable in size even when we control for a variety of firm characteristics (column (4)) and country fixed and industry fixed effects. Regarding control variables, our results are similar to the existing literature (see e.g. Albuquerque et al., 2020; Fahlenbrach et al., 2020; Neukirchen et al., 2021b). Particularly, we find negative and highly statistically significant coefficients on *Short-term Debt / Assets*, *Long-term Debt / Assets*, and positive and statistically significant coefficients on *Size*, *ROE*, *Cash / Assets*, *Market-to-Book*, *Historical Volatility*, and *Momentum*.

Although we find no consistent evidence supporting the notion that firms with a higher ESG performance exhibit higher cumulative raw returns, we can conclude that a one standard deviation increase in ESG scores is associated with on average a 2.59%

**Table 5.4:** This table reports the results from OLS regressions. In columns (1) and (3), the dependent variable is the cumulative stock return of a firm from February 3, 2020 to March 23, 2020. In columns (2) and (4), the dependent variable is the cumulative abnormal return of a firm based on market model estimations. In Panel A, the main independent variable of interest is a firm's *ESG Score*. Across all columns, we control for country fixed and industry fixed effects using the Global Industry Classification Standard's (GICS) 11 sectors. In columns (3) and (4), we also include several firm controls. In Panel B, the main independent variable of interest is *High ESG*. *High ESG* is a dummy variable that is set to one if the firm's ESG score is larger than the median ESG Score in the respective country. The regression specifications of Panel B are similar to Panel A. The construction of our variables is provided in appendix Table D1. We present robust standard errors clustered by country in parentheses, where ***, **, * denotes statistical significance at the 1%, 5%, and 10% level.

| **Panel A** | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Dependent Variable: | *Raw Returns* | *Abnormal Returns* | *Raw Returns* | *Abnormal Returns* |
| ESG Score | −0.0450 | 0.1772*** | −0.0278 | 0.1267** |
| | (0.0344) | (0.0568) | (0.0514) | (0.0603) |
| Size | | | −0.0029 | 0.0221*** |
| | | | (0.0065) | (0.0039) |
| ROE | | | 0.2416** | 0.2894*** |
| | | | (0.1161) | (0.1101) |
| Profitability | | | 0.0358 | 0.0315 |
| | | | (0.0871) | (0.0790) |
| Cash / Assets | | | 0.0068 | 0.1204* |
| | | | (0.0591) | (0.0665) |
| Short-term Debt / Assets | | | −0.3891** | −0.3569** |
| | | | (0.1694) | (0.1650) |
| Long-term Debt / Assets | | | −0.2570*** | −0.2265*** |
| | | | (0.0427) | (0.0481) |
| Market-to-Book | | | 0.0063*** | 0.0055*** |
| | | | (0.0016) | (0.0020) |
| Negative Market-to-Book | | | 0.0676 | 0.0278 |
| | | | (0.0462) | (0.0467) |
| Historical Volatility | | | −0.1850* | 0.2231*** |
| | | | (0.1025) | (0.0839) |
| Momentum | | | 0.0182 | 0.0909*** |
| | | | (0.0243) | (0.0345) |
| Observations | 1452 | 1452 | 1122 | 1122 |
| Industry/Country FE | yes | yes | yes | yes |
| Adjusted R-Squared | 0.01 | 0.02 | 0.07 | 0.08 |

| **Panel B** | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Dependent Variable: | *Raw Returns* | *Abnormal Returns* | *Raw Returns* | *Abnormal Returns* |
| High ESG | −0.0188 | 0.0678*** | −0.0135 | 0.0383** |
| | (0.0147) | (0.0201) | (0.0190) | (0.0186) |
| Observations | 1452 | 1452 | 1122 | 1122 |
| Industry/Country FE | yes | yes | yes | yes |
| Firm controls | no | no | yes | yes |
| Adjusted R-Squared | 0.01 | 0.02 | 0.07 | 0.08 |

higher abnormal return during the collapse period. The results are in line with the ongoing debate of whether ESG significantly pays off during times of crisis. While Bae et al. (2021) and Demers et al. (2020) find no evidence that ESG affects stock returns and market adjusted stock returns, Albuquerque et al. (2020) find that firms with higher environmental and social ratings are associated with higher abnormal stock returns over the crisis period.

In Panel B, we employ our dummy variable *High ESG* and run the same specifications as in Panel A to ensure that our results hold when employing an alternative measure for a firm's ESG performance. The results remain qualitatively similar. We find positive and highly statistically significant coefficients on *High ESG* in columns (2) and (4) where we use cumulative abnormal stock returns as the dependent variable. Again, *High ESG* remains insignificant when the dependent variable is a firm's cumulative raw stock return. In terms of control variables, the results are in line with the one found in Panel A. We can conclude, that firms with high ESG scores are associated with at least 3.83 percentage points higher abnormal stock returns compared to those with low ESG scores; thus firms with very low ESG efforts were particularly affected by the COVID-19 crisis.

### 5.3.2 ESG Ratings and Stock Volatility

Since our previous results suggest that firms with higher ESG ratings had significantly higher abnormal returns during the crisis period, we also investigate whether firms with higher corporate ESG ratings exhibit lower stock volatility. To test this relationship, we perform the regressions as in Table 5.4 using a firm's stock volatility and a firm's idiosyncratic volatility during the collapse period from February 3, 2020 to March 23, 2020 as dependent variables. Our main independent variable of interest is a firm's ESG score. As in Table 5.4 we include a variety of firm characteristics and industry fixed and country fixed effects. Table 5.5 presents the results.

**Table 5.5:** This table reports the results from OLS regressions. In columns (1) and (3), the dependent variable is the stock volatility of a firm from February 3, 2020 to March 23, 2020. In columns (2) and (4), the dependent variable is the idiosyncratic volatility of a firm. The main independent variable of interest is a firm's *ESG Score*. Across all columns, we control for country fixed and industry fixed effects using the Global Industry Classification Standard's (GICS) 11 sectors. In columns (3) and (4), we also include several firm controls. The construction of our variables is provided in appendix Table D1. We present robust standard errors clustered by country in parentheses, where ***, **, * denotes statistical significance at the 1%, 5%, and 10% level.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Dependent Variable: | *Volatility* | *Idiosyncratic Volatility* | *Volatility* | *Idiosyncratic Volatility* |
| ESG Score | −0.0061 | −0.0166*** | −0.0016 | −0.0085* |
| | (0.0044) | (0.0044) | (0.0042) | (0.0044) |
| Size | | | −0.0001 | −0.0008** |
| | | | (0.0003) | (0.0004) |
| ROE | | | −0.0032 | −0.0049 |
| | | | (0.0072) | (0.0084) |
| Profitability | | | −0.0200*** | −0.0144*** |
| | | | (0.0069) | (0.0052) |
| Cash / Assets | | | 0.0052 | 0.0024 |
| | | | (0.0046) | (0.0040) |
| Short-term Debt / Assets | | | 0.0160** | 0.0156*** |
| | | | (0.0064) | (0.0056) |
| Long-term Debt / Assets | | | 0.0198*** | 0.0159*** |
| | | | (0.0053) | (0.0052) |
| Market-to-Book | | | −0.0002 | −0.0002 |
| | | | (0.0002) | (0.0002) |
| Negative Market-to-Book | | | 0.0032 | 0.0049* |
| | | | (0.0032) | (0.0029) |
| Historical Volatility | | | 0.0393*** | 0.0349*** |
| | | | (0.0060) | (0.0051) |
| Momentum | | | 0.0032* | 0.0003 |
| | | | (0.0017) | (0.0018) |
| Observations | 1452 | 1452 | 1122 | 1122 |
| Industry/Country FE | yes | yes | yes | yes |
| Adjusted R-Squared | 0.01 | 0.04 | 0.15 | 0.18 |

We find negative but statistically insignificant coefficients on *ESG Score* in columns (1) and (3) where the dependent variable is a firm's stock volatility during the collapse period. Further, we find negative and statistically significant coefficients on *ESG Score* when considering a firm's idiosyncratic volatility as the dependent variable in column (2). The effect slightly vanishes after firm controls have been included into the regression model (column (4)). We find that a one standard deviation increase in ESG scores is associated with a decrease of 0.17% in terms of total idiosyncratic volatility. This effect is economically sizeable as it is represents approximately 3.83% of the mean idiosyncratic stock volatility. The results are in line with Albuquerque et al. (2020) who show that high environmental and social (ES)-rated firms exhibit significantly lower stock volatility. Regarding our control variables, we find that firms with higher debt over assets ratios and higher historical volatility are associated with higher idiosyncratic volatility. We additionally find larger firms and highly profitable firms to experience significantly lower stock volatility during the crisis period.

### 5.3.3 ESG Ratings and Country Characteristics

We now examine whether a firm's ESG performance is even more important depending on the respective country the firm is domiciled in. Specifically, we examine the following country characteristics. We investigate the effect of ESG in high-trust and low-trust countries as proposed by Lins et al. (2017) who find that the association between financial crisis' stock returns and CSR is particularly valuable in high-trust US regions. Similar to the methodology used in Karolyi et al. (2020) and Neukirchen et al. (2021b) we also examine whether high ESG-rated firms profit even more when they are domiciled in countries with poorer security regulations, in countries with lower-quality accounting rules, i.e. disclosure practices, and in countries with lower legal protection of minority shareholders.

We gather data on a country's level of societal trust from the World Values Survey's (WVS) latest wave from 2017 to 2020. Our proxy for the quality of securities regulations is a country's *Rule of Law* index from the World Bank's World Governance Indicators for 2019. Data on a country's disclosure standards come from the *Disclosure index* provided by La Porta et al. (2006), and data on the level of legal protection standards come from the *Anti-Self-Dealing index* (ASDI) provided by Djankov et al. (2008).

**Table 5.6:** This table reports the results from OLS regressions. Across all columns, the dependent variable is the cumulative abnormal stock return of a firm from February 3, 2020 to March 23, 2020 and the main independent variable of interest is *High ESG*. *High ESG* is a dummy variable that is set to one if the firm's ESG score is larger than the median ESG Score in the respective country. We create sub-samples based on the following country characteristics. In columns (1) and (2), we split the sample into *Low Trust* and *High Trust* countries based on the sample country's median. In columns (3) and (4), we split the sample based on the *Rule of Law* index from the World Bank's World Governance Indicators. In columns (5) and (6), we use the *Disclosure* index by La Porta et al. (2006), and in columns (7) and (8), we use the Anti-Self Dealing index (*ASDI*) to create the sub-samples. Across all columns, we control for country fixed and industry fixed effects using the Global Industry Classification Standard's (GICS) 11 sectors. The construction of our variables is provided in appendix Table D1. We present robust standard errors clustered by country in parentheses, where ***, **, * denotes statistical significance at the 1%, 5%, and 10% level.

| Dependent Variable: *Abnormal Returns* | *Trust* | | *Rule of Law* | | *Disclosure* | | *ASDI* | |
|---|---|---|---|---|---|---|---|---|
| | (1) *Low* | (2) *High* | (3) *Low* | (4) *High* | (5) *Low* | (6) *High* | (7) *Low* | (8) *High* |
| High ESG | 0.0553*** | 0.0304 | 0.0336** | 0.0536 | 0.0504** | 0.0234 | 0.0299 | 0.0503** |
| | (0.0182) | (0.0397) | (0.0158) | (0.0404) | (0.0245) | (0.0390) | (0.0303) | (0.0209) |
| Size | 0.0223*** | 0.0247** | 0.0243*** | 0.0222** | 0.0169*** | 0.0326*** | 0.0267*** | 0.0219*** |
| | (0.0052) | (0.0097) | (0.0044) | (0.0086) | (0.0035) | (0.0067) | (0.0070) | (0.0041) |
| ROE | 0.2653** | 0.5160 | 0.2709*** | 0.3974 | 0.2103** | 0.3293*** | 0.2763* | 0.2363** |
| | (0.1121) | (0.3459) | (0.0976) | (0.3156) | (0.0892) | (0.1097) | (0.1474) | (0.0971) |
| Profitability | −0.1402** | 0.1358** | −0.0959 | 0.1658** | −0.0873 | 0.0506 | 0.0792 | 0.0577 |
| | (0.0658) | (0.0619) | (0.0617) | (0.0660) | (0.1546) | (0.1707) | (0.1433) | (0.0843) |
| Cash / Assets | 0.0109 | 0.2280*** | −0.0291 | 0.2435*** | 0.0732 | 0.0972 | 0.1898** | 0.0249 |
| | (0.0875) | (0.0837) | (0.0653) | (0.0812) | (0.0836) | (0.1343) | (0.0966) | (0.0708) |
| Short-term Debt / Assets | −0.3329 | −0.5690*** | −0.2563 | −0.5076*** | −0.1749 | −0.6304** | −0.2333 | −0.4956* |
| | (0.3429) | (0.1342) | (0.3201) | (0.1426) | (0.1831) | (0.2777) | (0.1813) | (0.2650) |
| Long-term Debt / Assets | −0.1695*** | −0.2811** | −0.1707*** | −0.3038*** | −0.3526*** | −0.1270* | −0.1925** | −0.2725*** |
| | (0.0467) | (0.1238) | (0.0451) | (0.1119) | (0.0597) | (0.0724) | (0.0973) | (0.0557) |
| Market-to-Book | 0.0108** | 0.0036** | 0.0108** | 0.0031** | 0.0034*** | 0.0100* | 0.0035** | 0.0054* |
| | (0.0051) | (0.0015) | (0.0048) | (0.0013) | (0.0013) | (0.0053) | (0.0018) | (0.0029) |
| Negative Market-to-Book | −0.0166 | 0.2001** | −0.0050 | 0.1974** | 0.1651** | 0.0108 | 0.0593 | −0.0269** |
| | (0.0276) | (0.1010) | (0.0238) | (0.0938) | (0.0768) | (0.0289) | (0.1028) | (0.0118) |
| Historical Volatility | 0.1770 | 0.2019 | 0.2197* | 0.1766 | 0.2621* | 0.1398 | 0.2409** | 0.1910 |
| | (0.1117) | (0.1431) | (0.1201) | (0.1194) | (0.1399) | (0.1013) | (0.1227) | (0.1244) |
| Momentum | 0.0248 | 0.1403** | 0.0425 | 0.1319** | 0.1028* | 0.0631 | 0.1069** | 0.0784 |
| | (0.0304) | (0.0601) | (0.0302) | (0.0525) | (0.0567) | (0.0558) | (0.0450) | (0.0600) |
| Observations | 674 | 373 | 710 | 412 | 542 | 566 | 626 | 496 |
| Industry/Country FE | yes | yes | yes | yes | yes | yes | yes | yes |
| Adjusted R-Squared | 0.04 | 0.17 | 0.04 | 0.15 | 0.09 | 0.07 | 0.07 | 0.06 |

To study this relationship, we split our dataset based on the country characteristics' median scores and run our baseline regression models on the sub-samples as done in Karolyi et al. (2020) and Neukirchen et al. (2021b). We present the results from these regressions in Table 5.6 where the main independent variable of interest is *High ESG*. As in our baseline model in Table 5.4, we control for a variety of firm characteristics and include industry fixed and country fixed effects.

We find a positive and highly statistically significant coefficient on *High ESG* where firms are either domiciled in low-trust countries (column (1)), or in countries with poorer security regulations (column (3)), or in countries where lower disclosure standards prevail (column (5)); thus a firm's ESG performance has a positive effect over the crisis period in certain countries. Further, we split the dataset by the *ASDI* and find that a firm's ESG performance significantly pays off in countries where the legal protection standards of minority shareholders are strong.

The results differ in some extent from those in Lins et al. (2017) who find that CSR is of significant importance in high-trust US regions during the GFC. However, Bae et al. (2021) find only weak support for the hypothesis that trust influences the effect of CSR during the COVID-19 pandemic. Further, Engelhardt et al. (2020b) find that financial volatility is significantly higher in response to COVID-19 cases in low-trust countries, hence our results indicate that good-quality ESG may reduce uncertainty among market participants during the COVID-19 crisis.

## 5.4 Robustness

We perform a variety of robustness checks to ensure the validity of our findings. First, we test whether our main results persist when we change the observation period. Specifically, we rerun our baseline regressions (I) over the whole first quarter of 2020 as in Albuquerque et al. (2020), and (II) over the so-called "fever period" from Ramelli and Wagner (2020) from February 24, 2020 to March 20, 2020. However, our results remain qualitatively similar.

Second, we follow Albuquerque et al. (2020) and use ES ratings in our analyses. We thus omit the governance score in unreported regressions and find very similar results compared to our previous findings. Additionally, we break down the ESG score into E, S, and G and use the scores separately as done in Albuquerque et al. (2020). Although not reported for reasons of brevity, we find similar baseline results. Our results are also in line with Albuquerque et al. (2020), who show that a firm's ES performance is of significant importance while a firm's governance score is not useful to explain stock returns over the crisis period. Although Albuquerque et al. (2020) primarily examining the US market, we find a similar pattern for European stock markets.

Third, we test whether our findings are driven by the performance of firms which are domiciled in the UK, as these firms amount to approximately 25% of our observations. Although we find that the coefficient on *ESG Score* is positive and statistically significant, the coefficient is slightly smaller in magnitude compared to the results found in Table 5.4. We also see a similar picture when we rerun the baseline regression in Table 5.5 when the dependent variable is a firm's idiosyncratic volatility. Further, we exclude firms from the financial sector and firms with low stock liquidity, i.e. firms with a market capitalization below $250 million as proposed by Lins et al. (2017) and Neukirchen et al. (2021b). Overall, our results remain qualitatively similar when performing several robustness exercises.

## 5.5 Conclusion

The COVID-19 crisis led to enormous uncertainty on financial markets along with a dramatic decline in stock prices and higher financial volatility. In this paper, we studied whether firms with higher ESG ratings perform significantly better during the COVID-19 crisis. We investigate a sample consisting of 1452 firms from 16 different European countries and argue that firms with better ESG performance had significantly higher cumulative abnormal returns and exhibit significantly lower idiosyncratic volatility in the beginning of 2020. Our results hold in several multivariate specifications as well as when applying a variety of robustness checks. We relate to the growing body of literature investigating features which make firms more resilient, and find that ESG pays off during times of crisis. Additionally, we find that ESG is even more important in low-trust countries, and in countries which exhibit poorer security regulations and where lower disclosure standards prevail.

# 6 The Value of (Private) Investor Relations during the COVID-19 Crisis

The following is based on Neukirchen et al. (2021b).

