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Banking sector reactions to COVID-19: The role of bank-specific factors and government policy responses

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ABSTRACT

This paper examines the impact of bank-specific factors and variations in the context of stringency of government policy responses on bank stock returns because of the COVID-19 pandemic. A sample of 1,927 publicly listed banks from 110 countries is used for the period of the first major wave of COVID-19, that is, January to May 2020. Our findings indicate that stock returns of banks with higher capitalization and deposits, more diversification, lower non-performing loans, and larger size are more resilient to the pandemic. While banks' environment and governance scores do not have a significant impact, higher social and corporate social responsibility strategy scores intensify the negative stock price reaction to COVID-19. We further observe that the pandemic-induced reduction in bank stock prices is mitigated as the strictness of government policy responses increases, mainly through economic responses such as income support, debt and contract relief, and fiscal measures from governments.

1. Introduction

The coronavirus (COVID-19) outbreak, which began in Wuhan, China, in December 2019, has spread globally. As all manners of people can quickly spread the virus, governments have been implementing several restrictions to minimize infections. Many economies globally have been implementing lockdown measures, which has led to decreases in economic activities and sharp declines in the stock markets. Alongside the health measures, central banks and governments implement a combination of monetary, fiscal, and regulatory policies in response to COVID-19 (Laeven and Valencia, 2020) to calm markets.[1] As the pandemic has caused economic disruption at an unprecedented speed and scale, the policies can only somewhat mitigate the negative economic impacts.

There are fast-developing literature that explore the potential impacts of the COVID-19 pandemic on financial markets, such as its influence on stock market behavior (Shanaev et al., 2020; Ashraf, 2020; Al-Awadhi et al., 2020; Zaremba et al., 2020, 2021a; Chen et al., 2020; Szczygielski et al., 2021; Liu et al., 2021), cryptocurrencies (Conlon et al., 2020; Conlon and McGee, 2020; Corbet et al., 2020; Demir et al., 2020; Goodell and Goutte, 2021a, 2021b), oil prices (Mzoughi et al., 2020; Sharif et al., 2020), bond markets (Nozawa and Qiu, 2021; Zaremba et al., 2021b), real estate (Ling et al., 2020), and gold (Akhtaruzzaman et al., 2021). However, at the time of writing and to our knowledge, there are limited studies that specifically address the impact of COVID-19 on stock returns of the banking industry. After the 2008 global financial crisis, tighter capital and liquidity requirements were placed for banks with Basel III, which helped the global banking system to improve its safety to certain extent (Baldwin and Weder di Mauro, 2020). However, banks

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[1] Detailed and up to date policy responses are available at https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19.

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are still hit harder than most industries by the rapid spread of COVID-19. The negative impact on banks is expected to be higher compared to previous crises (Aldasoro et al., 2020) because banks are, by nature, very vulnerable during crisis periods (Goodell, 2020). Motivated by such vulnerability, this paper examines how different bank-specific factors (such as balance sheet conditions and environmental, social, and governance (ESG) scores) and global variation in government policy responses influence the stock price reaction of the banking sector to the COVID-19 pandemic.

Fast-growing finance literature explores the potential impacts of the COVID-19 pandemic on financial markets. One stream of this research investigates how COVID-19 affects the stock markets. Shanaev et al. (2020) considered the impact of COVID-19 on stock returns in 51 countries by using three related proxies for the magnitude of COVID-19, namely fundamental measures (COVID-19 case numbers and infection peak), governmental policy measures (fiscal and monetary policy measures), and measures reflecting the sentiment (Google trends search volume for COVID-19). While all factors severely influenced the stock returns, the magnitude of the impact varied substantially. The main driver of the decrease in stock returns was the extent of policy interventions. Ashraf (2020) documented that while the response of 64 countries' stock markets to the growth of the number of COVID-19 confirmed cases was negative, the impact of the growth of the number of confirmed deaths was mostly insignificant. Al-Awadhi et al. (2020) showed the negative impact of the daily growth in the total numbers of cases and deaths caused by COVID-19 on the stock returns of companies in China. Using panel Granger non-causality tests, Wang and Enilov (2020) found that the number of confirmed COVID-19 cases causes a significant decrease in stock market returns in Canada, France, Germany, Italy, and the United States (US). Baek et al. (2020); Baker et al. (2020), and Zaremba et al. (2020) documented that COVID-19 lead to a substantial increase in stock market volatility.

Another vein of research is the impact of COVID-19 on other asset classes. The focus of this stream is on cryptocurrencies, which are generally expected to serve as a hedge against uncertainty. Demir et al. (2020) provided supportive evidence on the hedging role of cryptocurrencies against the uncertainty raised by COVID-19; Conlon and McGee (2020) and Corbet et al. (2020), in contrast, showed that Bitcoin does not act as a hedge. Other studies explored the response of oil prices (Mzoughi et al., 2020; Sharif et al., 2020), corporate bond markets (Nozawa and Qiu, 2021), real estate (Ling et al., 2020), and gold (Akhtaruzzaman et al., 2021) to COVID-19. Besides, some studies examined the more adversely affected sectors by the pandemic (Kanno, 2021; Haroon and Rizvi, 2020; Al-Awadhi et al., 2020; Mazur et al., 2020; Goodell and Huynh, 2020; Ramelli and Wagner, 2020).

Another vein, to which our paper is more related, aims to determine the firm-level factors that might mitigate the negative impact of COVID-19 and provide shelter to firms. While some of these studies focus on financial (balance sheet) characteristics, others investigate the influence of corporate social responsibility (CSR) and ESG scores, topics which have gained more attention during the pandemic (Popkova et al., 2021). Ramelli and Wagner (2020) investigated the pandemic's impact on stock prices of the US firms and show that, initially, firms with more exposure to China are negatively affected by COVID-19. However, as the center of the virus shifts to Europe and the US, those companies are more favored by investors. Moreover, they observe that firms with higher debt and less cash are more adversely affected. Ding et al. (2020) investigated the Chinese stock market reaction to the outbreak using event study methodology. They show that firms with higher Hubei exposure have lower stock returns because these firms, having had operations in the epicenter of the disease, are hit comparably harder. They also find that foreign exposure of firms serves as a value-creating factor during the domestic outbreak, but it destroys value after the virus spreads overseas. Zaremba et al. (2021b) explored which factors can provide stock market immunity to the pandemic. Implementing various techniques such as machine learning, panel regression, and factor analysis, they show that low unemployment, conservative investments, and limited valuations can improve immunity in 67 countries. Lopatta et al. (2020) found that companies that address COVID-19 in their annual reports in the early stages of the pandemic by including assessments on its potential impact on their business activities have lower stock risks and better stock performance, whereas companies that do not report any information about the pandemic experience increased stock price risk. Fahlenbrach et al. (2020) showed that financial flexibility is an essential factor providing resilience to firms during the pandemic, and firms with higher financial flexibility experience better stock returns, benefiting less from government stimulus packages. According to Heyden and Heyden (2021), firm-specific characteristics such as tangibility, liquidity, and institutional holdings can mitigate the magnitude of the stock price reaction. Hassan et al. (2020) constructed measures of firms' exposure to epidemic diseases using earnings conference call transcripts; companies that have experienced previous pandemics such as SARS or H1N1 have more optimistic expectations of their abilities to cope with COVID-19. Using data from 6,000 firms across 56 countries, Ding et al. (2021) explored the relationship between firm characteristics and stock prices during the COVID-19 pandemic. They observed that the pandemic-led decrease in stock prices was milder for firms with a stronger pre−COVID-19 financial situation (higher profit, less leverage, and more cash), more CSR activities, and less exposure to the pandemic through global markets and supply chains. Takahashi and Yamada (2021) explored the factors affecting Japanese stock returns during the pandemic; they observe that while indirect government ownership is positively associated with abnormal returns of Japanese companies, foreign ownership harms abnormal returns. They also found that ESG activities of firms were not significantly associated with abnormal returns. Albuquerque et al. (2020) analyzed whether firms with higher environmental and social ratings were more resilient to COVID-19 in the US, documenting that such firms tended to have higher returns and lower volatilities. A similar finding was reported by Broadstock et al. (2021); they found that higher ESG performance decreased financial risk, and portfolios with high-ESG scores generally outperformed low-ESG portfolios.

COVID-19 might affect banks in several different ways. For instance, banks worldwide hold large US dollar-denominated borrowings to fund international trade, financial investments, and a diverse set of dollar assets (Aldasoro and Ehlers, 2018). Financial crises tighten the money markets that lend dollars, implying risks for the global banking system. Banks operating in emerging economies are more severely hit by the decreases in the flow of such funds. As a first response to the pandemic, central banks extend the existing swap lines and create new lines to lower dollar funding costs (Bahaj and Reis, 2020). Bank prudential regulatory measures, such as softening the treatment of non-performing loans and easing capital buffers, have been placed to alleviate the negative impacts of COVID-19 on the stability of financial systems (Bitar and Tarazi, 2020). Danisman et al. (2021) showed that equity markets of

countries with stricter regulatory requirements on capital and liquidity tend to be more resilient to COVID-19. Due to Basel III capital and liquidity reforms from after 2008, banks are better positioned to absorb the severe impacts of COVID-19. However, easing the conduct of non-performing loans and capital buffers during the pandemic might jeopardize banks' solvency. The likelihood of an increase in non-performing loans and the possibility of heavy withdrawal of deposits by firms and households (Goodell, 2020; Perotti, 2020) would severely hit banks' performance. This was confirmed by Elnahass et al. (2021), who showed that COVID-19 has adverse effects on banks' financial performance and stability in 116 countries, which differs for Islamic and conventional banks. Danisman et al. (2021) found that banking systems with a higher presence of Islamic banks were more resilient.