## 6.1 Introduction

Communication with investors has become increasingly important due to the globalization of capital markets and the large amount of unvetted news and opinions about firms on the internet. The latter shape investors' perceptions and can significantly influence the firms' valuation (Bartov et al., 2018; Chapman et al., 2019; Lee et al., 2015; Schmidt, 2020). Helping investors and analysts to evaluate information and communicating the firm's strategy in order to reduce uncertainty and information frictions is a key task, typically carried out by the firms' investor relations (IR) departments. Accordingly, the US National Investor Relations Institute (NIRI) defines IR as a strategic management responsibility supposed "[...] to enable the most effective two-way communication between a company, the financial community, and other constituencies, which ultimately contributes to a company's securities achieving fair valuation"(NIRI, 2020). Although some studies have highlighted that firms with strong IR have better capital market outcomes (see e.g. Brennan and Tamarowski, 2000; Brochet et al., 2020; Bushee and Miller, 2012; Chapman et al., 2019; Karolyi et al., 2020; Kirk and Vincent, 2014), our understanding of whether this is particularly true or even stronger during times when uncertainty among investors is high, is still limited. In this paper, we use a large sample of European firms to investigate whether firms with strong IR outperformed firms with weak IR when stock markets collapsed as a result of the COVID-19 pandemic.

The COVID-19 pandemic and the subsequent economic lockdown in many European countries can be seen as a perfect example of an exogenous and unexpected shock that led to enormous uncertainty on capital markets (see e.g. Altig et al., 2020; Baker et al., 2020; Engelhardt et al., 2020a; Zhang et al., 2020). While European stock markets were thriving until mid-February 2020, the markets dropped by roughly 30% until the end of March 2020 (see Figure 6.1). Consequently, a lot of rumours appeared in press and online about firms' ability to manage the crisis. This might have overburdened market participants with limited information processing capabilities and led to information frictions (see e.g. Hirshleifer and Teoh, 2003; Merton, 1987; Peng and Xiong, 2006). If a firm's IR helps to alleviate uncertainty and to reduce information frictions, it should particularly pay off during times when market participants are unsettled. Thus, the COVID-19 pandemic creates an opportunity to test the link between the quality of a firm's IR and its market valuation.

We use the 2020's IR rankings for roughly 1,000 European firms from 16 different countries provided by Institutional Investor[1] and stock and accounting data from Compustat/Capital IQ and Thomson Reuters Eikon. In univariate tests, we find firms with strong IR, i.e. those having an above median IR score, to experience 7.09 percentage points higher cumulative returns after the crisis unfolded in mid-March 2020. We also find that this difference holds until the end of our observation period in October 2020. This provides a first indication of IR being valuable for firms during times of crisis.

To further test whether IR paid off during the COVID-19 crisis, we estimate various multivariate specifications. The dependent variables in these specifications are either the cumulative raw stock returns or the cumulative abnormal stock returns for the period from February 3, 2020 to March 23, 2020, which is the collapse period as defined in Fahlenbrach et al. (2020).[2] Employing both dummy variables and the raw IR scores, we find a positive association between a firm's IR quality and the stock performance during the collapse period. For instance, firms with strong IR experienced at least 4.76 percentage points higher cumulative returns when stock markets collapsed. Our results are robust to controlling for industry and country-fixed effects as well as for a variety of firm and governance characteristics, which have also been used in related settings (see e.g. Albuquerque et al., 2020; Fahlenbrach et al., 2020; Lemmon and Lins, 2003;

[1] Institutional Investor is an international business to business publisher running a yearly survey that investigates the perceived quality of firms' IR. The rankings for previous years have also been used in a study by Brochet et al. (2020).

[2] Figure 6.1 displays how the STOXX Europe 600 stock market index performed during the collapse period.

Lins et al., 2013, 2017; Mitton, 2002). In additional robustness tests, we use different time windows to calculate cumulative returns and also estimate regressions similar to Ding et al. (2020), where we employ weekly returns as the dependent variable and interact each independent variable with the weekly growth in confirmed COVID-19 cases. However, our results remain qualitatively similar.

Next, we show that having better-quality IR became even more valuable as the crisis unfolded. Following Albuquerque et al. (2020) and Ramelli and Wagner (2020), we estimate daily cross-sectional regressions of the firms' cumulative abnormal returns during the first quarter of 2020 on our measures for a firm's IR quality and find that the loading on the coefficient increases late-February to mid-March 2020. Thereafter, the loading on the coefficient stagnates.

To establish an even tighter link between a firm's IR quality and its stock performance during the COVID-19 crisis, we follow Lins et al. (2017) and Albuquerque et al. (2020) by using a difference-in-differences analysis. Specifically, we construct a panel of daily abnormal returns and estimate a difference-in-differences regression where the dependent variable is the daily abnormal return and the main independent variable of interest is the interaction between our dummy variable *High IR* and an event date dummy equalling one for all dates in the crisis period, and zero otherwise. We also include an interaction between *High IR* and an event date dummy equalling one for all dates after the initial shock to capture the impact of IR during the recovery period. Consistent with our previous findings, we find firms with strong IR to experience higher crisis returns.

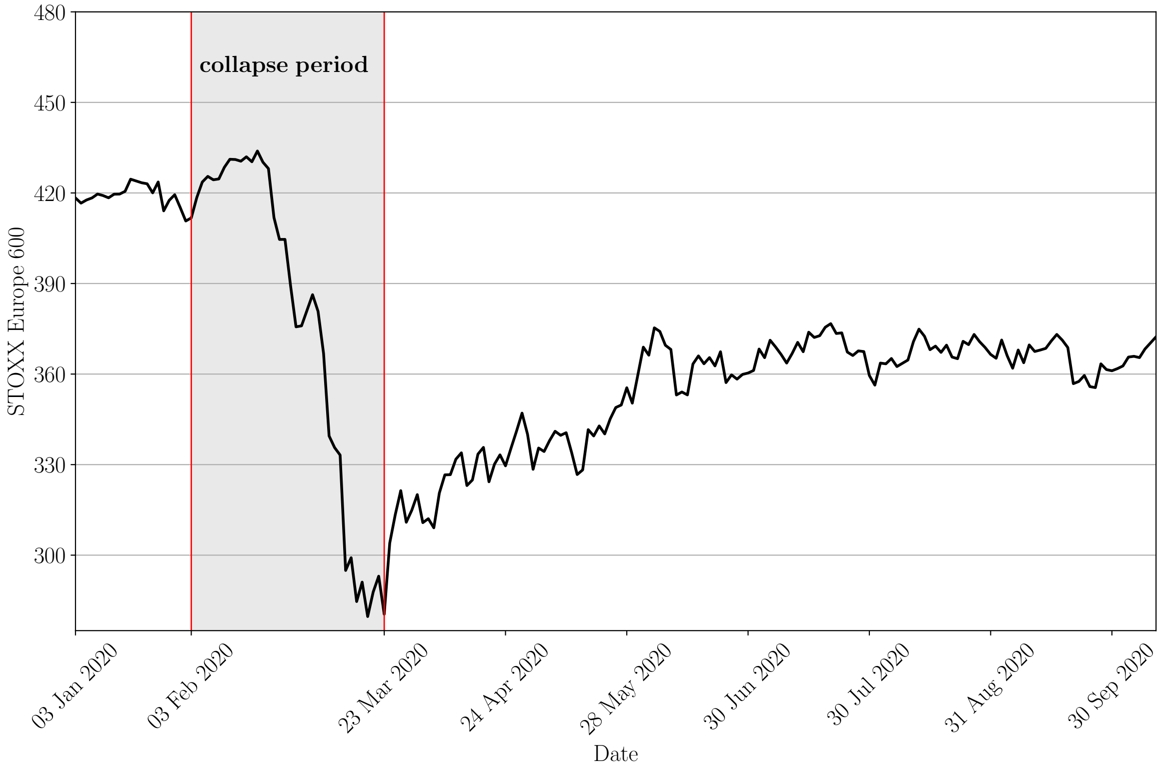
We next seek to identify which functions of a firm's IR caused the outperformance of strong IR firms compared to weak IR firms during the crisis period. We follow Brochet et al. (2020) and decompose a firm's IR score into a public and a private component. Rerunning our previous analyses with these scores shows that while a firm's private IR is positively associated with the stock performance during the crisis period, a firm's public IR does not appear to contribute to the outperformance of firms with better-quality IR. This finding is striking given that Brochet et al. (2020) stress that both functions contribute to better capital market outcomes. However, we interpret our result in the context of the crisis. Private IR functions, such as organizing meetings with senior management, might have been of particular importance to investors in an environment full of uncertainty. Besides, the COVID-19 crisis posed great challenges to a firm's public IR activities, especially concerning public investor events, due to the potential risk of infection.

While our tests focus on providing evidence that firms with better-quality IR outperformed those with lower-quality IR, we also examine how a firm's IR functions might have boosted its firm value. One explanation for the return premium could be that (private) IR helps to enhance a firm's credibility with its shareholders. Another explanation could be related to IR helping to diversify a firm's shareholder base, which could have also led to lower stock volatility during the crisis. To address the first aspect, we regress the fraction of incumbent institutional investors staying loyal to the firm over the crisis period on our measures for IR quality. Our results provide evidence that institutional investor loyalty is higher at firms with better-quality (private) IR. This suggests strong IR to enhance a firm's credibility. To address the second aspect, we regress the change in the number of institutional investors over the crisis period as well as the idiosyncratic stock volatility on our measures for IR quality. We find the change in the number of institutional investors to be more positive and volatility during the crisis period to be indeed slightly lower for strong (private) IR firms. Collectively, these findings highlight that a firm's IR function might have boosted its firm value by both enhancing its credibility with its shareholders and by diversifying its shareholder base.

In additional tests, we also check whether firms in industries particularly affected by the COVID-19 pandemic benefited even more from having better IR and whether there is a link between the value of IR during the crisis and the countries the firms are headquartered in. While we do not find that IR payed off more in industries particularly affected by the crisis, we find considerable variation in the value of IR depending on certain country characteristics. Following Karolyi et al. (2020), we investigate this by splitting the sample by the median scores on several country characteristics and rerun our baseline regression on the respective subsamples. Our results show that, consistent with Karolyi et al. (2020), firms with strong IR domiciled in countries where lower-quality legal institutions prevail experienced significantly higher abnormal returns during the collapse period compared to those domiciled in countries with higher-quality legal institutions. Further, we find that having better-quality IR was even more valuable in countries where the level of societal trust is weak and in countries where people have difficulties in dealing with uncertainty. We also rerun the analyses using the decomposed scores and find a firm's private IR function to be the driver of the results.

The remainder of this paper is structured as follows: Section 2 provides a literature review. Section 3 describes the data and variables. Section 4 presents our empirical analysis and the results, while Section 5 presents additional tests. In Section 6, we check the robustness of our results. Section 7 concludes.

**Figure 6.1:** This figure shows the STOXX Europe 600 stock market index for the period from January 3, 2020 to September 30, 2020. The collapse period (gray-shaded area) as defined in Fahlenbrach et al. (2020) is from February 3, 2020 to March 23, 2020.




## 6.2 Literature Review

Our contribution to the literature is twofold. First, we contribute to the literature on the impact of IR on corporate outcomes. In this regard, prior studies primarily focusing on the US market have shown a positive association between a firm's IR and its capital market outcomes. For instance, employing IR magazine ratings of investor relations, Agarwal et al. (2008) show higher-rated firms to experience higher abnormal returns surrounding their rating announcements. Bushee and Miller (2012) use a sample of US small and mid-cap firms, which have initiated an IR program, to show a positive association between a firm's IR activities and its market value (in terms of reductions in the book-to-price ratio). They also highlight that these firms attract more institutional investors. Similar findings are provided by Kirk and Vincent (2014), who focus on US firms having initiated internal professional IR. Chapman et al. (2019) study whether IR officers are valuable to firms since they might help investors and analysts to evaluate information. Their findings indicate that US firms with IR officers have better capital market outcomes, i.e. lower stock volatility and lower forecast dispersion. Chahine et al. (2020) show that hiring IR consultants prior to going public increases news coverage and is associated with higher first-day returns, while Hope et al. (2021) show that hiring Wall Street analysts as IR officers is beneficial. There is also evidence linking the firm's corporate social responsibility (CSR) performance to IR (Crifo et al., 2019; Hockerts and Moir, 2004). Karolyi et al. (2020) use survey data of IR officers from 59 countries to show a positive relation between a firm's IR efforts and its market valuation measured by Tobin's Q. They highlight that a firm's IR efforts are related to legal protection, disclosure standards and media visibility. Brochet et al. (2020) use the IR rankings provided by Institutional Investor (formerly called Extel) for the period from 2014 through 2018 and find a positive association between a firm's IR efforts and its market valuation. Also, they document that firms with strong IR have greater firm visibility and that the overall benefits of IR are higher in markets where communication with shareholders has been neglected in the past. Although all of these studies provide evidence indicating a positive association between IR and a firm's capital market outcomes, our study is the first to test the causal link using an exogenous shock. Our results imply that only a firm's private IR activities are positively associated with a firm's stock performance during the crisis and that a firm's IR functions are boosting its firm value through both enhancing credibility with its shareholders and through diversifying its shareholder base.

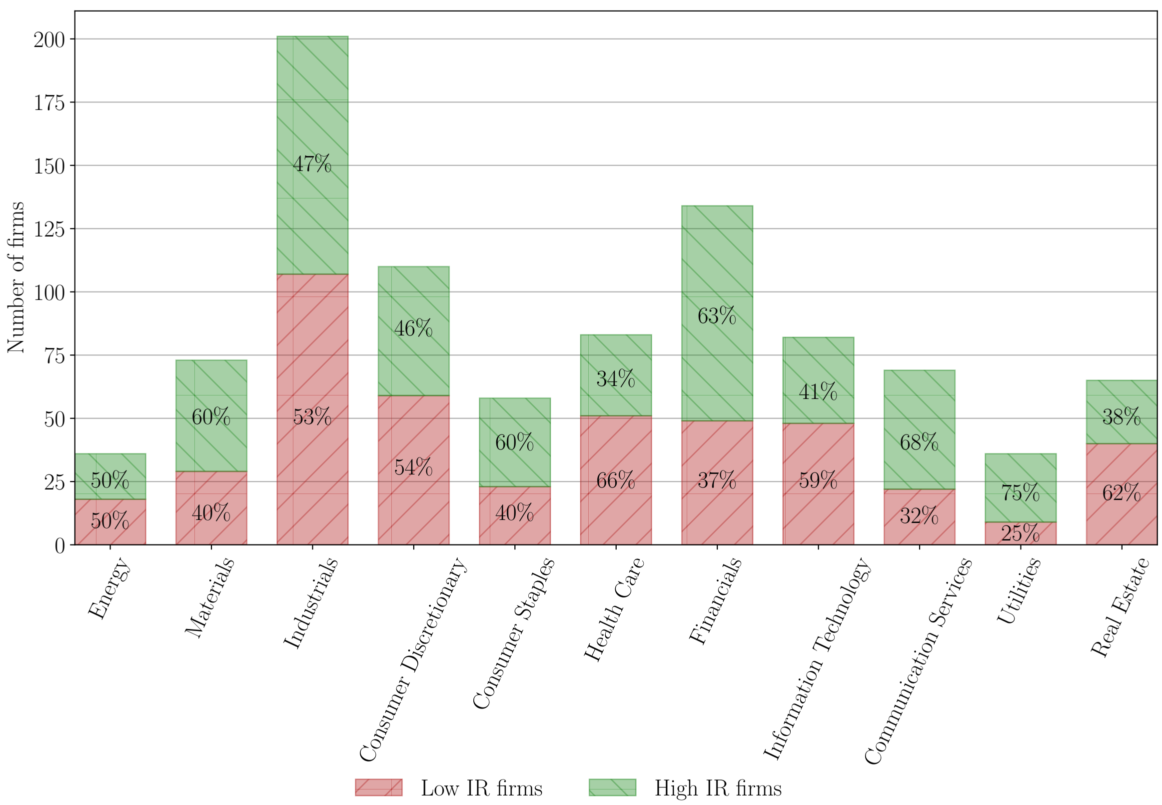
Second, we contribute to the ongoing literature on characteristics making firms more immune and resilient during times of crisis, and in particular during the COVID-19 crisis. Most of the recent studies, however, focus on the US stock market. For instance, Fahlenbrach et al. (2020) find US firms with high financial flexibility to experience higher returns during the crisis. Ramelli and Wagner (2020) find that this is particularly true for non-financial firms. A paper by Albuquerque et al. (2020), which we closely relate to in terms of methodology, shows US firms with higher environmental and social ratings to experience higher stock returns and less volatility. Landier and Thesmar (2020) highlight that the decline in stock prices during the COVID-19 crisis can be explained by analysts' forecast revisions. Acharya and Steffen (2020) document that firms with a lower credit-rating were particularly affected during the COVID-19 crisis, while Pagano et al. (2020) show firms more resilient to social distancing to be associated with higher stock returns. Alfaro et al. (2020) demonstrate that firms are less affected by the crisis if they are able to shed costs. One of the few studies focusing on cross-country data is Ding et al. (2020). Similar to Fahlenbrach et al. (2020) and Ramelli and Wagner (2020), they demonstrate that firms with high financial flexibility are associated with a lower decline in stock prices. Besides, they show the drop in a firm's stock price to be lower if the firm is more active in CSR and has less entrenched executives. Finally, Cheema-Fox et al. (2020) also employ cross-country data to show that stock price reactions are associated with the sentiment around firms' responses (in terms of layoffs, supply chain, products and services). We contribute to this strand of literature by showing that in a cross-country setting firms with strong IR experienced higher stock returns and were thus more resilient during the COVID-19 crisis.

## 6.3 Data and Variables

We obtain information on IR rankings for over $1,000$ publicly-traded companies from 16 European countries for the year 2020. These rankings, provided by Institutional Investor (historically called Extel), are based on a large survey where buy and sell-side analysts were asked to rate on the perceived quality of the firms' IR programs. The respondents were particularly asked to evaluate the firms' communication with investors (i.e. the productivity of road shows and meetings, the quality of conference calls, the access to senior management, the firms' responsiveness, the authority and credibility of the IR team and its business and market knowledge, the quality of investor events, and the quality of the firm's Environmental and Social (ES) reporting) as well as the firms' financial disclosure practices (i.e. the time to market, the granularity as well as the comparability and consistency of financial disclosures). Unfortunately, there is no data on the different sub-dimensions of the IR activities available, but Institutional Investor provides scores as well as ranks for each firm within a country based on the percentage of respondents voting for a particular firm. We then merge with stock and accounting data from Compustat/Capital IQ and with ownership data, governance data, data on a firm's informational environment, and ES ratings from Thomson Reuters Eikon. Additionally, we obtain data on a firm's news environment from Dow Jones Factiva.

Our main independent variable of interest is *High IR*, which is a dummy variable equalling one if the firm's IR score is larger than the median score within the respective country, and zero otherwise. Thereby, we account for the fact that the scores provided by Institutional Investor are scaled on country-level. In additional regressions, we also employ the natural logarithm of the raw IR score as the main independent variable of interest.

**Figure 6.2:** This figure shows the number of *High IR* and *Low IR* firms in the respective industry sectors based on the Global Industry Classification Standard's (GICS) 11 sectors. We report the proportion of *High IR* firms and the proportion of *Low IR* firms in percentages.



For a more detailed view on our main variable of interest *High IR*, we report the number and the proportion of *High IR* and *Low IR* firms in the respective industry sectors based on the Global Industry Classification Standard's (GICS) 11 sectors in Figure 6.2. For instance, we observe 201 firms located in the Industrials sector where we find that 47% of the firms are classified as *High IR* firms, and 53% of the firms are classified as *Low IR firms*. Furthermore, it is noteworthy that 75% of the firms in the Utilities sector are *High IR* firms.

Since we are interested in studying whether firms with strong IR have better stock performance during the COVID-19 crisis, we mainly employ the cumulative raw stock returns as well as the cumulative abnormal stock returns based on a market model estimation[3] as our dependent variables. Following Fahlenbrach et al. (2020), we specifically calculate cumulative returns for the period from February 3, 2020 through March 23, 2020, which is the so-called "collapse period" where stock prices declined dramatically. Although Fahlenbrach et al. (2020) focus on the US stock market, we find the same pattern on European stock markets. While mean daily stock returns are negative during the collapse period, we find a positive mean return of 7.32% on March 24, 2020, which is the day the market was informed that the approval of the two trillion US dollar coronavirus stimulus bill was likely. So European markets also reacted strongly to the news about the US government's policy response.

In terms of control variables, we follow the existing literature (see e.g. Albuquerque et al., 2020; Brochet et al., 2020; Fahlenbrach et al., 2020; Glossner et al., 2020; Lins et al., 2017; Karolyi et al., 2020) and describe the construction of these variables in detail in Table E1 in the appendix.

Our final sample consists of 947 firms from 16 European countries, for which we have stock data available. Table E2 in the appendix holds a list of countries covered. However, some of the control variables are missing for certain observations. This is why we estimate different regression models in our analysis. Taking this into account, Table 6.1 provides basic summary statistics for the variables in our sample and Table E3 in the appendix reports the respective correlations. The descriptive statistics show that mean and median cumulative raw returns over the collapse period are highly negative

[3]The expected returns used to calculate the abnormal returns are based on a market model estimation. We estimate betas using the firm's stock returns for the year 2019 and the returns of the respective national stock market index.

**Table 6.1:** This table reports descriptive statistics for our sample consisting of 947 firms from 16 European countries. The survey-based IR rankings come from Institutional Investor. Stock data and accounting data come from Compustat/Capital IQ. Corporate ES ratings, governance data, data on a firm's informational environment, and ownership data come from Thomson Reuters Eikon. Additionally, we obtain data on news coverage from Dow Jones Factiva. All variables are defined in detail in Table E1 in the appendix. Table E2 in the appendix reports the number of firms per country.

| | Observations | Minimum | Maximum | Mean | Median | Std. |
|---|---|---|---|---|---|---|
| *Dependent Variables:* | | | | | | |
| Abnormal Returns | 947 | −1.9940 | 0.6145 | −0.1444 | −0.1282 | 0.2815 |
| Raw Returns | 947 | −2.1291 | 0.3906 | −0.4558 | −0.4338 | 0.2672 |
| *Main Variable of Interest:* | | | | | | |
| *log*(IR Score) | 947 | −4.5816 | −1.4312 | −3.8985 | −4.0763 | 0.5998 |
| *Control Variables:* | | | | | | |
| Size | 749 | 2.0947 | 11.9168 | 7.9400 | 7.9933 | 1.8247 |
| ROE | 932 | −0.4715 | 0.2548 | 0.0389 | 0.0434 | 0.0852 |
| Tobin's Q | 932 | 0.7466 | 14.7823 | 2.1118 | 1.3301 | 2.1365 |
| Market-to-Book | 932 | −2.9155 | 46.7297 | 3.9440 | 2.0376 | 6.4184 |
| Historical Volatility | 947 | 0.1255 | 0.7547 | 0.2869 | 0.2613 | 0.1120 |
| Cash / Assets | 749 | 0.0039 | 0.6416 | 0.1213 | 0.0918 | 0.1135 |
| Short-term Debt / Assets | 921 | 0 | 0.2397 | 0.0520 | 0.0374 | 0.0501 |
| Long-term Debt / Assets | 938 | 0 | 0.6937 | 0.2202 | 0.2009 | 0.1584 |
| Momentum | 947 | −2.3754 | 0.8764 | −0.4487 | −0.3652 | 0.6681 |
| Analyst Following | 941 | 0 | 3.4340 | 2.4430 | 2.5649 | 0.6928 |
| Blockholder | 906 | 0.0515 | 0.8500 | 0.3713 | 0.3479 | 0.2072 |
| Institutional Ownership | 939 | 0.0753 | 0.9694 | 0.5647 | 0.5880 | 0.2215 |
| US Listing | 947 | 0 | 1 | 0.0570 | 0 | 0.2320 |
| High ES | 772 | 0 | 1 | 0.5000 | 0.5000 | 0.5003 |
| Board Size | 771 | 3 | 21 | 10.4786 | 10 | 3.6953 |
| Board Independence | 761 | 0 | 1 | 0.5873 | 0.6000 | 0.2612 |
| Board Governance Score | 761 | 0.0729 | 0.9488 | 0.5594 | 0.5789 | 0.2224 |
| Conferences | 947 | 0 | 9 | 0.9039 | 0 | 1.6668 |
| Road Show | 947 | 0 | 12 | 0.5671 | 0 | 1.9917 |
| Guidance | 947 | 0 | 4 | 1.9039 | 2 | 1.7992 |
| News Coverage | 910 | 3.2585 | 10.1266 | 6.7426 | 6.7268 | 1.4162 |
| Collapse News Coverage | 910 | 1.3888 | 8.3028 | 4.9102 | 4.9053 | 1.4258 |

amounting to approximately −45.58% and −43.38%, respectively. The standard deviation is 26.72%; thus cumulative returns exhibit large variation. In fact, the numbers are almost identical to those reported in Fahlenbrach et al. (2020). Also, mean and median cumulative abnormal returns are negative. The mean of the natural logarithm of the IR score amounts to −3.90. Regarding control variables, we find that the average firm size in terms of total sales amounts to $11.31 billion. Further, the average firm in our sample has a return on equity of 3.89%, a market-to-book ratio of 3.94 and a cash-to-assets ratio of 12.13%.

Before investigating the relationship between a firm's IR quality and the crisis returns, we provide univariate tests to compare the characteristics of *High IR* and *Low IR* firms first. Table 6.2 presents the results.

**Table 6.2:** This table presents the results from univariate tests. We classify a firm as a *Low IR* (*High IR*) firm, if the firm's IR score is below (larger than) the median score within the respective country, and zero otherwise. All variables are described in detail in Table E1 in the appendix. To test whether the difference in means between *High IR* and *Low IR* firms is significantly different from zero, we perform a *t*-test. ***, **, * denote statistical significance at the 1%, 5%, and 10% level.

| | High IR | | Low IR | | |
|---|---|---|---|---|---|
| | Observations | Mean | Observations | Mean | Difference |
| Size | 385 | 8.6360 | 364 | 7.2040 | 1.4320*** |
| Sales Growth | 382 | 0.1218 | 357 | 0.1382 | −0.0163 |
| ROE | 487 | 0.0527 | 445 | 0.0237 | 0.0290*** |
| Tobin's Q | 487 | 2.1808 | 445 | 2.0362 | 0.1445 |
| Market-to-Book | 487 | 4.0452 | 445 | 3.8332 | 0.2119 |
| Historical Volatility | 492 | 0.2662 | 455 | 0.3093 | −0.0431*** |
| Cash / Assets | 385 | 0.1111 | 364 | 0.1320 | −0.0209** |
| Short-term Debt / Assets | 477 | 0.0495 | 444 | 0.0546 | −0.0052 |
| Long-term Debt / Assets | 486 | 0.2152 | 452 | 0.2257 | −0.0105 |
| Momentum | 492 | −0.4239 | 455 | −0.4754 | 0.0515 |
| Analyst Following | 491 | 2.7711 | 450 | 2.0851 | 0.6860*** |
| Blockholder | 464 | 0.3350 | 442 | 0.4095 | −0.0745*** |
| Institutional Ownership | 489 | 0.5609 | 450 | 0.5688 | −0.0079 |
| US Listing | 492 | 0.0874 | 455 | 0.0242 | 0.0632*** |
| High ES | 458 | 0.5917 | 314 | 0.3662 | 0.2255*** |
| Board Size | 452 | 11.135 | 319 | 9.5486 | 1.5864*** |
| Board Independence | 448 | 0.6135 | 313 | 0.5497 | 0.0638*** |
| Board Governance Score | 448 | 0.6062 | 313 | 0.4924 | 0.1138*** |
| Conferences | 492 | 1.2175 | 455 | 0.5648 | 0.6526*** |
| Road Show | 492 | 0.8252 | 455 | 0.2879 | 0.5373*** |
| Guidance | 492 | 2.3984 | 455 | 1.3692 | 1.0291*** |
| News Coverage | 472 | 7.2249 | 438 | 6.2229 | 1.0020*** |
| Collapse News Coverage | 472 | 5.4005 | 438 | 4.3818 | 1.0188*** |

We find that *High IR* firms are on average significantly larger in terms of firm size and have a higher return on equity compared to *Low IR* firms. We also observe *High*

*IR* firms to have significantly lower historical stock volatility and a lower cash-to-assets ratio. While the mean of the analysts following *High IR* firms is significantly higher, we find the percentage of shares held by blockholders to be lower. Regarding governance characteristics, *High IR* firms have significantly larger boards, a higher board independence ratio and a higher board governance score. Concerning the news environment and investor events, *High IR* firms appear to host significantly more conferences and road shows, provide more earnings guidance, and also have higher news coverage.

## 6.4 Empirical Analysis and Results

### 6.4.1 Baseline Results

To study whether firms with better IR had higher stock returns during the COVID-19 crisis, we first perform a univariate analysis.

Similar to Fahlenbrach et al. (2020), we compare the evolution of cumulative raw stock returns between groups of firms with strong IR and those with weak IR. To classify firms, we use our dummy variable *High IR*. Figure 6.3 shows the results.

Figure 6.3 indicates that the difference in cumulative returns widens when stock markets collapsed in mid-March 2020 and that this difference holds until the end of our observation period in October 2020. While the difference in mean cumulative returns between firms with strong IR and those with weak IR is almost zero at the beginning of the year, we find firms with strong IR to experience on average 6.42 percentage points higher cumulative returns (as of September 30, 2020) after the COVID-19 crisis unfolded. This suggests that reducing uncertainty and information frictions among investors through effective IR is valuable.

To test whether these first results also hold in multivariate specifications, we perform various ordinary least squares (OLS) regressions as defined below:

$$Stock\ Performance_i = \beta_0 + \beta_1 \times High\ IR_i + \beta' \times X_{i,t-1} + \alpha_k + \alpha_j + \varepsilon_i \qquad (6.4.1)$$

where $i$ denotes the firm. We measure stock performance using either the cumulative raw stock returns or the cumulative abnormal stock returns for the period from February

3, 2020 to March 23, 2020, which is the collapse period as defined in Fahlenbrach et al. (2020). The main independent variable of interest in our regressions is the dummy variable *High IR*, which equals one if the firm's IR score is larger than the median IR score, and zero otherwise. We also control for a variety of firm characteristics denoted by the vector $X_{i,t-1}$. The terms $\alpha_k$ and $\alpha_j$, respectively, denote industry-fixed effects (based on the GICS 11 sectors) and country-fixed effects. $\varepsilon_i$ stands for the respective error term. Following Lins et al. (2013) and Petersen (2009), we cluster standard errors by country to account for the possibility that firm characteristics are correlated between firms within a country.[4] Table 6.3 presents the results.

**Figure 6.3:** This figure shows the evolution of daily logarithmic stock returns of different samples for the period from January 1, 2020 to September 23, 2020. We consider all firms in our sample and two subsamples consisting of *High IR* firms and *Low IR* firms. We classify firms using the median *IR Score* within the respective country.


[4]In unreported regressions, we also cluster standard errors by country and industry. Nonetheless, we find qualitatively similar results.

**Table 6.3:** This table presents the results from OLS regressions. In Panel A, the dependent variable is a firm's cumulative raw stock return for the period from February 3, 2020 to March 23, 2020, which is the collapse period as defined in Fahlenbrach et al. (2020). The main independent variable of interest is *High IR*, which equals one if the firm's IR score is larger than the median IR score within the respective country. Across all columns, we control for industry-fixed effects based on the Global Industry Classification Standard's (GICS) 11 sectors. In columns (2) to (4), we include country-fixed effects. In columns (3) and (4), we additionally include controls for a variety of firm characteristics. Finally, in column (4) we also include several board characteristics and the dummy variable *High ES* to control for firms with high ES ratings. All variables are described in detail in Table E1 in the appendix. In Panel B, the dependent variable is a firm's cumulative abnormal return (based on market model estimations) for the period from February 3, 2020 to March 23, 2020. The regression specifications are similar to those in Panel A. Across all panels, we report robust standard errors clustered by country in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| **Panel A:**<br>Dependent Variable: *Raw returns* | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| High IR | 0.0579*** | 0.0626*** | 0.0804*** | 0.0476* |
| | (0.0108) | (0.0202) | (0.0196) | (0.0265) |
| Size | | | −0.0087 | −0.0117 |
| | | | (0.0106) | (0.0124) |
| ROE | | | 0.2723 | 0.3677 |
| | | | (0.2905) | (0.2688) |
| Tobin's Q | | | 0.0222*** | 0.0211*** |
| | | | (0.0060) | (0.0062) |
| Market-to-Book | | | −0.0016 | −0.0033 |
| | | | (0.0020) | (0.0025) |
| Historical Volatility | | | −0.3700*** | −0.3123** |
| | | | (0.1238) | (0.1478) |
| Cash / Assets | | | 0.0522 | 0.1009 |
| | | | (0.0812) | (0.0908) |
| Short-term Debt / Assets | | | −0.1729 | −0.2984 |
| | | | (0.1974) | (0.2279) |
| Long-term Debt / Assets | | | −0.3202*** | −0.2686*** |
| | | | (0.0697) | (0.0645) |
| Momentum | | | 0.0334** | 0.0534*** |
| | | | (0.0132) | (0.0148) |
| Analyst Following | | | −0.0270 | 0.0150 |
| | | | (0.0277) | (0.0243) |
| Blockholder | | | 0.0452 | 0.0693 |
| | | | (0.0510) | (0.0522) |
| Institutional Ownership | | | 0.0231 | 0.0285 |
| | | | (0.0466) | (0.0487) |
| US Listing | | | 0.0985*** | 0.0640** |
| | | | (0.0213) | (0.0287) |
| High ES | | | | 0.0668** |
| | | | | (0.0318) |
| Board Size | | | | −0.0036 |
| | | | | (0.0034) |
| Board Independence | | | | 0.0180 |
| | | | | (0.0346) |
| Board Governance Score | | | | −0.1045*** |
| | | | | (0.0306) |
| Observations | 947 | 947 | 710 | 558 |
| Industry Fixed Effects | yes | yes | yes | yes |
| Country Fixed Effects | no | yes | yes | yes |
| Adjusted R-Squared | 0.01 | 0.01 | 0.16 | 0.15 |

| **Panel B:** Dependent Variable: *Abnormal returns* | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| High IR | 0.1186*** | 0.1247*** | 0.0997*** | 0.0696*** |
| | (0.0095) | (0.0216) | (0.0217) | (0.0260) |
| Size | | | 0.0090 | 0.0046 |
| | | | (0.0125) | (0.0107) |
| ROE | | | 0.3717 | 0.3495 |
| | | | (0.2795) | (0.3157) |
| Tobin's Q | | | 0.0267*** | 0.0227*** |
| | | | (0.0054) | (0.0063) |
| Market-to-Book | | | −0.0012 | −0.0011 |
| | | | (0.0017) | (0.0022) |
| Historical Volatility | | | −0.0999 | −0.0345 |
| | | | (0.1359) | (0.1589) |
| Cash / Assets | | | 0.0855 | 0.1069 |
| | | | (0.0634) | (0.0747) |
| Short-term Debt / Assets | | | −0.2121 | −0.4052* |
| | | | (0.1907) | (0.2202) |
| Long-term Debt / Assets | | | −0.2878*** | −0.2414*** |
| | | | (0.0635) | (0.0661) |
| Momentum | | | −0.0934*** | −0.0759*** |
| | | | (0.0101) | (0.0155) |
| Analyst Following | | | 0.0174 | 0.0525** |
| | | | (0.0290) | (0.0213) |
| Blockholder | | | −0.0225 | 0.0271 |
| | | | (0.0482) | (0.0535) |
| Institutional Ownership | | | 0.0026 | 0.0088 |
| | | | (0.0468) | (0.0410) |
| US Listing | | | 0.1002*** | 0.0821*** |
| | | | (0.0211) | (0.0270) |
| High ES | | | | 0.0391 |
| | | | | (0.0316) |
| Board Size | | | | −0.0014 |
| | | | | (0.0030) |
| Board Independence | | | | 0.0198 |
| | | | | (0.0349) |
| Board Governance Score | | | | −0.0702 |
| | | | | (0.0427) |
| Observations | 947 | 947 | 710 | 558 |
| Industry Fixed Effects | yes | yes | yes | yes |
| Country Fixed Effects | no | yes | yes | yes |
| Adjusted R-Squared | 0.05 | 0.05 | 0.19 | 0.15 |

In Panel A, we use the firm's cumulative raw stock return as the dependent variable and *High IR* as our independent variable of interest. Across all columns, we find positive and highly statistically significant coefficients on *High IR*. The coefficients are also comparable in size regardless of whether we control for industry-fixed effects only (column (1)), industry and country-fixed effects (column (2)), or industry and country-fixed effects as well as for further firm (column (3)) and governance characteristics (column (4)). The two reasons why we control for governance characteristics are that (I) a firm's IR activities could complement or substitute some aspects of corporate governance, and that (II) recent research suggests well-governed firms to perform better during times of crisis (Lins et al., 2013; Nguyen et al., 2015). Considering that we still find a positive and statistically significant association after controlling for all of these factors, we can conclude that firms with strong IR experienced on average at least 4.76 percentage points higher returns when stock markets collapsed. This is an economically sizeable effect. In terms of control variables, we also find positive and statistically significant coefficients on *Momentum*, *Tobin's Q*, *US Listing* and *High ES*, and negative and statistically significant coefficients on *Historical Volatility*, *Long-term Debt / Assets* and *Board Governance Score*. These results are mainly in line with the related literature showing firms with stronger ES performance, higher financial flexibility and better past performance to experience higher returns during the COVID-19 crisis (see e.g. Albuquerque et al., 2020; Ding et al., 2020; Fahlenbrach et al., 2020). Interestingly, we also find that well-governed firms appear to have performed worse and that there is no significant relationship between a firm's stock performance during the crisis and its ownership structure or its informational environment.

In Panel B, we run the same regressions using a firm's cumulative abnormal stock return (based on a market model estimation) as the dependent variable and *High IR* as our independent variable of interest. Again, we find positive and highly statistically significant coefficients on *High IR* across all columns; thus strengthening our findings from Panel A. As a matter of fact, adjusting for firm risk leads to larger magnitudes of the coefficients on *High IR*. Firms with better-quality IR are associated with at least 6.96 percentage points higher abnormal returns compared to those with lower-quality IR. Regarding our control variables, the results show a similar picture to the one found in Panel A, except for the negative coefficient on *Momentum* and the positive and statistically significant coefficient on *Analyst Following* in column (4). Also, statistical significance vanishes regarding the *Board Governance Score*.