Moreover, COVID-19 negatively affects the performance of firms' operations in all industries, and there might be spillover effects on banks, which would magnify their credit risk exposure. Acharya and Steffen (2020) argued that the increasing speed of credit line drawdowns, especially of riskier firms, might harm bank balance sheets and lower their capital adequacy ratios. This would jeopardize their stability and put some constraints to future intermediation with some potential spillovers to the real economy. Although all banks' balance sheets would potentially suffer from such negative consequences of COVID-19, some banks are likely to be less affected. For instance, Beltratti and Stulz (2012) found significant variations in the stock returns of large banks around the world during the 2008 global financial crisis, and not every bank performed equally poorly. Their findings showed that while the stock prices of banks that rely more on short-term finance pre-crisis performed worse, banks that have more capital and lower pre-crisis returns fared better during the crisis. Other studies explored bank-specific factors that led to better accounting performances during the global financial crisis. For instance, Berger and Bouwman (2013) found that higher capital improved the performance of medium and large US banks during crises. According to Vazquez and Federico (2015), banks with less structural liquidity and more leverage before the 2008 financial crisis were more inclined to fail afterward. Laeven et al. (2016) found that systemic risk during the 2008 crisis increased with bank size, and it was inversely related to bank capital. As evident, investors differentiate banks according to their pre-crisis financial characteristics, and a solid pre−COVID-19 balance sheet is essential (Aldasoro et al., 2020). Motivated by these studies, we aim to explore which bank-specific factors can provide shelter to banks during COVID-19.

During COVID-19, governments have developed and implemented several health-related and non-health-related policy responses. For instance, they have imposed several restrictions such as border closures, stay-at-home requirements, international flight bans, and social distancing measures. Such policy responses are likely to impact the stock returns of banks. We further explore whether the variation in various government policy responses to COVID-19 has influenced the stock return behavior of banks. To analyze this, we utilize the government policy response data available for several countries from the Oxford COVID-19 Government Response Tracker (OxCGRT) (Hale et al., 2020). Their database includes indicators on (1) containment and closure policies, (2) health system policies, and (3) economic policy responses of governments. Economic policy response indicators (composed of income support, debt contract relief, fiscal measures, and international support) are our main focus because bank behavior and investor valuations would be more influenced by such policies.

We used a sample of 1,927 publicly listed banks from 110 countries for the first major COVID-19 wave: January to May 2020. We employed panel data estimation techniques with country and time (week) fixed effects; examined the influence of interaction between the growth of the weekly cumulative number of deaths and the variables that include bank-specific factors, ESG scores, and the government policy response indices on the weekly stock returns. We followed Ding et al. (2021) and Zaremba et al. (2021b) and used the most recent year's data to capture the pre-pandemic bank-specific factors and ESG scores that are likely to influence stock price behavior during the pandemic. For the remaining variables, we used data in weekly frequency. Our findings indicate that stock prices of banks with higher capital and deposit share, more diversification, less non-performing loans, and larger size are more resilient. Our finding complements the notion that a stronger pre−COVID-19 bank balance sheet has been crucial for investor valuations during the pandemic (Aldasoro et al., 2020; Ding et al., 2021) and also is in line with the findings of Beltratti and Stulz (2012), who find that bank stocks with stronger pre-crisis balance sheet factors have performed better during the 2008 global financial crisis. Next, we find that while banks' environment and governance scores do not have a significant impact, higher social and CSR strategy scores intensify the negative stock price reaction to COVID-19. This aligns with Takahashi and Yamada (2021), who documented that ESG activities are not associated with abnormal returns. We further observe that the pandemic-induced reduction in bank stock prices is mitigated as the strictness of government policy responses increases through income support, debt and contract relief, and fiscal measures from governments, consistent with Zaremba et al. (2021b,c). This shows that the policy responses by the governments do help and support stock markets during COVID-19.

We contribute to the literature in the following ways. First, while there is fast-developing finance literature on COVID-19, to our knowledge, existing studies focusing on the impact of COVID-19 on bank stock prices are scarce. Therefore, this paper is among the first to shed light on the impact of COVID-19 on global banking stock returns; first, we reveal bank-specific factors that make banks more resilient to the pandemic. Second, as COVID-19 spreads globally, governments impose several restrictions, containment and health measures, monetary, fiscal, and regulatory policy responses. We take advantage of a new database and retrieve government policy response data from the OxCGRT compiled by Hale et al. (2020) and then document which types of policy responses have helped mitigate the negative reactions to COVID-19.

The rest of the paper is organized as follows. Section 2 explains the data and methodology. Section 3 presents the results and discussions. The last section concludes the paper.

2. Data and methodology

2.1. Data

This section presents the various sources of data and variables used.

2.1.1. COVID-19

The COVID-19 related data is retrieved from Hale et al. (2020), the OxCGRT. The first COVID-19 case was observed in Wuhan, China, in December 2019, and the first death was reported in China on January 11, 2020. We extracted the COVID-19 related data for 110 countries for the first major wave from January 11, 2020, to May 28, 2020. We used the growth of the weekly cumulative number of deaths (denoted as *COVID19*) in a country to measure the exposure to the pandemic. Table 1 displays brief descriptions of the variables and data sources. To match *COVID19* with weekly stock returns, we calculated it from Saturdays to Fridays. Specifically, following Ding et al. (2021), we calculated it for each country j and week t as follows:

$$COVID19_{jt} = \ln\left(1 + Confirmed\ Deaths_{jt}\right) - \ln(1 + Confirmed\ Deaths_{jt-1}) \quad (1)$$

As a robustness check, we used the weekly growth of the cumulative number of cases (*COVID19_V2*) as an alternative measure of country exposure to the pandemic. Table 2 presents the descriptive statistics where the mean *COVID19* is 0.34 with a maximum of 3.06.

2.1.2. Stock price

The stock price data was obtained from Thomson Reuters Datastream. We considered all publicly listed banks in a stock exchange, collected stock price information on 1,927 publicly listed banks from 110 countries, and accounted for all publicly listed banks.[2] Following Ding et al. (2021) and Hanselaar et al. (2019), stocks that actively trade in 2020 were included. The weekly stock returns (*Return*) were calculated by using the last trading day of the week dividend-adjusted closing prices during the weeks from January 2, 2020, through May 28, 2020. Table 2 demonstrates that the mean value of *Return* is −1.26%, revealing the global decline in bank stock prices. Fig. 1 displays the relationship between stock price returns and the COVID-19 exposure of the countries; the negative correlation is observed, which is an initial sign of the negative impact of the pandemic on bank stock returns.

2.1.3. Bank-level financials

We collected bank-level financial data from the Worldscope database of Thomson Reuters Eikon. Following Ding et al. (2021), we used the most recent year's data, that is, 2018, to incorporate the pre-2020 financial conditions that were likely to influence stock price behavior during the pandemic.[3] We considered six main bank characteristics as follows: *Capitalization, ROE, Noninterest income share*, *Size*, *Deposit share,* and *NPLs*. *Capitalization* is the share of common equity in total assets and indicates how well capitalized the banks were pre-pandemic. Table 2 demonstrates that the capitalization range in our sample is 2.63–62.72 %, with a mean of 11.48 %. *ROE* is the return on equity and a proxy for the profitability of banks. ROE ranges from −31.70 % to 34.79 %, with a mean of 9.50 %. *Noninterest income share* is a proxy for income diversification and is calculated as the share of noninterest income in total revenues and indicates the revenues from sources other than interest such as trading activities, fees, and commissions. The mean noninterest income share is 22.23 %. *Size* is calculated as the natural logarithm of total assets, and the average size of banks is 17.74, ranging from 5.58 to 27.90. *Deposit share* is the share of deposits in total assets; the mean deposit share is 71.36 %, ranging from 14.76–93.59. Further, *NPLs* indicate the share of non-performing loans to total loans, and the average NPLs is 4.17 %, with a minimum of 0.02 % and a maximum of 62.96 %.

2.1.4. Environment, social and governance (ESG)

Next, we investigated whether pre-pandemic ESG scores of banks have any influence on stock return behavior during the pandemic. We retrieved data from the Thomson Reuters ASSET4 database, which collects ESG information for publicly listed and large firms from various sources such as corporate annual and socially responsible reports, stock exchange filings, non-profit organizations, and the news media. Like bank characteristics and country controls, we used the most recent year's data, that is, 2018. However, ESG data is not available for many banks in the database, which leaves us with fewer observations. We focused on four indices related to *Environment*, *Social*, *Governance,* and *CSR strategy*. *Environment* stands for environment pillar score, indicating the environmental performance of banks for resource use, emission reduction, and green innovation. *Social* indicates the social pillar score and captures information on the extent to which banks enhance employee welfare, respect human rights, produce responsibly, and act in community development. *Governance* incorporates the corporate governance pillar score that is evaluated in: management, shareholders, and CSR strategy. Finally, the *CSR Strategy* captures information on the extent of organizing, operationalizing, and implementing CSR strategies. All of these four indices range from 0 to 100, and Table 2 indicates that banks have the highest average score on the governance

[2] Please see Appendix 1 for the list of countries.

[3] 2018 is used for bank-specific variables because of the unavailability of more recent bank balance sheet data at the time of writing. In the absence of an established methodological framework, we follow the literature (Ding et al., 2021; Zaremba et al., 2021b) and take their latest value. Even though this approach has some limitations, it shows how the differences between the pre-pandemic balance sheet situations of banks would affect the stock price reaction to COVID-19. Moreover, Table 2 shows that the standard deviations for bank-level variables range between 8.50 to 15.31, implying that there is a considerable amount of variation between banks.

Table 1
Variable descriptions.