To ensure that our results also hold when we use alternative measures for a firm's IR quality, we rerun the same regressions as in Panel B of Table 6.3 but use the natural logarithm of the raw IR scores as well as dummy variables for each IR quartile as our main independent variables of interest. Table 6.4 presents the results where we do not report the coefficients on the control variables for reasons of brevity.

**Table 6.4:** This table presents the results from OLS regressions. In Panel A, the dependent variable is a firm's cumulative abnormal stock return for the period from February 3, 2020 to March 23, 2020, which is the collapse period as defined in Fahlenbrach et al. (2020). The main independent variable of interest is *log(IR Score)* which is the natural logarithm of the raw IR score. In Panel B, we use the cumulative abnormal return as the dependent variable and dummy variables for the IR quartiles per country. *IR Score Q2* takes the value of one if the firm is in the second IR quartile and zero otherwise, *IR Score Q3* takes the value of one if the firm is in the third IR quartile and zero otherwise, and *IR Score Q4* takes the value of one if the firm is in the fourth IR quartile and zero otherwise. Across all panels, we control for industry-fixed effects based on the Global Industry Classification Standard's (GICS) 11 sectors in all regressions. We include country-fixed effects in columns (2) to (4). In columns (3) and (4), we additionally include controls for a variety of firm and board characteristics (not reported but similar to those used in Table 6.3). All variables are described in detail in Table E1 in the appendix. Across all panels, we report robust standard errors clustered by country in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| **Panel A:**<br>Dependent Variable: *Abnormal returns* | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| *log*(IR Score) | 0.0846*** | 0.1506*** | 0.1430*** | 0.1103*** |
| | (0.0114) | (0.0192) | (0.0220) | (0.0228) |
| Observations | 947 | 947 | 710 | 558 |
| Firm characteristics | no | no | yes | yes |
| Board characteristics | no | no | no | yes |
| Industry Fixed Effects | yes | yes | yes | yes |
| Country Fixed Effects | no | yes | yes | yes |
| Adjusted R-Squared | 0.03 | 0.06 | 0.19 | 0.16 |

| **Panel B:**<br>Dependent Variable: *Abnormal returns* | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| IR Score 2 | 0.0678*** | 0.0616* | 0.0669*** | 0.0576** |
| | (0.0158) | (0.0319) | (0.0248) | (0.0260) |
| IR Score 3 | 0.1217*** | 0.1253*** | 0.1173*** | 0.0873** |
| | (0.0200) | (0.0333) | (0.0348) | (0.0398) |
| IR Score 4 | 0.1839*** | 0.1859*** | 0.1773*** | 0.1385*** |
| | (0.0131) | (0.0362) | (0.0257) | (0.0355) |
| Observations | 947 | 947 | 710 | 558 |
| Firm characteristics | no | no | yes | yes |
| Board characteristics | no | no | no | yes |
| Industry Fixed Effects | yes | yes | yes | yes |
| Country Fixed Effects | no | yes | yes | yes |
| Adjusted R-Squared | 0.06 | 0.07 | 0.20 | 0.15 |

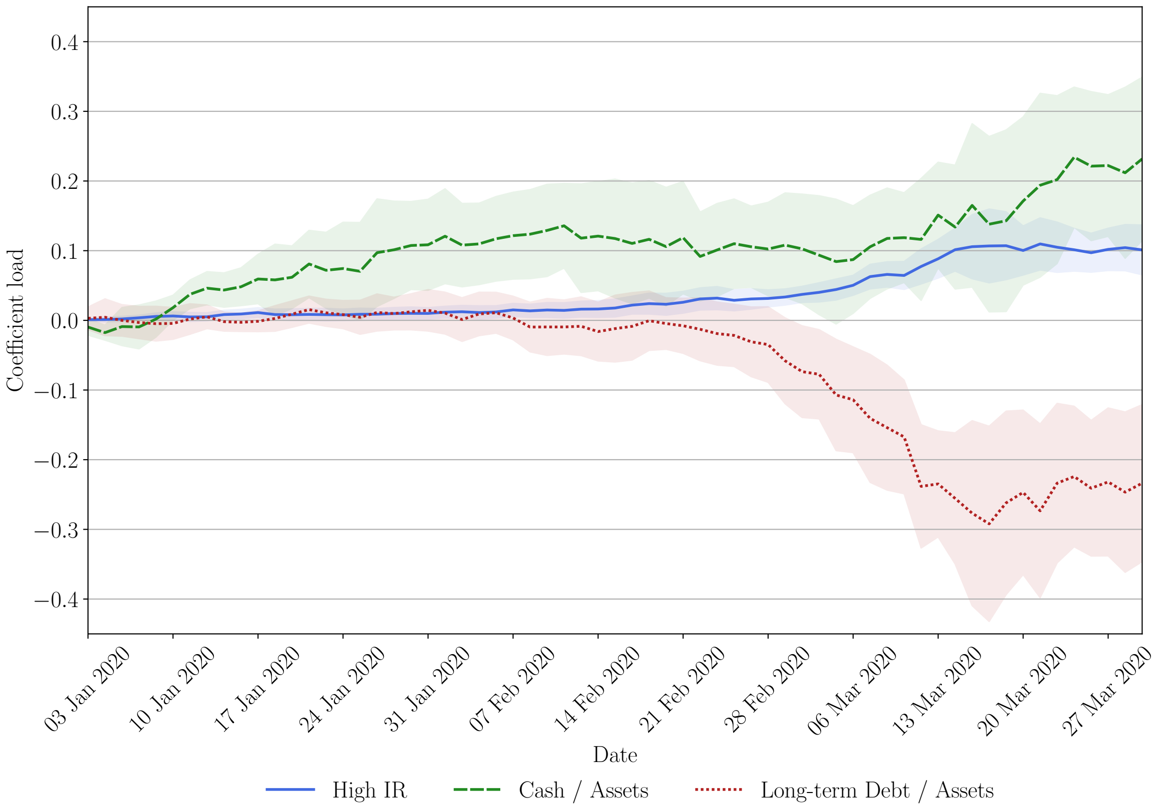
In Panel A, we report the results from regressions where we use the firm's cumulative abnormal stock return as the dependent variable and the natural logarithm of the raw IR scores as the main independent variable. Similar to our previous results, we find firms with higher-quality IR to be associated with higher abnormal stock returns during the crisis. Interestingly, controlling for country-fixed effects (columns (2) to (4)) does not only lead to an improvement in terms of fit, but also to a significant increase in magnitude of the coefficient on *High IR*. However, controlling for further firm and governance characteristics (columns (3) and (4)) does not change the magnitude of the coefficient significantly.

In Panel B, we show the results from regressions where the dependent variable is the firm's cumulative abnormal stock return and where we divide firms into IR quartiles. This approach helps us to analyze whether the positive association between a firm's IR quality and the abnormal stock returns during the crisis is more pronounced at very high or very low levels. In each regression, we therefore include the dummy variables *IR Score Q2* (taking the value of one if the firm is in the second IR quartile), *IR Score Q3* (taking the value of one if the firm is in the third IR quartile), and *IR Score Q4* (taking the value of one if the firm is in the fourth IR quartile). The intercept captures the effect of firms being in the first quartile. Consistent with our previous findings, we find firms with better IR to experience higher abnormal returns during the crisis. Particularly, the results show that the difference in abnormal returns between firms in the best quartile and those in the worst quartile is at least 13.85 percentage points. This is an economically sizeable effect considering that mean cumulative abnormal returns amount to $-14.44\%$. Furthermore, it is noteworthy that although the relation between IR and the cumulative abnormal returns during the collapse period is monotonic, it is not completely linear when we control for further governance characteristics. For instance, we find firms being in the second quartile to experience almost 6 percentage points higher abnormal returns compared to those in the first quartile. However, the results show only a 2.97 percentage points improvement when firms are in the third quartile (compared to those in the second quartile), and another 5.12 percentage points improvement when firms are in the best quartile. We can therefore conclude that those firms with very weak IR were particularly affected during the COVID-19 crisis.

### 6.4.2 The Importance of IR during and after the Crisis

To further test whether investors particularly favored firms with better IR during the crisis period, we perform daily cross-sectional regressions with the same model specifications as in column (3) of Panel B (Table 6.3). This test allows us to study whether the importance of IR increased when the COVID-19 crisis unfolded. Similar to Albuquerque et al. (2020), we choose January 2, 2020 as our starting point and calculate abnormal returns for this particular trading day. From this point on, we gradually expand the window by one additional trading day, calculate the respective cumulative abnormal returns for the time window and run the regression. Figure 6.4 displays the results.

**Figure 6.4:** This figure shows the evolution of coefficients and the respective 90% confidence intervals from daily cross-sectional regressions with the same model specifications as in column (3) of Panel B (Table 6.3). We report the daily coefficient loadings on the variables *High IR*, *Cash / Assets*, and *Long-term Debt / Assets* for the period from January 3, 2020 to March 27, 2020.



For better orientation, we show the evolution of the coefficients on our variable of interest *High IR* as well as on *Cash / Assets* and *Long-term Debt / Assets*.

We find that the loading of the coefficients on *High IR* increases and that they become statistically significant when stock markets collapsed beginning in late-February. While the coefficients on *High IR* are almost zero and mostly statistically insignificant at the beginning of the year, the coefficient is largest (10.96%) and highly statistically significant (1% level) using the time window from January 2, 2020 to March 23, 2020. This provides support for our hypothesis stating that firms with better two-way communication performed significantly better during the COVID-19 crisis since they may have reduced uncertainty and information frictions among market participants. It is also noteworthy that we find the coefficient on *Cash / Assets* to increase as well, while the coefficient on *Long-term Debt / Assets* decreases. As already mentioned before, this is in line with the findings from Albuquerque et al. (2020), Ding et al. (2020), and Fahlenbrach et al. (2020).

Next, we perform difference-in-differences estimations similar to Lins et al. (2017) and Albuquerque et al. (2020) as an identification strategy to establish an even tighter link between the stock performance of firms with strong IR and the COVID-19 crisis. Specifically, we construct a panel of daily abnormal returns for all firms in our sample for the period from January 1, 2020 through October 6, 2020. Using this panel, we estimate the following regression:

$$\begin{aligned} Abnormal\ return_{i,t} = \beta_0 + \beta_1 \times High\ IR_i \times crisis_t + \beta_2 \times High\ IR_i \times post\ crisis_t \\ + \alpha_k + \alpha_t + \varepsilon_{i,t} \end{aligned} \tag{6.4.2}$$

where $i$ is the firm, $t$ is the trading day and $\varepsilon_{i,t}$ denotes the error term. We use *High IR* as our treatment variable and interact it with the variables *crisis* and *post crisis*. The variable *crisis* is a dummy variable equalling one for all dates between February 24, 2020 and March 23, 2020, and zero otherwise. As outlined in Ramelli and Wagner (2020), this is the period where stock markets fell dramatically. The variable *post crisis* is also a dummy variable, which equals one for all dates from March 24, 2020 onwards, and zero otherwise. Thus, this variable covers the period where stock markets were recovering. The terms $\alpha_k$ and $\alpha_t$, respectively, denote firm-fixed effects and day-fixed effects. We report the results from these regressions in Table 6.5, where standard errors are clustered by firm and day. To ensure that the parallel trends assumption is not violated, we also perform the same formal test as in Albuquerque et al. (2020). Hence, we run a regression of daily abnormal returns on *High IR* for the period from January 1, 2020 to February 23, 2020. Although not reported for reasons of brevity, we can assure that there is no statistically significant relation between *High IR* and the daily abnormal returns.

**Table 6.5:** This table presents the results from difference-in-differences regressions. The dependent variable is a firm's daily abnormal return for the period from January 1, 2020 to October 6, 2020. *High IR* is our treatment variable and we interact it with the variables *crisis* and *post crisis*. The variable *crisis* is a dummy variable equalling one for all dates between February 24, 2020 and March 23, 2020, and zero otherwise. The variable *post crisis* is a dummy variable equalling one for all dates after March 24, 2020, and zero otherwise. In column (1) we do not include any fixed effects, while in column (2) we include firm and day-fixed effects. Thus, we omit the individual terms. All variables are described in detail in Table E1 in the appendix. We report robust standard errors clustered by firm and day in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| Dependent Variable: *Abnormal returns* | (1) | (2) |
|---|---|---|
| High IR × crisis | 0.0040*** | 0.0040*** |
| | (0.0012) | (0.0012) |
| High IR × post crisis | −0.0005 | −0.0005 |
| | (0.0003) | (0.0003) |
| High IR | 0.0004 | |
| | (0.0003) | |
| crisis | −0.0076*** | |
| | (0.0021) | |
| post crisis | 0.0008 | |
| | (0.0006) | |
| Observations | 189,400 | 189,400 |
| Firm Fixed Effects | no | yes |
| Day Fixed Effects | no | yes |
| Adjusted R-Squared | 0.010 | 0.001 |

In column (1) of Table 6.5, we show the results from a regression where we include all interactions and individual effects, but omit fixed effects. In column (2), we report the results from a regression where we include the interactions and firm and day-fixed effects; thus we omit the individual effects. Regardless of the specification, we find positive and statistically significant coefficients on the interaction between *High IR* and *crisis*, and negative but statistically insignificant coefficients on the interaction between *High IR* and *post crisis*. The positive coefficients indicate that firms with strong IR experienced on average 0.40 percentage points higher daily abnormal returns during the period where stock markets collapsed. Cumulating these daily gains over the whole crisis period yields an average abnormal return surplus of approximately 8.80 percentage points, which is comparable to the results from our baseline estimations. It may appear surprising that we do not find a statistically significant reversal in abnormal returns in the post-crisis period. Yet, this may be due to the fact that the level of uncertainty on financial markets was still high after the initial shock since a vaccine was not immediately available and governments were imposing severe restrictions.

### 6.4.3 Differentiating between Public and Private IR

After having shown that IR is generally valuable during the crisis, we examine which functions of IR particularly drive our results. We follow Brochet et al. (2020) and decompose a firm's IR score into a public and a private component. While the public component aims at capturing the impact of those IR activities primarily related to public events and disclosure quality on our IR score, the private component aims at capturing the impact of activities primarily related to private interactions (e.g. meetings with senior management) between a firm and its investor base. In their analysis, Brochet et al. (2020) highlight that both functions of IR contribute significantly to better capital market outcomes. It is, however, questionable whether this finding persists during the COVID-19 crisis. This is because the COVID-19 crisis did not only cause significant uncertainty about a firm's future cash flows but also posed additional challenges for public investor events due to the potential risk of infection.

To investigate the relationship between firms' crisis returns and the public and private components of IR, we use a two-stage regression approach. As a first stage, we run a regression of the natural logarithm of the IR score on three variables related to a firm's public IR functions, namely *Guidance*, *Conferences*, and *US Listing*; and additionally include industry and country-fixed effects. Similar to Brochet et al. (2020), we find all three variables to be positively and statistically significantly related to the IR score. We then use the fitted values from this first stage regression as the firms' *Public IR Score*, while we use the residuals, i.e. the part that is not explained by a firm's public IR activities, as the firms' *Private IR Score*. Additionally, we construct the dummy variables *Public IR* and *Private IR*, which equal one if the respective score is larger

**Table 6.6:** This table presents the results from OLS regressions. The dependent variable is a firm's cumulative abnormal return (based on market model estimations) for the period from February 3, 2020 to March 23, 2020, which is the collapse period as defined in Fahlenbrach et al. (2020). In column (1), the main independent variables of interest are a firm's *Public IR Score* and the respective *Private IR Score*. To construct the public and private components of IR, we run a regression of the natural logarithm of the IR score on three variables related to a firm's public IR functions, namely *Guidance*, *Conferences*, and *US Listing*. We employ the fitted values as firms' *Public IR Score* and the residuals as firms' *Private IR Score*. In column (2) we use the dummy variables *Public IR* and *Private IR*, which equal one if the respective score is larger than the sample median, and zero otherwise. Across all columns, we control for country-fixed effects and industry-fixed effects based on the Global Industry Classification Standard's (GICS) 11 sectors and a variety of firm characteristics. All variables are described in detail in Table E1 in the appendix. We report robust standard errors clustered by country in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| Dependent Variable: *Abnormal returns* | (1) | (2) |
|---|---|---|
| Public IR Score | 0.0300 | |
| | (0.0792) | |
| Private IR Score | 0.1503*** | |
| | (0.0214) | |
| Public IR | | 0.0066 |
| | | (0.0347) |
| Private IR | | 0.0858*** |
| | | (0.0111) |
| Size | 0.0071 | 0.0115 |
| | (0.0140) | (0.0130) |
| ROE | 0.3652 | 0.3535 |
| | (0.2806) | (0.2933) |
| Tobin's Q | 0.0279*** | 0.0282*** |
| | (0.0058) | (0.0058) |
| Market-to-Book | −0.0020 | −0.0018 |
| | (0.0015) | (0.0014) |
| Historical Volatility | −0.1128 | −0.1085 |
| | (0.1439) | (0.1413) |
| Cash / Assets | 0.0625 | 0.1024 |
| | (0.0718) | (0.0656) |
| Short-term Debt / Assets | −0.1743 | −0.1733 |
| | (0.1891) | (0.1997) |
| Long-term Debt / Assets | −0.2956*** | −0.2899*** |
| | (0.0638) | (0.0627) |
| Momentum | −0.0995*** | −0.0957*** |
| | (0.0096) | (0.0104) |
| Analyst Following | 0.0214 | 0.0304 |
| | (0.0261) | (0.0269) |
| Blockholder | −0.0201 | −0.0241 |
| | (0.0530) | (0.0527) |
| Institutional Ownership | −0.0021 | 0.0065 |
| | (0.0471) | (0.0469) |
| US Listing | 0.1199*** | 0.1170*** |
| | (0.0346) | (0.0283) |
| Observations | 710 | 710 |
| Industry Fixed Effects | yes | yes |
| Country Fixed Effects | yes | yes |
| Adjusted R-Squared | 0.20 | 0.18 |

than the sample median, and zero otherwise. As a second stage, we then run the same regressions as in the previous sections replacing the variable *High IR* with the respective scores and dummy variables. The results from these regressions are presented in Table 6.6 and Table 6.7.

In Table 6.6, we show the results from our baseline regression.[5] We employ the raw scores in column (1) and the dummy variables in column (2). In both columns, we find the coefficient on our variable proxying for a firm's private IR functions to be positive and highly statistically significant; and the coefficient on the variables proxying for a firm's public IR functions to be positive but statistically insignificant. In terms of effect size, the coefficient on *Private IR* in column (2) indicates that those firms with strong private IR experienced 8.58 percentage points higher cumulative abnormal returns during the crisis period than those with weak private IR. This effect is almost similar in size compared to the one we observe using our dummy variable *High IR*.