Variable	Definition	Source
Return	The weekly stock return of banks which is calculated by using the closing prices on the last trading day of the week.	Thomson Reuters Datastream
COVID19	Confirmed deaths growth is calculated as: log(1+number of confirmed deaths in week t) − log(1+ number of confirmed deaths in week t-1)	Hale et al. (2020)
COVID19_V2	Confirmed cases growth is calculated as: log(1+number of confirmed cases in week t) − log(1+ number of confirmed cases in week t-1)	Hale et al. (2020)
Capitalization	Common Equity/ Total assets	Thomson Reuters Worldscope
ROE	Return on Equity	Thomson Reuters Worldscope
Noninterest income share	Non-interest income/Total Revenues	Thomson Reuters Worldscope
Size	Ln (Total assets)	Thomson Reuters Worldscope
Deposit share	Deposits/ Assets	Thomson Reuters Worldscope
NPLs	Non-performing loans/ Total loans	Thomson Reuters Worldscope
GDP pc growth	GDP per capita growth	World Bank World Development Indicators
Credit to private sector	Domestic credit to private sector (% of GDP)	World Bank World Development Indicators
Income support	This index measures whether the governments are covering the salaries or providing direct cash payments to people who lose their jobs or cannot work. It equals 0 if there is no income support; equals 1 if the government is replacing less than 50 % of lost salary; equals 2 if the government replaces 50 % or more of lost salary.	Hale et al. (2020). Oxford COVID-19 Government Response Tracker. Available: www.bsg.ox.ac.uk/covidtracker
Debt contract relief	Debt contract relief measures whether the governments are freezing financial obligations for households. It equals 0 if there is no such relief; equals 1 if there is a narrow relief which is specific to one kind of contract; equals 2 if there is a broad debt/contract relief.	Hale et al. (2020)
Fiscal measures (million USD)	Fiscal measures show the monetary value USD of fiscal stimuli adopted in a country which includes spending or tax cuts.	Hale et al. (2020)
International support (million USD)	International support indicates the monetary USD value of announced offers of COVID-19 related aid spending to other countries.	Hale et al. (2020)
Stringency Index	Stringency index measures the stringency in government responses to COVID-19. It ranges from 0−100 and is a simple average of the individual 9 component policy response indicators mainly related to containment and closure.	Hale et al. (2020)
Government Response Index	Government Response index measures the government responses to COVID-19. It ranges from 0–100 and is a simple average of the individual 13 component policy response indicators, related to containment and closure, economic response and health systems.	Hale et al. (2020)
Containment health index	Containment health index ranges from 0–100 and is a simple average of the individual 11 component policy response indicators, related to containment and closure, and health systems.	Hale et al. (2020)
Economic support index	Economic support index ranges from 0–100 and is a simple average of the individual 2 component policy response indicators, related to economic responses.	Hale et al. (2020)
Environment	Environmental pillar score indicates banks' environmental performance in three areas: resource use, emissions, and innovation.	Thomson Reuters ASSET4
Social	Social pillar score measures banks' commitments in four areas: workplace, human rights, community, and product responsibility.	Thomson Reuters ASSET4
Governance	Governance pillar score is evaluated in three dimensions: management, shareholders, and corporate social responsibility strategy.	Thomson Reuters ASSET4
CSR strategy	CSR Strategy index incorporates information on the extent of organizing, operationalizing, and implementing CSR strategies.	Thomson Reuters ASSET4

index with 49.50, and the lowest on the environment index with 25.37.

2.1.5. Government responses

We also investigated whether the variation in various government policy responses to COVID-19 has generated any influence on the stock return behavior of banks. For this, we retrieved government policy response data for the sample countries from Hale et al. (2020), the OxCGRT, on a weekly frequency for the period from January 11, 2020, to May 28, 2020.[4] The economic policy response indices from this database are our focus, which include *Income support*, *Debt contract relief*, *Fiscal measures,* and *International support.* Table 1 contains brief descriptions of these variables.

Income support considers whether governments cover the salaries or provide cash payments for people who lost their jobs during the

[4] OxCGRT systematically collects information on various common global government policies in response to the pandemic on 17 indicators with data from over 160 countries. Among the 17 indicators, eight capture information on containment and closure policies such as school and workplace closures and movement restrictions. Five indicators provide information on policies regarding health systems such as testing regimes or emergency healthcare investments. The remaining four indicators capture government economic policy responses which is our focus.

Table 2
Descriptive Statistics.

	N	mean	min	max	p25	p50	p75	sd
Return (%)	38508	−1.26	−527.30	647.70	−3.24	0.00	0.89	12.69
COVID19 (%)	1488	0.34	0.00	3.06	0.00	0.09	0.50	0.51
COVID19_V2 (%)	1488	0.49	−0.92	5.09	0.01	0.25	0.69	0.65
Bank characteristics								
Capitalization (%)	25200	11.48	2.63	62.72	7.31	9.95	12.70	8.54
ROE (%)	29757	9.50	−31.70	34.79	6.09	9.70	12.98	8.56
Noninterest income share (%)	29211	22.23	−59.99	110.70	11.74	19.75	30.15	14.92
Size	30177	17.74	5.58	27.90	14.95	17.27	20.21	3.50
Deposit share (%)	24549	71.36	14.76	93.59	64.60	74.82	81.98	15.31
NPLs (%)	21987	4.17	0.02	62.96	0.73	1.64	3.82	8.50
Environment	10626	25.37	0.00	92.34	0.00	7.97	51.04	30.86
Social	10626	43.81	0.00	96.74	24.50	37.55	62.97	24.12
Governance	10626	49.50	1.17	98.21	30.53	50.06	68.14	22.26
CSR strategy	10626	31.48	0.00	99.81	0.00	15.44	64.29	34.93
Country Controls								
GDP pc growth (%)	97	2.06	−4.63	6.84	0.94	2.13	3.80	2.25
Credit to private sector (%)	87	69.46	8.71	179.28	34.60	61.82	93.85	43.47
Government Responses								
Income support	2096		0	2	0	0	1	0.72
Income Support=1	342	0.16						
Income Support=2	282	0.13						
Debt contract relief	2096		0	2	0	0	1	0.80
Debt contract relief=1	287	0.14						
Debt contract relief=2	411	0.20						
Fiscal measures (million USD)	2086	1410	0	1960000	0	0	0	44400
International support (million USD)	2071	0.76	0	1300	0	0	0	29
Stringency Index	2096	40.78	0	100.00	0.00	32.41	79.63	36.76
Government Response Index	2084	37.66	0	96.15	2.56	33.33	70.51	32.69
Containment health index	2085	40.46	0	100.00	3.03	37.88	75.00	34.44
Economic support index	2091	22.32	0	100.00	0	0	50.00	32.31

Note: This table presents descriptive statistics of the variables.

pandemic. It is in an ordinal scale that takes a value of 0 when there is no income support; 1 if the support is less than 50 % of the lost salary; and 2 if the support is more than 50 %. Table 2 shows that 13 % of the countries provide support of more than half of the lost salary and 16 % provide support of less than half. *Debt contract relief* accounts for whether governments freeze financial obligations for households regarding loan repayments, water bills, or banning evictions, etc. It is an ordinal measure that takes a value of 0 for no such reliefs, 1 for narrow reliefs (specific to one kind of contract), and 2 for broad reliefs. While 20 % of the countries provided broad reliefs, 14 % recorded narrow reliefs (Table 2). *Fiscal measures* indicate the USD amount of economic stimulus policies adopted in the countries, including spending and tax cuts; the average fiscal measure is 1.4 billion USD (Table 2). *International support* demonstrates the USD amount of announced offers of COVID-19 related aid spending to other countries; the mean *International support* is 0.76 million USD. We took the natural logarithm of the variables *Fiscal measures* and *International support* in our regressions.

The OxCGRT aggregates the data from the 17 indicators into a set of four common indices to measure the strictness of government policies throughout the pandemic. We will also investigate their impact on bank stock returns during the pandemic. These include *Stringency Government Response*, *Containment Health,* and *Economic Support Indices*.

The *Stringency Index* measures the stringency in government responses to COVID-19 from 0 to 100, with higher values indicating stricter policies. It is a simple average of the individual nine component policy response indicators, mainly related to containment and closure policies. Our stringency index has an average value of 40.78. *Government Response Index* records the government responses to COVID-19 from 0 to 100. It records how government responses vary over the indicators related to containment and closures, economic responses, and health systems. The government response index has an average of 37.66 (Table 2). The *Containment Health Index is* also from 0 to 100. It is a simple average of the individual components that combine lockdown restrictions and closures with health measures such as testing policy and contact tracing, investments in healthcare, and vaccines. The average containment health index is 40.46. Lastly, the *Economic Support Index* combines measures such as income support and debt and contract relief, and the average economic support index is 22.32.

2.1.6. Country-specific controls

We further control some country-specific characteristics to account for the different country contexts, including *GDP pc growth* and *Credit to private sector*. The data for these are from the World Bank World Development Indicators, with 2018 values being used. *GDP pc growth* is simply the GDP (Gross Domestic Product) per capita growth, and *Credit to private sector* is the share of domestic credit to the private sector in GDP. The average *GDP pc growth* is 2.06 %, ranging between −4.63 % and 6.84 % (Table 2). The average *Credit to*

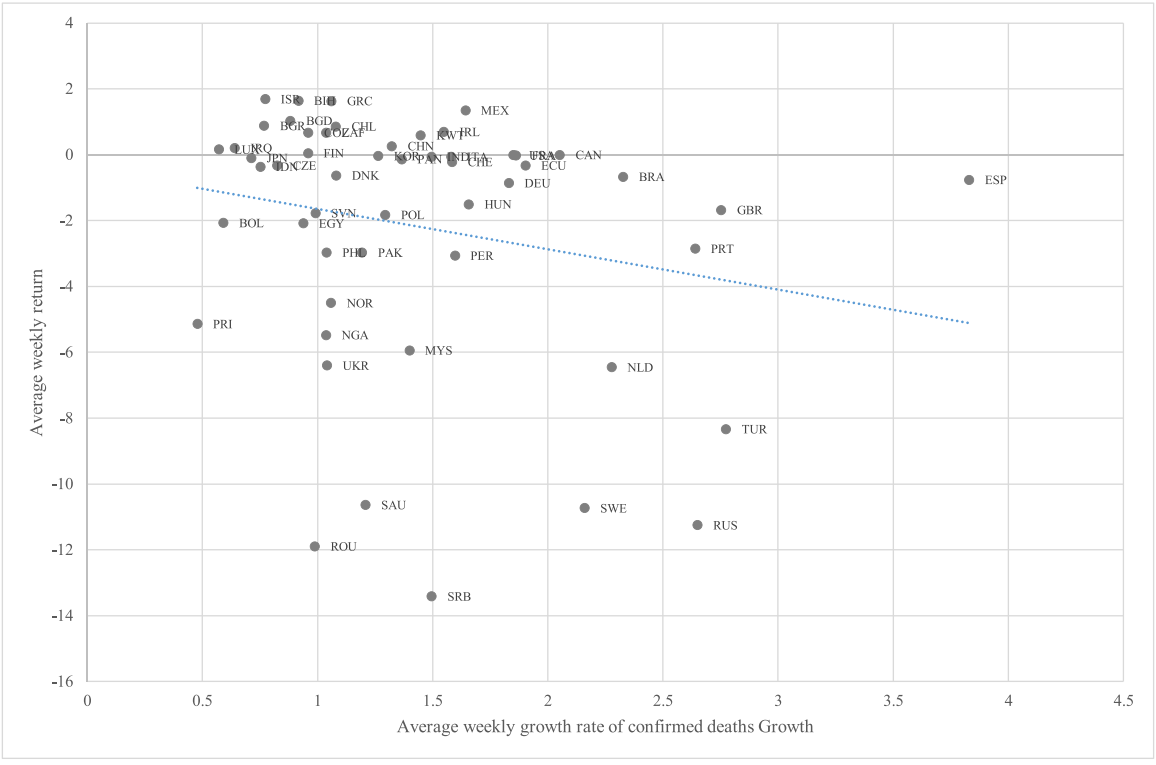

Fig. 1. Growth of Confirmed Deaths and Bank Stock Returns.

private sector is 69.46 %, showing a high variation, with a minimum of 8.71 % and a maximum of 179.28 %.