In Table 6.7, we present the results from the difference-in-differences regressions replacing *High IR* with the respective dummy variables for the IR functions. Same as in the baseline regression, we find firms with better-quality private IR to perform significantly better during the crisis period. In both columns, the coefficients on the interaction between *Private IR* and *crisis* are positive and statistically significant, while the coefficients on the interaction between *Public IR* and *crisis* are positive but not statistically significant at conventional levels. Also, we cannot observe a sign of reversal in the post-crisis period.

Overall, the results in this section suggest that a firm's private IR functions are the main driver of the valuation effects during the COVID-19 crisis. A reason for this result may be that firms with better-quality private IR were particularly able to alleviate investors' uncertainty about a firm's prospects (e.g. through the use of meetings with senior management). Also, considering that the COVID-19 crisis posed great challenges to a firm's public IR activities, especially public investor events, it is not surprising that public IR activities are not associated with higher returns during the collapse period.

[5]The regression specification is similar to the one used in column (3) of Panel B of Table 6.3.

**Table 6.7:** This table presents the results from difference-in-differences regressions. The dependent variable is a firm's daily abnormal return for the period from January 1, 2020 to October 6, 2020. The main independent variables of interest are *Public IR* and *Private IR*. To construct the public and private components of IR, we run a regression of the natural logarithm of the IR score on three variables related to a firm's public IR functions, namely *Guidance*, *Conferences*, and *US Listing*. We employ the fitted values as firms' *Public IR Score* and the residuals as firms' *Private IR Score* and construct the dummy variables *Public IR* and *Private IR*, which equal one if the respective score is larger than the sample median, and zero otherwise. We then use *Public IR* and *Private IR* as our treatment variables and we interact them with the variables *crisis* and *post crisis*. The variable *crisis* is a dummy variable equalling one for all dates between February 24, 2020 and March 23, 2020, and zero otherwise. The variable *post crisis* is a dummy variable equalling one for all dates after March 24, 2020, and zero otherwise. In column (1) we do not include any fixed effects, while in column (2) we include firm and day-fixed effects. Thus, we omit the individual terms. All variables are described in detail in Table E1 in the appendix. We report robust standard errors clustered by firm and day in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| Dependent Variable: *Abnormal returns* | (1) | (2) |
|---|---|---|
| Public IR × crisis | 0.0015 | 0.0015 |
| | (0.0013) | (0.0013) |
| Private IR × crisis | 0.0032*** | 0.0032*** |
| | (0.0009) | (0.0009) |
| Public IR × post crisis | −0.0005 | −0.0005 |
| | (0.0003) | (0.0003) |
| Private IR × post crisis | −0.0005 | −0.0005 |
| | (0.0003) | (0.0003) |
| Public IR | 0.0001 | |
| | (0.0003) | |
| Private IR | 0.0007*** | |
| | (0.0003) | |
| crisis | −0.0078*** | |
| | (0.0023) | |
| post crisis | 0.0010 | |
| | (0.0006) | |
| Observations | 189,400 | 189,400 |
| Firm Fixed Effects | no | yes |
| Day Fixed Effects | no | yes |
| Adjusted R-Squared | 0.010 | 0.001 |

### 6.4.4 Enhancement of Credibility or Diversification of Shareholder Base

We next examine how a firm's IR functions and particularly private IR functions have boosted its firm value during the crisis period. One potential reason may be that (private) IR helps to enhance credibility with its (incumbent) institutional investors, who are the main targets of a firm's IR activities. Another reason may be that IR helps to diversify a firm's shareholder base, which in fact could also reduce stock volatility.

To address the first aspect, we run several fractional generalized linear models (GLM)[6] where we regress our variable *% Staying Inst. Investors*, i.e. the fraction of those incumbent institutional investors who stayed loyal to the firm during the crisis period, on our measures for a firm's IR quality and a variety of control variables. If a firm's IR quality helps to enhance credibility with its incumbent institutional investors, we can expect that a large proportion of them stayed invested in firms with better-quality IR over the crisis period. Table 6.8 reports our results.

In column (1), we measure a firm's IR quality using our dummy variable *High IR*. Consistent with our hypothesis, we find positive and statistically significant coefficients on *High IR*. In terms of marginal effects, we find that firms with better-quality IR are associated with an almost 0.5 percentage points higher fraction of incumbent institutional investors staying loyal to the firm during the market collapse compared to firms with lower-quality IR. This is an economically sizeable effect considering that the mean of *% Staying Inst. Investors* is roughly 95%. Regarding the control variables, we also find the proportion of institutional investors staying loyal to the firm to be larger at firms with better prior firm performance and a higher proportion of institutional ownership.

In columns (2) and (3), we replace *High IR* with our raw scores and the dummy variables for the public and private components of a firm's IR. While a firm's private IR quality appears to be positively associated with the proportion of institutional investors staying loyal to the firm over the crisis period, there is some slight indication that the association is negative for a firm's public IR quality (column (2)), but statistical significance vanishes when using the dummy variables (column (3)).

[6] To ensure robust estimation results, we employ a fractional generalized linear model (GLM) because our response variable is a fraction (for an overview, see e.g. Papke and Wooldridge, 1996). In unreported regression, we also employ OLS regressions and obtain qualitatively similar results.

**Table 6.8:** This table shows the results from fractional GLM regressions. The dependent variable *% Staying Inst. Investors* is the fraction of those incumbent institutional investors who stayed loyal to the firm during the crisis period (i.e. the first quarter of 2020). In column (1), the main independent variable of interest is *High IR*, which equals one if the firm's IR score is larger than the median IR score within the respective country. In column (2), the main independent variables of interest are a firm's *Public IR Score* and the respective *Private IR Score*. To construct the public and private components of IR, we run a regression of the natural logarithm of the IR score on three variables related to a firm's public IR functions, namely *Guidance*, *Conferences*, and *US Listing*. We employ the fitted values as firms' *Public IR Score* and the residuals as firms' *Private IR Score*. In column (3) we use the dummy variables *Public IR* and *Private IR*, which equal one if the respective score is larger than the sample median, and zero otherwise. We report the marginal effects (ME) of the respective coefficients next to each regression specification. Across all columns, we control for country-fixed effects and industry-fixed effects based on the Global Industry Classification Standard's (GICS) 11 sectors and a variety of firm characteristics. All variables are described in detail in Table E1 in the appendix. We report robust standard errors clustered by country in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| Dependent Variable: *% Staying Inst. Investors* | (1) | ME | (2) | ME | (3) | ME |
|---|---|---|---|---|---|---|
| High IR | 0.1160** | 0.0047** | | | | |
| | (0.0451) | (0.0018) | | | | |
| Public IR Score | | | −0.4490** | −0.0181** | | |
| | | | (0.2010) | (0.0081) | | |
| Private IR Score | | | 0.1620** | 0.0066** | | |
| | | | (0.0745) | (0.0030) | | |
| Public IR | | | | | −0.0936 | −0.0038 |
| | | | | | (0.1190) | (0.0049) |
| Private IR | | | | | 0.1540** | 0.0062** |
| | | | | | (0.0606) | (0.0024) |
| Size | 0.0306 | 0.0012 | 0.0406 | 0.0016 | 0.0334 | 0.0014 |
| | (0.0302) | (0.0012) | (0.0293) | (0.0012) | (0.0290) | (0.0012) |
| ROE | −0.1740 | −0.0070 | −0.2210 | −0.0089 | −0.2030 | −0.0082 |
| | (0.1700) | (0.0069) | (0.1740) | (0.0070) | (0.1750) | (0.0071) |
| Tobin's Q | 0.0385*** | 0.0016*** | 0.0380*** | 0.0015*** | 0.0375*** | 0.0015*** |
| | (0.0124) | (0.0005) | (0.0123) | (0.0005) | (0.0111) | (0.0004) |
| Market-to-Book | −0.0026*** | −0.0001*** | −0.0028*** | −0.0001*** | −0.0028*** | −0.0001*** |
| | (0.0006) | (0.0000) | (0.0006) | (0.0000) | (0.0006) | (0.0000) |
| Historical Volatility | −0.4050* | −0.0163* | −0.4140* | −0.0167* | −0.4190* | −0.0169* |
| | (0.2450) | (0.0099) | (0.2460) | (0.0099) | (0.2420) | (0.0098) |
| Cash / Assets | 0.4440* | 0.0179* | 0.3990 | 0.0161 | 0.4680* | 0.0189* |
| | (0.2620) | (0.0106) | (0.2640) | (0.0107) | (0.2690) | (0.0108) |
| Short-term Debt / Assets | 0.1500 | 0.0060 | 0.1690 | 0.0068 | 0.1850 | 0.0075 |
| | (0.4940) | (0.0200) | (0.4540) | (0.0183) | (0.4840) | (0.0195) |
| Long-term Debt / Assets | −0.0122 | −0.0005 | −0.0744 | −0.0030 | −0.0282 | −0.0011 |
| | (0.1520) | (0.0061) | (0.1600) | (0.0065) | (0.1480) | (0.0060) |
| Momentum | 0.2210*** | 0.0089*** | 0.2180*** | 0.0088*** | 0.2200*** | 0.0088*** |
| | (0.0385) | (0.0015) | (0.0403) | (0.0016) | (0.0392) | (0.0016) |
| Analyst Following | 0.0652 | 0.0026 | 0.1120** | 0.0045** | 0.0807* | 0.0032* |
| | (0.0458) | (0.0018) | (0.0475) | (0.0019) | (0.0423) | (0.0017) |
| Blockholder | −0.0223 | −0.0009 | −0.0476 | −0.0019 | −0.0333 | −0.0013 |
| | (0.1160) | (0.0047) | (0.1090) | (0.0044) | (0.1130) | (0.0046) |
| Institutional Ownership | 0.2990*** | 0.0121*** | 0.2970*** | 0.0120*** | 0.3120*** | 0.0126*** |
| | (0.0841) | (0.0034) | (0.0817) | (0.0033) | (0.0789) | (0.0032) |
| US Listing | −0.2320 | −0.0094 | −0.0559 | −0.0023 | −0.1650 | −0.0067 |
| | (0.2700) | (0.0109) | (0.2890) | (0.0117) | (0.2820) | (0.0114) |
| Observations | 710 | 710 | 710 | 710 | 710 | 710 |
| Industry Fixed Effects | yes | yes | yes | yes | yes | yes |
| Country Fixed Effects | yes | yes | yes | yes | yes | yes |
| R-Squared | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |

However, it is important to mention that the magnitude of the coefficient on the dummy variable *Private IR* is even larger than the magnitude of the coefficient on *High IR*. This suggest a firm's private IR activities, such as meetings with senior management, to be of significant importance for institutional investors since they might reduce uncertainty and information frictions, and enhance a firm's credibility.

In Table 6.9, we split the incumbent institutional investors by their countries of origin and repeat the analysis using the two dummy variables *Public IR* and *Private IR* as our main independent variables. The rationale is that IR activities might focus on domestic institutional investors since a firm's shareholder base is originally domestic (Karolyi et al., 2020). Differentiating between domestic and foreign institutional investors, however, leaves our findings qualitatively unchanged. Although the results are slightly more pronounced regarding domestic institutional investors, we find that a firm's private IR quality is positively associated with institutional investor loyalty in both regressions.

To investigate the second aspect that IR could also help to diversify a firm's shareholder base, we perform several OLS regressions where the dependent variable is the change in the number of all institutional owners during the crisis period and the main independent variables are our measures for IR quality. If IR helps to diversify a firm's shareholder base, we expect to find positive coefficients on our variables of interests. Table 6.10 displays our results.

In column (1), we employ *High IR* as our main independent variable of interest and find a positive and highly statistically significant association with the change in the number of institutional owners. This is in line with the notion of IR activities helping to diversify a firm's shareholder base and thus to increase firm value during the crisis. Our results also show that the change in the number of institutional owners during the crisis period was more positive for firms with better prior firm performance and a larger proportion of institutional ownership; and more negative for firms with higher ratios of debt to assets.

In columns (2) and (3), we again replace *High IR* with our raw scores and the dummy variables for the public and private components of a firm's IR. Similar to the picture found in the fractional GLM regressions, we find a firm's private IR quality to be positively associated with the change in the number of institutional owners over the crisis period, while there is some slight indication that the association is negative for a firm's public IR quality.

**Table 6.9:** This table shows the results from fractional GLM regressions. The dependent variable of interest in column (1) ((2)) is *% Staying Domestic Inst. Investors* (*% Staying Foreign Inst. Investors*) which is the fraction of those incumbent domestic (foreign) institutional investors who stayed loyal to the firm during the crisis period (i.e. the first quarter of 2020). The main independent variables of interest are *Public IR* and *Private IR*. To construct the public and private components of IR, we run a regression of the natural logarithm of the IR score on three variables related to a firm's public IR functions, namely *Guidance*, *Conferences*, and *US Listing*. We employ the fitted values as firms' *Public IR Score* and the residuals as firms' *Private IR Score*. Across all columns, we then use the dummy variables *Public IR* and *Private IR*, which equal one if the respective score is larger than the sample median, and zero otherwise. We report the marginal effects (ME) of the respective coefficients next to each regression specification. Across all columns, we control for country-fixed effects and industry-fixed effects based on the Global Industry Classification Standard's (GICS) 11 sectors and a variety of firm characteristics. All variables are described in detail in Table E1 in the appendix. We report robust standard errors clustered by country in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| Dependent Variable: | *% Staying Domestic Inst. Investors* | | *% Staying Foreign Inst. Investors* | |
|---|---|---|---|---|
| | (1) | ME | (2) | ME |
| Public IR | −0.0652 | −0.0024 | −0.1170 | −0.0048 |
| | (0.1110) | (0.0041) | (0.1180) | (0.0049) |
| Private IR | 0.1970*** | 0.0072*** | 0.1340* | 0.0055* |
| | (0.0731) | (0.0027) | (0.0755) | (0.0031) |
| Size | 0.0217 | 0.0008 | 0.0348 | 0.0014 |
| | (0.0318) | (0.0012) | (0.0355) | (0.0015) |
| ROE | −0.2860 | −0.0104 | −0.0725 | −0.0029 |
| | (0.3350) | (0.0122) | (0.1490) | (0.0061) |
| Tobin's Q | 0.0136 | 0.0005 | 0.0335*** | 0.0014*** |
| | (0.0148) | (0.0005) | (0.0120) | (0.0005) |
| Market-to-Book | −0.0020** | −0.0001** | 0.0017 | 0.0001 |
| | (0.0009) | (0.0000) | (0.0026) | (0.0001) |
| Historical Volatility | −0.1940 | −0.0071 | −0.4040* | −0.0165* |
| | (0.2280) | (0.0083) | (0.2240) | (0.0091) |
| Cash / Assets | 0.2360 | 0.0086 | 0.4810** | 0.0197** |
| | (0.4710) | (0.0172) | (0.2310) | (0.0094) |
| Short-term Debt / Assets | 2.3730*** | 0.0865*** | −0.7380 | −0.0302 |
| | (0.8850) | (0.0322) | (0.4640) | (0.0190) |
| Long-term Debt / Assets | −0.1880 | −0.0069 | −0.0900 | −0.0037 |
| | (0.1740) | (0.0063) | (0.1880) | (0.0077) |
| Momentum | 0.1280** | 0.0047** | 0.2400*** | 0.0098*** |
| | (0.0623) | (0.0022) | (0.0413) | (0.0017) |
| Analyst Following | −0.0212 | −0.0008 | 0.1160 | 0.0047 |
| | (0.0713) | (0.0026) | (0.0711) | (0.0029) |
| Blockholder | −0.0455 | −0.00167 | −0.1320 | −0.0054 |
| | (0.1730) | (0.0063) | (0.1270) | (0.0052) |
| Institutional Ownership | 0.3660 | 0.0133 | 0.3040** | 0.0124** |
| | (0.2700) | (0.0098) | (0.1240) | (0.0050) |
| US Listing | 0.0181 | 0.0007 | −0.2130 | −0.0086 |
| | (0.2060) | (0.0075) | (0.3110) | (0.0127) |
| Observations | 707 | 707 | 707 | 707 |
| Industry Fixed Effects | yes | yes | yes | yes |
| Country Fixed Effects | yes | yes | yes | yes |
| R-Squared | 0.03 | 0.03 | 0.01 | 0.01 |

**Table 6.10:** This table shows the results from OLS regressions. The dependent variable in columns (1) to (3) is *# Inst. Ownership Change* which is the change in the number of all institutional owners during the crisis period (i.e. the first quarter of 2020). In columns (4) to (5) ((6) to (7)) the dependent variable is *# Domestic Inst. Ownership Change* (*# Foreign Inst. Ownership Change*) which is the change in the number of all domestic (foreign) institutional owners. In column (1), the main independent variable of interest is *High IR*, which equals one if the firm's IR score is larger than the median IR score within the respective country. In columns (2), (4) and (6) the main independent variables of interest are a firm's *Public IR Score* and the respective *Private IR Score*. To construct the public and private components of IR, we run a regression of the natural logarithm of the IR score on three variables related to a firm's public IR functions, namely *Guidance*, *Conferences*, and *US Listing*. We employ the fitted values as firms' *Public IR Score* and the residuals as firms' *Private IR Score*. In columns (3), (5), and (7) we use the dummy variables *Public IR* and *Private IR*, which equal one if the respective score is larger than the sample median, and zero otherwise. Across all columns, we control for country-fixed effects and industry-fixed effects based on the Global Industry Classification Standard's (GICS) 11 sectors and a variety of firm characteristics. All variables are described in detail in Table E1 in the appendix. We report robust standard errors clustered by country in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| Dependent Variable: | # Inst. Ownership Change | | | # Domestic Inst. Ownership Change | | # Foreign Inst. Ownership Change | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| High IR | 2.8512*** | | | | | | |
| | (0.9951) | | | | | | |
| Public IR Score | | −4.6212** | | −1.0318 | | −3.8436** | |
| | | (2.1592) | | (0.7725) | | (1.9556) | |
| Private IR Score | | 5.5663*** | | 0.4645** | | 5.1129*** | |
| | | (1.5140) | | (0.2137) | | (1.3599) | |
| Public IR | | | −1.4327 | | 0.2476 | | −1.6599 |
| | | | (1.4144) | | (0.3398) | | (1.3601) |
| Private IR | | | 2.6529** | | 0.6432*** | | 2.0388* |
| | | | (1.2476) | | (0.2113) | | (1.0455) |
| Size | −0.9447*** | −0.9292*** | −0.8529*** | −0.0345 | −0.0579 | −0.8940*** | −0.8003*** |
| | (0.3263) | (0.2970) | (0.2979) | (0.0464) | (0.0536) | (0.2750) | (0.2782) |
| ROE | 2.2334 | 0.6410 | 1.0676 | 1.2651** | 1.3290* | −0.3135 | 0.0938 |
| | (4.2310) | (4.2212) | (4.3102) | (0.5587) | (0.7209) | (3.7456) | (3.7295) |
| Tobin's Q | 0.7717*** | 0.8127*** | 0.7996*** | 0.1054 | 0.1027 | 0.6661*** | 0.6551*** |
| | (0.2896) | (0.2720) | (0.2688) | (0.1163) | (0.1115) | (0.2042) | (0.1965) |
| Market-to-Book | 0.0046 | −0.0308 | −0.0126 | 0.0045 | 0.0021 | −0.0207 | −0.0002 |
| | (0.0831) | (0.0789) | (0.0744) | (0.0280) | (0.0275) | (0.0680) | (0.0640) |
| Historical Volatility | −3.3109 | −4.1880 | −3.6389 | 0.5652 | 0.5743 | −6.2158*** | −5.6646** |
| | (4.0102) | (3.6743) | (3.8541) | (1.6223) | (1.6500) | (2.2872) | (2.6627) |
| Cash / Assets | 5.6226 | 4.0639 | 6.0047 | 1.7567 | 2.0232 | 1.5122 | 3.2177 |
| | (3.8746) | (3.7583) | (3.7237) | (1.3424) | (1.4158) | (3.3761) | (3.4214) |
| Short-term Debt / Assets | −16.5589** | −14.8530* | −15.7138* | 0.2503 | 0.4060 | −15.3523** | −16.3672*** |
| | (8.2720) | (8.4203) | (8.2867) | (2.7771) | (2.9467) | (6.7607) | (6.3318) |
| Long-term Debt / Assets | −4.4575* | −5.3821** | −4.5492** | −0.3506 | −0.2514 | −5.2009** | −4.4434* |
| | (2.2778) | (2.4328) | (2.1818) | (0.7331) | (0.7822) | (2.5486) | (2.3737) |
| Momentum | 6.0084*** | 5.7226*** | 5.9312*** | 0.7717*** | 0.7658*** | 4.9663*** | 5.1811*** |
| | (0.7504) | (0.7196) | (0.7700) | (0.1842) | (0.1760) | (0.6954) | (0.7469) |
| Analyst Following | −0.0040 | 0.3611 | 0.4795 | 0.0927 | −0.0545 | 0.2088 | 0.4491 |
| | (0.7543) | (0.9624) | (0.8836) | (0.1288) | (0.0947) | (0.9022) | (0.8386) |
| Blockholder | −0.1141 | −0.3160 | −0.3560 | 0.3766 | 0.5018 | −0.5362 | −0.6805 |
| | (2.2484) | (2.1214) | (2.1680) | (0.6392) | (0.6221) | (1.7577) | (1.8105) |
| Institutional Ownership | 5.3545*** | 5.1843** | 5.6737*** | 0.6508 | 0.6506 | 4.5013** | 4.9879** |
| | (2.0145) | (2.1124) | (2.0187) | (0.5329) | (0.5065) | (2.1187) | (2.0458) |
| US Listing | 3.5531 | 6.0544** | 4.6421* | 0.7133 | 0.2897 | 5.6208** | 4.5430* |
| | (2.2544) | (2.4153) | (2.4062) | (0.7216) | (0.4689) | (2.7544) | (2.5859) |
| Observations | 708 | 708 | 708 | 708 | 708 | 708 | 708 |
| Industry Fixed Effects | yes | yes | yes | yes | yes | yes | yes |
| Country Fixed Effects | yes | yes | yes | yes | yes | yes | yes |
| Adjusted R-Squared | 0.20 | 0.22 | 0.20 | 0.04 | 0.04 | 0.22 | 0.19 |

In columns (4) to (7), we present the results from regressions similar to those in columns (2) and (3) but where we again split the institutional investors by their country of origin. Yet, this does not influence our main findings. A firm's private IR activities still appear to have helped significantly diversifying a firm's shareholder base during the COVID-19 collapse.

In unreported regressions, we also examine whether there are considerable differences between firms with strong IR and those with weak IR concerning the change in the proportion of shares held by (incumbent) institutional investors during the crisis period. Although the coefficients on our measures for IR quality are positive throughout all regressions, i.e. the change in the proportion of shares held by (incumbent) institutional investors is more positive for firms with better-quality IR, they are not statistically significant at conventional levels. Thus, we cannot confirm sizeable differences. Nonetheless, the set of tests presented above provides some indication that a firm's credibility as well as the diversification of its shareholders base through effective (private) IR were boosting its value during the crisis period.

### 6.4.5 Stock Volatility

Since our previous findings indicate that better-quality (private) IR has helped to diversify a firm's shareholder base, we test whether this has also helped to reduce stock volatility during the crisis. The argument is that as the number of financially sophisticated investors, especially institutional and foreign investors, increases, there is a substantial improvement in the amount and accuracy of the information about the firm; and thus stock volatility decreases (Jankensgård and Vilhelmsson, 2018; Holmström and Tirole, 1993; Li et al., 2011; Merton, 1987). In fact, this argument may be particularly viable during times of crisis when the level of uncertainty is high.

To examine this relationship, we perform regressions where the dependent variable is the stock's idiosyncratic volatility during the collapse period and the main independent variables of interest are our measures for a firm's IR quality. Control variables and fixed effects are similar to those used in Table 6.3. We report our results in Table 6.11.

Consistent with previous literature (see e.g. Brochet et al., 2020; Chapman et al., 2019) and with our hypothesis, we find some weak evidence that firms with better-quality IR also had lower stock volatility during the COVID-19 stock market crash.

**Table 6.11:** This table presents the results from OLS regressions. The dependent variable is a firm's idiosyncratic volatility (based on market model estimations) for the period from February 3, 2020 to March 23, 2020, which is the collapse period as defined in Fahlenbrach et al. (2020). In columns (1) and (2), the main independent variable of interest is *High IR*, which equals one if the firm's IR score is larger than the median IR score within the respective country. In columns (3) and (4), the main independent variables of interest are a firm's *Public IR Score* and the respective *Private IR Score*. To construct the public and private components of IR, we run a regression of the natural logarithm of the IR score on three variables related to a firm's public IR functions, namely *Guidance*, *Conferences*, and *US Listing*. We employ the fitted values as firms' *Public IR Score* and the residuals as firms' *Private IR Score*. Across all columns, we control for country-fixed effects and industry-fixed effects based on the Global Industry Classification Standard's (GICS) 11 sectors. In columns (2) and (4) we also control for a variety of firm characteristics. All variables are described in detail in Table E1 in the appendix. We report robust standard errors clustered by country in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| Dependent Variable: *Idiosyncratic Volatility* | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| High IR | −0.0067*** | −0.0024 | | |
| | (0.0017) | (0.0020) | | |
| Public IR Score | | | −0.0155*** | −0.0005 |
| | | | (0.0043) | (0.0029) |
| Private IR Score | | | −0.0060*** | −0.0017* |
| | | | (0.0011) | (0.0009) |
| Size | | −0.0011* | | −0.0012 |
| | | (0.0007) | | (0.0008) |
| ROE | | −0.0038 | | −0.0041 |
| | | (0.0070) | | (0.0065) |
| Tobin's Q | | −0.0006 | | −0.0006 |
| | | (0.0005) | | (0.0005) |
| Market-to-Book | | 0.0000 | | 0.0000 |
| | | (0.0001) | | (0.0001) |
| Historical Volatility | | 0.0487*** | | 0.0487*** |
| | | (0.0113) | | (0.0113) |
| Cash / Assets | | −0.0055 | | −0.0055 |
| | | (0.0047) | | (0.0049) |
| Short-term Debt / Assets | | 0.0052 | | 0.0048 |
| | | (0.0084) | | (0.0089) |
| Long-term Debt / Assets | | 0.0198*** | | 0.0198*** |
| | | (0.0071) | | (0.0071) |
| Momentum | | 0.0001 | | 0.0001 |
| | | (0.0005) | | (0.0005) |
| Analyst Following | | 0.0001 | | −0.0002 |
| | | (0.0016) | | (0.0013) |
| Blockholder | | 0.0041 | | 0.0042 |
| | | (0.0027) | | (0.0027) |
| Institutional Ownership | | 0.0019 | | 0.0020 |
| | | (0.0019) | | (0.0019) |
| US Listing | | −0.0033*** | | −0.0036** |
| | | (0.0011) | | (0.0016) |
| Observations | 947 | 710 | 947 | 710 |
| Industry Fixed Effects | yes | yes | yes | yes |
| Country Fixed Effects | yes | yes | yes | yes |
| Adjusted R-Squared | 0.04 | 0.19 | 0.05 | 0.19 |

Although the coefficients on our IR measures are negative throughout all regressions, statistical significance vanishes after controlling for a variety of firm characteristics. As for the control variables, the results are similar to related studies (see e.g. Albuquerque et al., 2020). While volatility is lower for larger firms, those with better past performance and lower historical volatility, volatility is higher for firms with higher ratios of long-term debt to assets.

## 6.5 Additional Tests

### 6.5.1 Results for Industries Strongly Affected by the COVID-19 Pandemic and Policy Responses

In the prior sections, we have documented a positive association between a firm's (private) IR quality and its crisis returns using our entire sample. We now focus on a subsample of firms in industries particularly affected by the COVID-19 pandemic and the respective policy responses. Given that investors in these industries were confronted with even greater uncertainty during the collapse period, we may expect to find a firm's (private) IR quality to have an even more pronounced impact on stock performance. Using a similar classification as in Fahlenbrach et al. (2020), we identify the following industries based on the GICS 69-industry classification: Auto Components; Automobiles; Leisure Products; Textiles, Apparel & Luxury Goods; Hotels, Restaurants & Leisure; Diversified Consumer Services; Distributors; Multiline Retail; Specialty Retail; Beverages; Food Products; Construction Materials; Construction & Engineering; Machinery; Air Freight & Logistics; Airlines; Marine; Road & Rail; Transportation Infrastructure; Media; and Entertainment.

As expected, we find that these industries were strongly affected by the COVID-19 pandemic. For instance, the mean cumulative return of −51.40% is considerably lower compared to our entire sample. Besides, the cumulative abnormal return is also about 5.14 percentage points lower and volatility is 0.81 percentage points higher.

To test the assumption of IR being even more valuable in these industries, we perform the same baseline regressions using our subsample. Table 6.12 displays the results.

**Table 6.12:** This table presents the results from OLS regressions for a subsample of firms particularly affected by the COVID-19 pandemic. The dependent variable is a firm's cumulative abnormal return (based on market model estimations) for the period from February 3, 2020 to March 23, 2020, which is the collapse period as defined in Fahlenbrach et al. (2020). In columns (1) and (2), the main independent variable of interest is *High IR*, which equals one if the firm's IR score is larger than the median IR score within the respective country. In column (3), the main independent variables of interest are a firm's *Public IR Score* and the respective *Private IR Score*. To construct the public and private components of IR, we run a regression of the natural logarithm of the IR score on three variables related to a firm's public IR functions, namely *Guidance*, *Conferences*, and *US Listing*. We employ the fitted values as firms' *Public IR Score* and the residuals as firms' *Private IR Score*. Across all columns, we control for country-fixed effects and industry-fixed effects based on the Global Industry Classification Standard's (GICS) 11 sectors. In columns (2) and (3) we also control for a variety of firm characteristics. All variables are described in detail in Table E1 in the appendix. We report robust standard errors clustered by country in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| Dependent Variable: *Abnormal returns* | (1) | (2) | (3) |
|---|---|---|---|
| High IR | 0.1133*** | 0.0588* | |
| | (0.0437) | (0.0354) | |
| Public IR Score | | | −0.0121 |
| | | | (0.1512) |
| Private IR Score | | | 0.1307*** |
| | | | (0.0433) |
| Size | | 0.0135 | 0.0141 |
| | | (0.0143) | (0.0187) |
| ROE | | 0.2596 | 0.2397 |
| | | (0.2107) | (0.2055) |
| Tobin's Q | | 0.0426** | 0.0423** |
| | | (0.0183) | (0.0195) |
| Market-to-Book | | −0.0025 | −0.0034 |
| | | (0.0071) | (0.0069) |
| Historical Volatility | | −0.0068 | 0.0041 |
| | | (0.1930) | (0.2033) |
| Cash / Assets | | −0.1681 | −0.1900 |
| | | (0.1479) | (0.1812) |
| Short-term Debt / Assets | | −0.2416 | −0.2598 |
| | | (0.3568) | (0.3512) |
| Long-term Debt / Assets | | −0.6161*** | −0.6299*** |
| | | (0.1005) | (0.1004) |
| Momentum | | −0.1134*** | −0.1122*** |
| | | (0.0235) | (0.0229) |
| Analyst Following | | 0.0341 | 0.0293 |
| | | (0.0394) | (0.0414) |
| Blockholder | | −0.1004 | −0.0905 |
| | | (0.1001) | (0.1082) |
| Institutional Ownership | | 0.0452 | 0.0506 |
| | | (0.0748) | (0.0724) |
| US Listing | | 0.2792*** | 0.3147*** |
| | | (0.0384) | (0.0814) |
| Observations | 263 | 248 | 248 |
| Industry Fixed Effects | yes | yes | yes |
| Country Fixed Effects | yes | yes | yes |
| Adjusted R-Squared | 0.04 | 0.30 | 0.31 |

In all three columns, we find a positive and statistically significant association between a firm's (private) IR quality and the crisis returns. Compared to the estimates for the entire sample, the coefficients' magnitudes are, however, slightly lower (even when calculating standardized regression coefficients). Based on these results, we cannot confirm that firms in these industries have benefited even more from having better-quality (private) IR during the crisis period. We also run the difference-in-differences regressions using this subsample to validate our findings. But these tests, though not reported, leave our findings qualitatively unchanged.

### 6.5.2 Country Characteristics and the Value of IR

In this next subsection, we investigate whether our results from the baseline models may differ depending on the countries the firms are headquartered in. Although our findings indicate that firms with strong IR experienced on average at least 6.96 percentage points higher cumulative abnormal returns during the crisis period, there are several reasons why this effect may be more or less pronounced in certain countries depending on the countries' characteristics. As Karolyi et al. (2020) show, firms profit even more from engaging in IR activities when they are domiciled in countries with lower-quality legal institutions and security market regulations, in countries with lower disclosure standards and in countries where legal protection of minority shareholders is weak. Therefore, we also test whether we find similar results when stock markets collapsed during the COVID-19 crisis.

We obtain data on a country's Rule of Law index from the World Bank's World Governance Indicators for the year 2019, data on a country's disclosure standards based on the index provided by La Porta et al. (2006) as well as data on a country's legal protection standards of minority shareholders based on the Anti-Self-Dealing index (*ASDI*) provided by Djankov et al. (2008). Additionally, we obtain data on a country's level of trust from the World Values Survey's (WVS) latest wave (2017-2020) and data on certain cultural characteristics, i.e. *Uncertainty Avoidance* and *Long-Term Orientation*, from Hofstede's website. The rationale behind testing for the latter characteristics is that (I) the level of societal trust within a country is associated with the stock market volatility during the COVID-19 crisis (Engelhardt et al., 2020b) and that (II) reducing uncertainty during the crisis through effective communication with investors may be even more valuable in cultures which feel uncomfortable with uncertainty and prefer long-term relationships.

Following Karolyi et al. (2020), we examine these aspects by first splitting the sample based on the indices' median scores for the countries we investigate, and then by performing the same baseline regressions on the different subsamples. Although our entire sample consists solely of European countries, we find considerable variation in the respective scores. Hence, we believe our approach is feasible. Table 6.13 reports the results from the regressions where the main independent variable of interest is *High IR*.

Consistent with the results in Karolyi et al. (2020), we find a positive and highly statistically significant coefficient on *High IR* in the regression for the subsample of firms headquartered in countries where lower-quality legal institutions and security market regulations prevail (column (1)). Also, we find the coefficient on *High IR* to be not only considerably lower but also statistically insignificant for the subsample of firms headquartered in high rule of law countries (column (2)).

In columns (3) and (4), we split the sample by a country's disclosure standards. Our results show that in countries with low disclosure standards as well as in countries with high disclosure standards having strong IR has a significant positive effect on crisis returns. As a matter of fact, the coefficient is significantly higher in countries with high disclosure standards. This is an important difference compared to the findings of Karolyi et al. (2020). They stress that firms benefit significantly more from engaging in IR in countries with weak disclosure standards.

Splitting the sample by a country's *ASDI* (columns (5) and (6)), we also find different results compared to those in Karolyi et al. (2020). While they show that firms benefit significantly more from engaging in IR in countries with weak legal protection of minority shareholders, we find that firms with strong IR experienced higher returns during the COVID-19 crisis in both, countries with weak legal protection and in countries with strong legal protection of minority shareholders.

In columns (7) and (8), we show the results where we split the sample by the level of societal trust. Similar to the results in columns (1) and (2), we find firms with strong IR to experience significantly higher crisis returns if they are domiciled in countries with low levels of societal trust. In the regression for the subsample of firms headquartered in countries with high levels of societal trust (column (8)), the magnitude of the coefficient

**Table 6.13:** This table shows the results from OLS regressions of the firm's cumulative abnormal stock return over the period from February 3, 2020 to March 23, 2020 on *High IR*, firm controls and country and industry-fixed effects for various subsamples. We split the entire sample based on the median score of the countries in our sample. The subsamples are based on the following characteristics: the *Rule of Law index* from the World Bank's World Governance Indicators for the year 2019 (columns (1) and (2)), the *Disclosure index* provided by La Porta et al. (2006) (columns (3) and (4)), the Anti-Self-Dealing index (*ASDI*) provided by Djankov et al. (2008) (columns (5) and (6)), the level of societal trust from the World Values Survey's latest wave (columns (7) and (8)), and Hofstede's cultural dimensions *Uncertainty Avoidance* (columns (9) and (10)) and *Long-Term Orientation* (columns (11) and (12)). All variables are described in detail in Table E1 in the appendix. We report robust standard errors that are clustered by country in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| | *Low Rule of Law* | *High Rule of Law* | *Low Disclosure* | *High Disclosure* |
|---|---|---|---|---|
| Dependent Variable: *Abn. returns* | (1) | (2) | (3) | (4) |
| High IR | 0.1233*** | 0.0361 | 0.0611*** | 0.1381** |
| | (0.0181) | (0.0286) | (0.0205) | (0.0538) |
| Observations | 510 | 200 | 459 | 243 |
| Firm characteristics | yes | yes | yes | yes |
| Industry Fixed Effects | yes | yes | yes | yes |
| Country Fixed Effects | yes | yes | yes | yes |
| Adjusted R-Squared | 0.18 | 0.24 | 0.19 | 0.22 |
| | *Low ASDI* | *High ASDI* | *Low Trust* | *High Trust* |
| Dependent Variable: *Abn. returns* | (5) | (6) | (7) | (8) |
| High IR | 0.0928*** | 0.0963*** | 0.1233*** | 0.0159 |
| | (0.0311) | (0.0188) | (0.0180) | (0.0325) |
| Observations | 403 | 307 | 475 | 178 |
| Firm characteristics | yes | yes | yes | yes |
| Industry Fixed Effects | yes | yes | yes | yes |
| Country Fixed Effects | yes | yes | yes | yes |
| Adjusted R-Squared | 0.19 | 0.20 | 0.17 | 0.30 |
| | *Low Uncertainty Avoidance* | *High Uncertainty Avoidance* | *Low Long-Term Orientation* | *High Long-Term Orientation* |
| Dependent Variable: *Abn. returns* | (9) | (10) | (11) | (12) |
| High IR | 0.0917*** | 0.1334*** | 0.0990*** | 0.0879** |
| | (0.0296) | (0.0216) | (0.0229) | (0.0410) |
| Observations | 453 | 257 | 316 | 394 |
| Firm characteristics | yes | yes | yes | yes |
| Industry Fixed Effects | yes | yes | yes | yes |
| Country Fixed Effects | yes | yes | yes | yes |
| Adjusted R-Squared | 0.19 | 0.22 | 0.20 | 0.17 |

on *High IR* is lower and not statistically significant.[7] In line with Engelhardt et al. (2020b), who show stock market volatility to be higher (in reaction to case announcements) in countries with low levels of societal trust, these results may indicate that reducing uncertainty through effective communication with investors may have been even more valuable.