2.2. Methodology

To explore how bank characteristics and variation in government responses might influence stock returns after COVID-19, we followed Ding et al. (2021) and Zaremba et al. (2021b). Specifically, we used panel data estimation techniques with country and week fixed effects and incorporated the following empirical models:

$$Return_{it} = \alpha + \beta * COVID19_{jt} + \gamma * COVID19_{jt} * X_i + \delta * COVID19_{jt} * Z_j + \theta_i + \theta_t + \varepsilon_{it} \quad (2)$$

$$Return_{it} = \alpha + \beta * COVID19_{jt} + \gamma * COVID19_{jt} * Y_j + + \delta * COVID19_{jt} * Z_j + \theta_i + \theta_t + \varepsilon_{it} \quad (3)$$

where *i*, *j*, and *t* correspond to bank, country, and time (week), respectively. We included bank fixed effects and time (week) fixed effects to condition out the heterogeneity between the banks and the differences through time, i.e., bank- and time-varying properties. We estimated Eqs. (2) and (3) using panel data estimation techniques with standard errors clustered at the bank level.[5]

The dependent variable *Return* stands for the weekly bank stock returns calculated using the stock price from the last trading day in week t − 1 to the week *t* for January 2, 2020, to May 28, 2020. *COVID19* is the main independent variable of interest that measures COVID-19 exposure of countries and is calculated as the growth of the weekly cumulative number of deaths in a country. The interaction term *COVID19**X in Eq. (2) helps explore which banks' stock prices are more resilient during the pandemic. X stands for the bank's financial characteristics: Capitalization, ROE, Noninterest income share, Size, Deposit share, and *NPLs*. X also includes bank-level ESG scores. Z stands for the country controls to account for the heterogeneity between the countries, including *GDP pc growth* and *Credit to private sector*. The variables included in X and Z capture the pre-pandemic conditions, and the latest available data (2018) is used. Eq. (3) includes the interaction term *COVID19**Y where Y is the various government policy responses. These include *Income support*, *Debt contract relief*, *Fiscal measures*, *International support, Stringency Index*, *Government Response Index*, *Containment Health Index,* and *Economic Support Index*.

[5] Szczygielski et al. (2020) provide evidence that the empirical return-factor models that incorporate a limited number of variables might understate or overstate the impact of COVID-19 for time-series models, which might lead to under-specification. As we use panel data estimation techniques, but not times-series estimation, our approach does not suffer from such. However, studies examining the relationship between COVID-19 data and return behavior in a global setting within multifactor time series models need to take into account this under-specification issue.

3. Results

We first present the findings of the impact of bank-specific factors, then the effect of ESG scores, and the influence of variation in the stringency of government policy responses on bank stock returns as a response to COVID-19.

3.1. Bank characteristics

Table 3 presents the regression results regarding the influence of bank characteristics on stock price reactions during the pandemic. As an initial step, in Column 1, we exclude the interactions and include only *COVID19* and focus on the link between the country's exposures to the pandemic and bank stock returns. The coefficient of *COVID19* turns out negative and significant, indicating that the country's exposure to the pandemic in weekly growth rate of the cumulative number of deaths negatively influences the bank stock market performance. For economic magnitude, if COVID-19 deaths grow at the sample average of 0.44 %, the bank stock returns will fall by 0.38 % (0.44 %*−0.86) more per week. This negative impact's magnitude is significant, as it corresponds to 30 % of the sample mean of bank stock return over the sample period (−1.26). The results are consistent when we consider *COVID19_V2* in Column 2 as an alternative measure of the country's exposure to the pandemic. Our finding complements Ding et al.'s (2021); Al-Awadhi et al.'s (2020), and Ashraf's (2020), who document that COVID-19 exposure is strongly and negatively correlated with the stock market performance for firms from various industries.

Column 3 includes the interactions between *COVID19* and bank characteristics. We observe that the interactions between *COVID19* and *Capitalization, Noninterest income share, Size,* and *Deposit Share* appear positive and significant, whereas *NPLs* enters negatively and significantly. This is meaningful because the stock prices of banks with more capital and diversification, higher deposits, less non-performing loans, and larger size would be expected to be more resilient to the pandemic-induced stock price reduction. This is because higher values of these variables indicate stronger pre-pandemic conditions, and investor valuations would be less affected by the decreased credit demand and conservative lending behavior of banks (Danisman and Demir, 2020). This complements Beltratti and Stulz (2012) and Berger and Bouwman (2013) who showed that banks that have more capital fare better during crises. Aldasoro et al. (2020) also argued that well-capitalized banks saw a much stronger recovery implying that markets rewarded such banks. However, they did not report any significant recovery difference for non-performing loans. Larger banks might indicate more trust for investors during such an unusual pandemic time. This is in line with Ornelas et al. (2019) who documented that during the 2008 global financial crisis, large banks benefited more from government-sponsored credit allocations. The coefficient of the interaction between COVID19

Table 3
Bank characteristics and stock price reactions to COVID-19.