In this respect, we also test whether we find similar results using Hofstede's cultural dimension *Uncertainty Avoidance* to split the sample. The argument is that having strong IR may be particularly valuable in cultures which have difficulties in dealing with uncertainty. The results presented in columns (9) and (10) support this notion. While we find positive and statistically significant coefficients on *High IR* in both subsamples, the magnitude is significantly higher in the regression for the subsample consisting of firms headquartered in countries with high scores on this dimension.

Finally, we use the scores on Hofstede's cultural dimension *Long-Term Orientation* to split the sample. We find positive and highly statistically significant coefficients for both subsamples (columns (11) and (12)). In Table 6.14, we show the results where we employ our dummy variables *Private IR* and *Public IR* as the main independent variables of interest. Throughout all subsamples, we find positive and statistically significant coefficients on *Private IR*, while the coefficients on *Public IR* remain statistically insignificant (except for column (11)). This is in line with our baseline results and suggests that, despite of any country characteristics, a firm's private IR activities were boosting a firm's stock performance during the crisis period. The only noteworthy difference compared to the findings in Table 6.13 is that a firm's private IR activities were even more valuable in countries scoring high on the dimension *Long-Term Orientation*. The latter is consistent with the notion that private IR activities enhance credibility and are thus more valuable in cultures putting emphasis on long-lasting relationships.

Overall, the results in this subsection indicate that the value of having high-quality IR during the COVID-19 crisis is dependent on country characteristics. Firms in high rule of law countries and high-trust countries do not appear to have benefited from having strong IR. These findings persist even after using the dummy variables based on the decomposed scores.

[7]In unreported regressions, where we only include industry-fixed effects but omit country-fixed effects, we find that the coefficient is slightly higher (5.46%) and remains statistically significant. However, this is the only noteworthy difference that we find when we rerun the same regressions as in Table 6.13 using industry-fixed effects only.

**Table 6.14:** This table shows the results from OLS regressions of the firm's cumulative abnormal stock return over the period from February 3, 2020 to March 23, 2020 on *Public IR* and *Private IR*, firm controls and country and industry-fixed effects. We split the entire sample based on the median score of the countries in our sample. The subsamples are based on the following characteristics: the *Rule of Law index* from the World Bank's World Governance Indicators for the year 2019 (columns (1) and (2)), the *Disclosure index* provided by La Porta et al. (2006) (columns (3) and (4)), the Anti-Self-Dealing index (*ASDI*) provided by Djankov et al. (2008) (columns (5) and (6)), the level of societal trust from the World Values Survey's latest wave (columns (7) and (8)), and Hofstede's cultural dimensions *Uncertainty Avoidance* (columns (9) and (10)) and *Long-Term Orientation* (columns (11) and (12)). We report robust standard errors that are clustered by country in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| | *Low Rule of Law* | *High Rule of Law* | *Low Disclosure* | *High Disclosure* |
|---|---|---|---|---|
| Dependent Variable: *Abn. returns* | (1) | (2) | (3) | (4) |
| Public IR | 0.0101 | 0.0138 | −0.0161 | 0.0144 |
| | (0.0349) | (0.0718) | (0.0398) | (0.0287) |
| Private IR | 0.0923*** | 0.0430* | 0.0716*** | 0.0917*** |
| | (0.0109) | (0.0255) | (0.0149) | (0.0131) |
| Observations | 510 | 200 | 459 | 243 |
| Firm characteristics | yes | yes | yes | yes |
| Industry Fixed Effects | yes | yes | yes | yes |
| Country Fixed Effects | yes | yes | yes | yes |
| Adjusted R-Squared | 0.17 | 0.24 | 0.19 | 0.20 |
| | *Low ASDI* | *High ASDI* | *Low Trust* | *High Trust* |
| Dependent Variable: *Abn. returns* | (5) | (6) | (7) | (8) |
| Public IR | 0.0288 | −0.0120 | 0.0119 | −0.0121 |
| | (0.0343) | (0.0458) | (0.0384) | (0.0644) |
| Private IR | 0.0959*** | 0.0928*** | 0.0955*** | 0.0171 |
| | (0.0212) | (0.0119) | (0.0108) | (0.0206) |
| Observations | 403 | 307 | 475 | 178 |
| Firm characteristics | yes | yes | yes | yes |
| Industry Fixed Effects | yes | yes | yes | yes |
| Country Fixed Effects | yes | yes | yes | yes |
| Adjusted R-Squared | 0.19 | 0.20 | 0.16 | 0.30 |
| | *Low Uncertainty Avoidance* | *High Uncertainty Avoidance* | *Low Long-Term Orientation* | *High Long-Term Orientation* |
| Dependent Variable: *Abn. returns* | (9) | (10) | (11) | (12) |
| Public IR | −0.0404 | 0.0370 | 0.1556*** | −0.0168 |
| | (0.0549) | (0.0239) | (0.0484) | (0.0427) |
| Private IR | 0.0819*** | 0.1048*** | 0.0825*** | 0.0970*** |
| | (0.0178) | (0.0231) | (0.0175) | (0.0254) |
| Observations | 453 | 257 | 316 | 394 |
| Firm characteristics | yes | yes | yes | yes |
| Industry Fixed Effects | yes | yes | yes | yes |
| Country Fixed Effects | yes | yes | yes | yes |
| Adjusted R-Squared | 0.19 | 0.20 | 0.21 | 0.18 |

### 6.5.3 Operating Performance

Finally, we perform a preliminary analysis investigating whether firms with better IR had better operating performance during the first three quarters of 2020 since this could be a channel explaining the return premium aside from merely establishing an effective communication with shareholders. We do so by conducting OLS regressions of the quarterly change of various operating performance measures[8] (e.g. the operating profit margin, the return on assets, and asset turnover) on our measures for IR quality, a set of firm controls similar to Albuquerque et al. (2020), and both country and industry-fixed effects. We find no consistent evidence supporting the notion that firms with strong IR had better operating performance during the first three quarters of 2020. In fact, we rather find negative and slightly statistically significant coefficients on our IR measures in some regressions. Hence, we can conclude that firms with strong IR had, if at all, weaker operating performance. This finding is, however, consistent with the assumption that firms with better-quality IR are simply better at establishing an effective communication with investors and achieving a somewhat fairer valuation during times of crisis, but they do not necessarily have better operating performance.

## 6.6 Robustness

We conduct several robustness tests to ensure the validity of our main finding that firms with strong (private) IR had higher stock returns than those with weak (private) IR during the COVID-19 stock market crash. First, we use two alternative specifications for the collapse period provided by Fahlenbrach et al. (2020). Specifically, we calculate cumulative abnormal returns over the period from February 24, 2020 until March 20, 2020, which is the so-called "Fever period" in Ramelli and Wagner (2020), as well as over the whole first quarter as done in Albuquerque et al. (2020). Our finding persists when changing the observation period.

Second, we calculate abnormal returns based on the capital asset pricing model

[8]We calculate the change from the fourth quarter of 2019 to the first quarter of 2020, the change from fourth quarter of 2019 to the second quarter of 2020, the change from the fourth quarter of 2019 to the third quarter of 2020, the change from the first quarter of 2020 to the second quarter of 2020, the change from the first quarter of 2020 to the third quarter as well as change from the second quarter of 2020 to the third quarter of 2020. We then perform the regressions using the changes as the dependent variables.

(CAPM) as well as the Fama-French three factor model and rerun our analyses. Overall, we find qualitatively similar results compared to our previous findings.

Third, we rerun our baseline regressions using a measure similar to the *severity of loss* measure provided by DesJardine et al. (2019) as the dependent variable, i.e. we calculate the percentage decline in a firm's stock price from the stock price immediately prior to the crisis (January 20, 2020) to the lowest stock price within the period from January 21, 2020 through October 6, 2020. Consistent with our previous findings, we also find firms with strong (private) IR to have higher crisis returns.

Fourth, we check whether our baseline results are driven by firms headquartered in the UK. This is because these firms account for more than 20% of our observations. However, excluding these observations and rerunning the regressions does not change our results. Additionally, we exclude (I) financial firms and (II) firms with low stock market liquidity, i.e. micro-cap firms with a market capitalization smaller than $250 million as suggested in Lins et al. (2017), but our results hold.

As a fifth robustness check, we estimate regression specifications similar to those proposed in Ding et al. (2020). In these regressions, we use a firm's weekly stock return as the dependent variable and interact each independent variable with the weekly growth in confirmed COVID-19 cases in the respective country. Additionally, we control for further economy characteristics and include firm-fixed effects. The results presented in the appendix Table E5 also support the view that firms with strong IR had higher crisis returns.

As another robustness test, we change the definition of the variable *crisis* in our difference-in-differences estimation. Following Albuquerque et al. (2020), we set the variable equal to one for each date in the period from January 30, 2020 to March 23, 2020, and zero otherwise. The rationale behind being that on January 30, 2020 the World Health Organisation (WHO) declared the outbreak a public health emergency of international concern. Nonetheless, we find very similar results as reported in Table 6.5.

Finally, we turn to a two-stage regression approach to address the issue that the IR scores might be driven by a firm's past performance and not necessarily by its IR activities. In our first stage regressions, we therefore regress either the firm's raw IR score or our *High IR* dummy on a set of variables accounting for prior year's firm performance. We also include industry and country-fixed effects. In our second stage, we then regress the cumulative abnormal returns on the residuals from the first stage regressions, i.e. the part of the IR score that is not explained by prior firm performance. We also control for the variables used in our baseline specifications and include industry and country-fixed effects. In line with our previous results, we find positive and highly statistically significant coefficients on the residuals in both regressions (see Table E4 in the appendix). Hence, this approach helps us to ensure that IR activities make firms more resilient during the COVID-19 crisis.

## 6.7 Conclusion

The COVID-19 pandemic and the subsequent economic lockdown in many European countries presents a perfect example to test the link between a firm's IR quality and its capital market outcomes. This is because the crisis led to enormous uncertainty and a large amount of often-unfiltered news about firms' future prospects. Helping investors to evaluate information in order to reduce the level of uncertainty and information frictions is the key task of a firm's IR department. In this paper, we therefore argue that firms with better-quality IR are more resilient during times of crisis as they effectively reduce information frictions and achieve a somewhat fairer valuation.

To test this relationship, we use a large sample of European firms and the IR rankings provided by Institutional Investor. Consistent with our hypothesis, we find firms with strong IR to experience significantly higher stock returns compared to those with weak IR during the crisis. Furthermore, we find that high-quality IR did not only help to attract significantly more institutional investors but also to enhance credibility with the firm's current shareholder base during the first quarter of 2020. After decomposing IR into public and private functions, we find the private IR function to be the main driver of our results.

In additional tests, we find that the value of IR is dependent on the country the firm is headquartered in. In line with Karolyi et al. (2020), the results show that firms with better-quality IR benefited significantly more in countries with low-quality legal institutions. Further, we find that the value of IR was higher in countries with low levels of societal trust and in uncertainty-avoidant countries.

Moreover, we test whether firms with strong IR had lower stock volatility and higher operating performance during the crisis. While we find support for the first notion, there is no evidence that firms with better IR had better operating performance. However, this in line with our argument that firms with strong IR achieve higher stock returns through establishing an effective two-way communication and reducing information frictions.

As with most research in this field, we know that unobserved systematic differences between strong and weak IR firms could explain our results. However, we run a battery of robustness checks and include time and firm-fixed effects to ensure the validity of our results. Overall, our findings indicate that establishing an effective communication through a firm's IR department significantly paid off during the crisis when investors and analysts became concerned about high corporate debt and corporate liquidity. Firms with stronger IR performance were significantly more resilient when financial markets declined in the first quarter of 2020.

# A Appendix for Chapter 2

**Table A1:** This table shows the global stock market indices used in this study. ISO codes for each country are reported. For each country we select stock market indices which come from Trading Economics. Our sample covers 64 countries accounting for 94% of the world's GDP and containing countries of each economic region: East Asia and Pacific (10), Europe and Central Asia (32), Latin America and Carribean (8), Middle East and North Africa (3), North America (2), South Asia (3) and Sub-Saharan Africa (6).

| ID | ISO | Country | Market Index | ID | ISO | Country | Market Index |
|---|---|---|---|---|---|---|---|
| 1 | AUS | Australia | ASX200 | 33 | KEN | Kenya | NSE20 |
| 2 | AUT | Austria | ATX | 34 | KOR | South Korea | KOSPI |
| 3 | BEL | Belgium | BEL20 | 35 | LBN | Lebanon | BLOM |
| 4 | BGR | Bulgaria | SOFIX | 36 | LKA | Sri Lanka | CSE |
| 5 | BRA | Brazil | BOVESPA | 37 | LUX | Luxembourg | LUXX |
| 6 | BWA | Botswana | BSI DCI | 38 | LVA | Latvia | OMX Riga |
| 7 | CAN | Canada | TSX | 39 | MAR | Morocco | MASI |
| 8 | CHE | Switzerland | SMI | 40 | MEX | Mexico | IPC |
| 9 | CHL | Chile | IGPA | 41 | MUS | Mauritius | SEMDEX |
| 10 | CHN | China | SSE | 42 | MYS | Malaysia | FTSE KLCI |
| 11 | COL | Colombia | IGBC | 43 | NGA | Nigeria | NSE 30 |
| 12 | CYP | Cyprus | CSE | 44 | NLD | Netherlands | AEX |
| 13 | CZE | Czech Republic | SE PX | 45 | PAK | Pakistan | KSE100 |
| 14 | DEU | Germany | DAX | 46 | PER | Peru | PEN |
| 15 | DNK | Denmark | OMX20 | 47 | PHL | Philippines | PSEi |
| 16 | ECU | Ecuador | BVQA | 48 | POL | Poland | WIG |
| 17 | ESP | Spain | IBEX 35 | 49 | PRT | Portugal | PSI20 |
| 18 | EST | Estonia | OMX Tallinn | 50 | ROU | Romania | BET |
| 19 | FIN | Finland | HEX25 | 51 | RUS | Russia | MICEX |
| 20 | FRA | France | CAC 40 | 52 | SGP | Singapore | STI |
| 21 | GBR | United Kingdom | FTSE 100 | 53 | SRB | Serbia | BELEX15 |
| 22 | GHA | Ghana | GSE-CI | 54 | SVK | Slovakia | SAX |
| 23 | GRC | Greece | ASE | 55 | SVN | Slovenia | SBITOP |
| 24 | HRV | Croatia | CROBEX | 56 | SWE | Sweden | OMX30 |
| 25 | HUN | Hungary | BUX | 57 | THA | Thailand | SET50 |
| 26 | IDN | Indonesia | JCI | 58 | TUN | Tunisia | TUNINDEX |
| 27 | IND | India | SENSEX | 59 | TUR | Turkey | XU100 |
| 28 | IRL | Ireland | ISEQ | 60 | TWN | Taiwan | TWSE |
| 29 | ISL | Iceland | SE ICEX | 61 | USA | United States | DJIA |
| 30 | ITA | Italy | FTSE MIB | 62 | VEN | Venezuela | IBVC |
| 31 | JAM | Jamaica | Jamaica SE | 63 | VNM | Vietnam | VNINDEX |
| 32 | JPN | Japan | NIKKEI 225 | 64 | ZAF | South Africa | JALSH |

# B Appendix for Chapter 3

# C Appendix for Chapter 4

# D Appendix for Chapter 5

**Table D1:** This table provides definitions of our variables. Financial data come from Compustat/Capital IQ and ESG ratings come from Thomson Reuters Eikon.

| Variable | Definition |
|---|---|
| *Dependent variables:* | |
| Raw returns | Cumulative daily logarithmic stock return calculated from daily closing prices. |
| Abnormal returns | Cumulative daily abnormal stock return which is the raw stock return minus the expected return based on a market model estimated over a one year period from 2019 until 2020. |
| Volatility | Stock volatility calculated from daily raw returns. |
| Idiosyncratic Volatility | Stock volatility calculated from daily abnormal returns. |
| *Independent variables:* | |
| ESG Score | ESG score of a firm. |
| High ESG | Dummy variable that equals one if the firm's ESG score is larger than the median score within the respective country, and zero otherwise. |
| *Control variables:* | *All continuous variables are winsorized at the 1$^{st}$ and 99$^{th}$ percentiles.* |
| Tobin's Q | Total assets minus the book value of equity plus market capitalization, divided by a firm's total assets. |
| Size | The natural logarithm of total sales. |
| ROE | Net income over market capitalization. |
| Profitability | Operating income before depreciation over total assets of a firm. |
| Market-to-Book | Market capitalization divided by the book value of equity. |
| Negative Market-to-Book | A Dummy variable which is set to one if the Market-to-Book is negative, and zero otherwise. |
| Cash / Assets | Cash divided by total assets. |
| Short-term Debt / Assets | Short-term debt divided by total assets. |
| Long-term Debt / Assets | Long-term debt divided total assets. |
| Leverage | Book value of debt divided by total assets. |
| Historical Volatility | Stock volatility calculated from daily stock returns during 2019. |

| | |
|---|---|
| Momentum | Momentum factor calculated from the four-factor model provided by Carhart (1997). The momentum factor is estimated over a one year period from 2019 to 2020. |
| Low Rule of Law | A Dummy variable which is set one if a country's rule of law index is equal or smaller than the median score within the respective country. The rule of law index is provided by the World Bank's World Governance Indicators for 2019. |
| High Rule of Law | A Dummy variable which is set one if the country's rule of law index is larger than median score within the respective country. The rule of law index is provided by the World Bank's World Governance Indicators for 2019. |
| Low Disclosure | A Dummy variable which is set one if the country's disclosure index is equal or below the median score within the respective country. We obtain the disclosure index from La Porta et al. (2006). |
| High Disclosure | A Dummy variable which is set one if the country's disclosure index is equal or larger than the median score within the respective country. We obtain the disclosure index from La Porta et al. (2006). |
| Low ASDI | A Dummy variable which is set one if the country's ASDI is equal or below the median score within the respective country. We obtain the anti-self-dealing index (ASDI) from Djankov et al. (2008). |
| High ASDI | A Dummy variable which is set one if the country's ASDI is equal or larger than the median score within the respective country. We obtain the anti-self-dealing index (ASDI) from Djankov et al. (2008). |
| Low Trust | A Dummy variable which is set one if the country's trust score is equal or smaller than the median score within the respective country. We obtain data on the level of societal trust from the World Values Survey's (WVS) latest wave (i.e. wave 7, 2017-2020). |
| High Trust | A Dummy variable which is set one if the country's trust score is larger than the median score within the respective country. We obtain data on the level of societal trust from the World Values Survey's (WVS) latest wave (i.e. wave 7, 2017-2020). |

# E Appendix for Chapter 6

**Table E1:** This table provides definitions of the variables used in our empirical analysis. The survey-based IR rankings come from Institutional Investor. Stock data and accounting data come from Compustat/Capital IQ. Corporate ES ratings, governance data, data on a firm's informational environment, and ownership data come from Thomson Reuters Eikon. Additionally, we obtain data on news coverage from Dow Jones Factiva. Data on trust come from the World Values Survey's (WVS) latest wave (i.e. wave 7, 2017-2020). The *Rule of Law index* data come from the World Bank's World Governance Indicators 2019. The anti-self-dealing index (*ASDI*) is from Djankov et al. (2008) and the *Disclosure index* is from La Porta et al. (2006). Data on *Uncertainty Avoidance* and *Long-Term Orientation* come from Hofstede's website.

| Variable | Definition |
|---|---|
| *Dependent variables:* | |
| Raw returns | The cumulative daily logarithmic return based on the daily closing prices. |
| Weekly returns | The cumulative weekly logarithmic return based on the daily closing prices. |
| Abnormal returns | The cumulative daily abnormal return which is the raw return minus the expected return based on a market model estimated over a 12-month period from January 2019 until January 2020. |
| Idiosyncratic Volatility | Annualized stock volatility of daily abnormal returns. |
| *Independent variables:* | |
| $log$(IR Score) | The logarithmic IR score of a firm. |
| High IR | Dummy variable that equals one if the firm's IR score is larger than the median score within the respective country, and zero otherwise. |
| IR Score 2 | Dummy variable that equals one if the firm's IR score is in the second IR quartile, and zero otherwise. |
| IR Score 3 | Dummy variable that equals one if the firm's IR score is in the third IR quartile, and zero otherwise. |
| IR Score 4 | Dummy variable that equals one if the firm's IR score is in the fourth IR quartile, and zero otherwise. |
| Public IR Score | The fitted values from a regression of the natural logarithm of the IR score on three variables related to a firm's public IR functions, namely Guidance, Conferences, and US Listing. |
| Private IR Score | The residuals from a regression of the natural logarithm of the IR score on three variables related to a firm's public IR functions, namely Guidance, Conferences, and US Listing. |

| | |
|---|---|
| Public IR | Dummy variable that equals one if the firm's Public IR Score is larger than the sample median, and zero otherwise. |
| Private IR | Dummy variable that equals one if the firm's Private IR Score is larger than the sample median, and zero otherwise. |
| *Control variables:* | *Continuous variables are winsorized at the 1st and 99th percentiles.* |
| Size | The logarithm of a firm's total sales. |
| ROE | Return on equity calculated as net income of a firm over market capitalization. |
| Tobin's Q | Total assets of a firm minus the book value of equity plus market capitalization, all divided by total assets. |
| Market-to-Book | Market capitalization of a firm over book value of equity. |
| Historical Volatility | Annualized stock volatility of daily raw returns during 2019. |
| Cash / Assets | Cash over total assets of a firm. |
| Short-term Debt / Assets | Short-term debt over total assets of a firm. |
| Long-term Debt / Assets | Long-term debt over total assets of a firm. |
| Momentum | Momentum factor based on the four-factor model from Carhart (1997) estimated over a 12-month period from January 2019 until January 2020. |
| Analyst Following | The natural logarithm of the number of sell-side analysts forecasting a firm's earnings per share (EPS). |
| Blockholder | The percentage of a firm's shares held by blockholders who own 5% or more of a firm's shares. |
| Institutional Ownership | The percentage of a firm's shares held by institutional investors. |
| US Listing | Dummy variable that equals one if a firm is cross-listed on a US stock exchange, and zero otherwise. |
| High ES | Dummy variable that equals one if the firm's ES rating is larger than the sample median, and zero otherwise. |
| Board Size | The number of a firm's board members. |
| Board Independence | The percentage of independent board members reported by the firm. |
| Board Governance Score | The corporate governance score of a firm. |
| Conferences | The number of conferences held by a firm in 2019. |
| Road Show | The number of road shows held by a firm in 2019. |
| Guidance | The number of guidance announcements of a firm in 2019. |
| News Coverage | The logarithm of the number of news articles which are related to a firm in 2019. |
| Collapse News Coverage | The logarithm of the number of news articles which are related to a firm during the collapse period from February 3, 2020 to March 23, 2020. |
| % Staying Inst. Investors | The fraction of incumbent institutional investors who stayed loyal to the firm during the first quarter of 2020. |

| | |
|---|---|
| % Staying Domestic Inst. Investors | The fraction of incumbent domestic institutional investors who stayed loyal to the firm during the first quarter of 2020. |
| % Staying Foreign Inst. Investors | The fraction of incumbent foreign institutional investors who stayed loyal to the firm during the first quarter of 2020. |
| #Inst. Ownership Change | The change in the number of all institutional owners during the first quarter of 2020. |
| #Domestic Inst. Ownership Change | The change in the number of all domestic institutional owners during the first quarter of 2020. |
| #Foreign Inst. Ownership Change | The change in the number of all foreign institutional owners during the first quarter of 2020. |
| *Country characteristics:* | |
| Low Rule of Law | Dummy variable that equals one if the country's rule of law score is equal or below the sample countries' median. Rule of law in a country is measured through the World Bank's Rule of Law index. |
| High Rule of Law | Dummy variable that equals one if the country's rule of law score is equal or larger than the sample countries' median. Rule of law in a country is measured through the World Bank's Rule of Law index. |
| Low Disclosure | Dummy variable that equals one if the country's disclosure score is equal or below sample countries' median. Disclosure in a country is measured through the disclosure index provided by La Porta et al. (2006). |
| High Disclosure | Dummy variable that equals one if the country's disclosure score is equal or larger than the sample countries' median. Disclosure in a country is measured through the disclosure index provided by La Porta et al. (2006). |
| Low ASDI | Dummy variable that equals one if the country's ASDI score is equal or below the sample countries' median. The anti-self-dealing index (ASDI) is provided by Djankov et al. (2008). |
| High ASDI | Dummy variable that equals one if the country's ASDI score is equal or larger than the sample countries' median. The anti-self-dealing index (ASDI) is provided by Djankov et al. (2008). |
| Low Uncertainty Avoidance | Dummy variable that equals one if the country's uncertainty avoidance score is equal or below the sample countries' median. Uncertainty avoidance in a country is measured through Hofstede's cultural dimension scores. |
| High Uncertainty Avoidance | Dummy variable that equals one if the country's uncertainty avoidance score is equal or larger than the sample countries' median. Uncertainty avoidance in a country is measured through Hofstede's cultural dimension scores. |
| Low Long-Term Orientation | Dummy variable that equals one if the country's long-term orientation score is equal or below the sample countries' median. Long-term orientation in a country is measured through Hofstede's cultural dimension scores. |

| | |
|---|---|
| High Long-Term Orientation | Dummy variable that equals one if the country's long-term orientation score is equal or larger than the sample countries' median. Long-term orientation in a country is measured through Hofstede's cultural dimension scores. |
| Low Trust | Dummy variable that equals one if the country's trust score is equal or below the sample countries' median. Societal trust in a country is measured through the response to the question "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" from the WVS. We use the proportion of respondents answering with "most people can be trusted" as a score for societal trust. |
| High Trust | Dummy variable that equals one if the country's trust score is equal or larger than the sample countries' median. Societal trust in a country is measured through the response to the question "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" from the WVS. We use the proportion of respondents answering with "most people can be trusted" as a score for societal trust. |

**Table E2:** This table reports the number of firms per country in our sample. In total our sample consists of 947 firms from 16 different European countries.

| ID | Country | Number of Firms |
|---|---|---|
| 1 | Austria | 22 |
| 2 | Belgium | 36 |
| 3 | Denmark | 26 |
| 4 | Finland | 20 |
| 5 | France | 120 |
| 6 | Germany | 149 |
| 7 | Ireland | 16 |
| 8 | Italy | 80 |
| 9 | Luxembourg | 12 |
| 10 | Netherlands | 44 |
| 11 | Norway | 23 |
| 12 | Portugal | 10 |
| 13 | Spain | 70 |
| 14 | Sweden | 41 |
| 15 | Switzerland | 78 |
| 16 | United Kingdom | 200 |
| Total | | 947 |

**Table E3:** This table reports pairwise correlation coefficients for our variables where * indicates significance at the 5% level or lower. All variables are defined in detail in Table E1 in the appendix.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Abnormal returns | 1 | | | | | | | | | | | | | | | | | | | | |
| (2) Raw returns | 0.04* | 1 | | | | | | | | | | | | | | | | | | | |
| (3) High IR | −0.01 | 0.19* | 1 | | | | | | | | | | | | | | | | | | |
| (4) *log*(IR score) | 0.04* | 0.21* | 0.57* | 1 | | | | | | | | | | | | | | | | | |
| (5) Size | 0.02* | −0.03* | 0.34* | 0.41* | 1 | | | | | | | | | | | | | | | | |
| (6) ROE | 0.00 | 0.15* | 0.10* | 0.07* | 0.14* | 1 | | | | | | | | | | | | | | | |
| (7) Tobin's Q | −0.03* | 0.17* | 0.10* | 0.07* | −0.31* | −0.05* | 1 | | | | | | | | | | | | | | |
| (8) Market-to-Book | −0.03* | 0.11* | 0.07* | 0.08* | −0.21* | −0.03* | 0.83* | 1 | | | | | | | | | | | | | |
| (9) Historical Volatility | 0.01 | −0.28* | −0.23* | −0.26* | −0.31* | −0.30* | −0.05* | −0.08* | 1 | | | | | | | | | | | | |
| (10) Cash / Assets | 0.02* | 0.11* | −0.03* | −0.07* | −0.24* | 0.02* | 0.33* | 0.20* | 0.20* | 1 | | | | | | | | | | | |
| (11) Short-term Debt / Assets | 0.04* | −0.05* | −0.04* | 0.04* | 0.22* | 0.07* | −0.17* | −0.06* | −0.09* | −0.16* | 1 | | | | | | | | | | |
| (12) Long-term Debt / Assets | −0.01 | −0.14* | 0.02* | 0.06* | 0.03* | −0.03* | −0.17* | −0.01 | −0.08* | −0.34* | 0.18* | 1 | | | | | | | | | |
| (13) Momentum | −0.06* | 0.24* | 0.14* | 0.12* | 0.03* | −0.02* | 0.15* | 0.18* | −0.46* | −0.16* | −0.01 | 0.16* | 1 | | | | | | | | |
| (14) Analyst Following | 0.02* | 0.04* | 0.50* | 0.42* | 0.59* | 0.09* | 0.00 | 0.01 | −0.26* | −0.12* | 0.06* | 0.05* | 0.03* | 1 | | | | | | | |
| (15) Blockholder | 0.04* | 0.07* | −0.18* | −0.13* | −0.21* | −0.07* | 0.05* | 0.01* | 0.13* | 0.07* | 0.04* | −0.01* | −0.01 | −0.29* | 1 | | | | | | |
| (16) Institutional Ownership | −0.07* | −0.06* | −0.10* | −0.21* | −0.23* | −0.05* | 0.16* | 0.15* | 0.08* | 0.03* | −0.08* | −0.03* | 0.02* | −0.13* | 0.00 | 1 | | | | | |
| (17) US Listing | −0.02* | 0.05* | 0.12* | 0.14* | 0.22* | 0.01* | −0.02* | −0.03* | −0.09* | −0.01 | 0.02* | 0.05* | 0.11* | 0.18* | −0.16* | −0.08* | 1 | | | | |
| (18) High ES | 0.04* | 0.12* | 0.22* | 0.29* | 0.57* | 0.05* | −0.20* | −0.15* | −0.27* | −0.17* | 0.11* | 0.05* | 0.07* | 0.44* | −0.16* | −0.20* | 0.18* | 1 | | | |
| (19) Board Size | 0.08* | 0.01 | 0.18* | 0.21* | 0.53* | 0.02* | −0.27* | −0.22* | −0.20* | −0.09* | 0.19* | 0.06* | −0.09* | 0.42* | 0.00 | −0.28* | 0.04* | 0.42* | 1 | | |
| (20) Board Independence | −0.02* | −0.01 | 0.11* | 0.14* | 0.20* | 0.04* | 0.00 | −0.01* | −0.11* | −0.04* | 0.00 | 0.01* | 0.06* | 0.25* | −0.30* | 0.12* | 0.16* | 0.20* | −0.06* | 1 | |
| (21) Board Governance Score | −0.01* | −0.04* | 0.24* | 0.20* | 0.41* | 0.07* | −0.13* | −0.09* | −0.18* | −0.14* | 0.05* | 0.12* | 0.10* | 0.38* | −0.37* | −0.06* | 0.14* | 0.42* | 0.18* | 0.43* | 1 |

**Table E4:** This table shows the results from a second stage OLS regression where the dependent variable is the firm's cumulative abnormal stock return for the period from February 3, 2020 to March 23, 2020. In the first stage, we performed either a Logit regression of *High IR* or an OLS regression of the *log(IR Score)* on a set of firm performance measures and industry and country-fixed effects. We use the residuals (i.e. the part of *High IR* that is not explained by a firm's prior performance) of the Logit regression as the main independent variable of interest in this second stage regression in column (1), and those of the OLS regression in column (2). We also control for the same firm characteristics as in Table 6.3 and include industry and country-effects. The industry-fixed effects are based on the Global Industry Classification Standard's (GICS) 11 sectors. All variables are described in detail in Table E1 in the appendix. We report robust standard errors clustered by country in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| Dependent Variable: *Abnormal returns* | (1) | (2) |
|---|---|---|
| IR Residuals | 0.0650** | 0.1203*** |
| | (0.0259) | (0.0248) |
| Size | 0.0051 | −0.0002 |
| | (0.0113) | (0.0121) |
| ROE | 0.3482 | 0.3722 |
| | (0.3024) | (0.2966) |
| Tobin's Q | 0.0221*** | 0.0237*** |
| | (0.0065) | (0.0066) |
| Market-to-Book | 0.0000 | −0.0009 |
| | (0.0022) | (0.0022) |
| Historical Volatility | −0.1401 | −0.1499 |
| | (0.1608) | (0.1631) |
| Cash / Assets | 0.1037* | 0.1010 |
| | (0.0608) | (0.0616) |
| Short-term Debt / Assets | −0.4052* | −0.3618 |
| | (0.2430) | (0.2448) |
| Long-term Debt / Assets | −0.2739*** | −0.2728*** |
| | (0.0672) | (0.0676) |
| Momentum | −0.0827*** | −0.0863*** |
| | (0.0145) | (0.0145) |
| Analyst Following | 0.0529*** | 0.0358** |
| | (0.0176) | (0.0176) |
| Blockholder | 0.0364 | 0.0430 |
| | (0.0490) | (0.0507) |
| Institutional Ownership | −0.0033 | −0.0140 |
| | (0.0433) | (0.0430) |
| US Listing | 0.0876*** | 0.0753*** |
| | (0.0275) | (0.0288) |
| Observations | 550 | 550 |
| Industry Fixed Effects | yes | yes |
| Country Fixed Effects | yes | yes |
| Adjusted R-Squared | 0.15 | 0.16 |
| Estimation method | Logit | OLS |

**Table E5:** This table presents the results from OLS regressions similar to Ding et al. (2020). The dependent variable is a firm's weekly stock return during the first quarter of 2020. The main independent variable of interest is *High IR*, which equals one if the firm's IR score is larger than the median IR score within the respective country. We interact *High IR* with the variable *Weekly Growth*, which is the weekly growth rate of confirmed COVID-19 cases in the respective country, calculated as log((1+confirmed cases in week (t)) / (1 + confirmed cases in week (t-1))). Similar to Ding et al. (2020) we control for firm characteristics (in columns (2), (3) and (4)), and economy characteristics (in column (3)) in terms of annual *GDP growth* rate, *log(GDP)*, and *%Population (age > 65)*, which is the fraction of people aged above 65 years in a country. In column (3), we also include several legal origin dummy variables which equal one if the country's legal origin is English, French, or German. Across all columns, we include industry and firm fixed-effects. The industry-fixed effects are based on the Global Industry Classification Standard's (GICS) 11 sectors. We report robust standard errors clustered by firm in parentheses, with ***, **, * denoting statistical significance at the 1%, 5%, and 10% level.

| Dependent Variable: *Weekly returns* | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Weekly Growth | −0.0326*** | −0.0143** | −0.5561*** | −0.0196*** |
| | (0.0014) | (0.0056) | (0.0745) | (0.0056) |
| High IR × Weekly Growth | | 0.0059*** | 0.0056*** | 0.0058*** |
| | | (0.0022) | (0.0018) | (0.0021) |
| Size × Weekly Growth | | −0.0025*** | −0.0017*** | −0.0023*** |
| | | (0.0006) | (0.0006) | (0.0006) |
| ROE × Weekly Growth | | 0.0138 | 0.0108 | 0.0132 |
| | | (0.0121) | (0.0109) | (0.0116) |
| Tobin's Q × Weekly Growth | | −0.0002 | 0.0003* | −0.0001 |
| | | (0.0002) | (0.0002) | (0.0002) |
| Market-to-Book × Weekly Growth | | 0.0000*** | 0.0000*** | 0.0001*** |
| | | (0.0000) | (0.0000) | (0.0000) |
| Cash / Assets × Weekly Growth | | 0.0052 | −0.0073 | 0.0015 |
| | | (0.0091) | (0.0078) | (0.0086) |
| Short-term Debt / Assets × Weekly Growth | | 0.0077 | −0.0266 | 0.0018 |
| | | (0.0257) | (0.0222) | (0.0252) |
| Long-term Debt / Assets × Weekly Growth | | −0.0135* | −0.0216*** | −0.0149** |
| | | (0.0076) | (0.0068) | (0.0072) |
| Legor(English) × Weekly Growth | | | 0.0243*** | |
| | | | (0.0054) | |
| Legor(French) × Weekly Growth | | | 0.0408*** | |
| | | | (0.0048) | |
| Legor(German) × Weekly Growth | | | 0.0006 | |
| | | | (0.0046) | |
| GDP Growth × Weekly Growth | | | −0.0404 | |
| | | | (0.1009) | |
| log(GDP) × Weekly Growth | | | 0.0398*** | |
| | | | (0.0059) | |
| %Population (age > 65) × Weekly Growth | | | 0.0041*** | |
| | | | (0.0008) | |
| Observations | 8916 | 8904 | 8904 | 8904 |
| Industry Fixed Effects | yes | yes | yes | yes |
| Firm Fixed Effects | yes | yes | yes | yes |
| Economy Time Fixed Effects | no | no | no | yes |
| Adjusted R-Squared | 0.07 | 0.07 | 0.08 | 0.08 |

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