	(1)	(2)	(3)	(4)	(5)
COVID19	−0.864***		−5.170***	−6.886***	
	(0.13)		(1.13)	(1.22)	
COVID19_V2		−1.559***			
		(0.10)			
COVID19*Capitalization			0.048**	0.047**	0.076***
			(0.02)	(0.02)	(0.02)
COVID19*ROE			−0.021	−0.023*	−0.027*
			(0.01)	(0.01)	(0.01)
COVID19*Noninterest income share			0.016**	0.008**	0.020***
			(0.01)	(0.01)	(0.01)
COVID19*Size			0.136***	0.206***	0.174***
			(0.04)	(0.04)	(0.04)
COVID19*Deposit share			0.021***	0.016**	0.025***
			(0.01)	(0.01)	−0.007
COVID19*NPLs			−0.032***	−0.014**	−0.026**
			(0.01)	(0.01)	(0.01)
COVID19*GDP pc growth				−0.140**	
				(0.07)	
COVID19*Credit to private sector				0.008***	
				(0.00)	
Constant	−0.12	−0.108	−0.340***	−0.506***	−0.340***
	(0.19)	(0.19)	(0.11)	(0.11)	−0.113
R2	0.0887	0.0909	0.3512	0.3631	0.35
Observations	37868	37868	19919	18159	19919
Number of Banks	1895	1895	996	908	996
Bank FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Note: This table presents the regression results regarding the influence of bank characteristics on stock price reactions during the COVID-19 pandemic. The dependent variable is the weekly stock returns (Return) in all columns. Standard errors are clustered at the bank level and reported in parentheses.

* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.010$.

and ROE is insignificant, showing that profitability is not significantly associated with stock performance. Column 4 includes country controls, and the results remain robust, further revealing that countries' bank stock returns with more domestic credit share and lower GDP per capita growth are more resilient. The latter could be because of major developed markets such as the US, the United Kingdom, and France, with higher GDP per capita growth, being adversely affected by COVID-19 in confirmed numbers of cases and deaths. Column 5 excludes the COVID-19 variable, and the results hold. However, the coefficient of the interaction of COVID-19 and ROE becomes negative and significant, but shows weaker evidence as it is only significant at 10 %. Similarly, Aldasoro et al. (2020) showed that high profitable (Return on Assets) banks do not show a stronger recovery than low profitable ones.

To gage the economic magnitudes of the bank characteristics on the stock return sensitivity to COVID-19, we followed Ding et al. (2021) and exclude the COVID-19 term (Column 6). The coefficients reveal that a one standard deviation increase in pre-pandemic capitalization and noninterest income levels will mitigate the pandemic stock price reductions by 0.65 % (0.076*8.54) and 0.30 % (0.02*14.92), respectively. Moreover, one standard deviation increase in pre-pandemic size and deposit share levels will mitigate the negative pandemic stock price reductions by 0.61 % (0.174*3.50) and 0.38 % (0.025*15.31), respectively. Meanwhile, higher non-performing loans will magnify the pandemic-induced reduction in bank stock prices by 0.22 % (0.026*8.50). These impacts on stock prices are economically meaningful because the sample mean weekly stock return is −1.26 %.

3.2. ESG score

This section investigates whether ESG scores of banks would contribute to the resiliency of stock price reactions induced by COVID-19. Table 4 displays the findings where bank characteristics*COVID19 and country characteristics*COVID19 are included but not presented because of space considerations. Columns 1–4 include environment, social, governance, and CSR strategy scores sequentially because they are highly correlated with each other. We observed that environment and governance scores do not have a significant impact on bank stock returns during the pandemic, which complements Takahashi and Yamada (2021), who documented that ESG activities are not related to abnormal returns. Columns 2 and 4 show that higher social and CSR strategy scores intensify the negative stock price reaction to COVID-19. This finding complements the literature documenting that while ESG and CSR activities benefit the executives of firms, they might lead to reductions in shareholder value (Bénabou and Tirole, 2010; Masulis and Reza, 2015).

3.3. Government policy responses

Table 5 presents the findings of whether the variation in government policy responses to COVID-19 has generated any influence on the stock return behavior of banks. Columns 1–4 includes COVID19 with government policy response indicators sequentially because of high collinearity. Column 1 shows that the reduction in bank stock prices is mitigated as the income support from governments increase during the pandemic as opposed to when there is no such support. Specifically, the coefficient estimates in Column 1 more than doubles when the support is more than 50 % of the lost salary as compared to when support is less than 50 %. Column 2 documents that as governments increase the debt and contract relief for households to narrow and broad reliefs, the negative bank stock price reaction is mitigated because these reliefs include loan repayments (among others), which would reduce the non-performing loans, improve lending conditions, and lead investors to value bank stocks more favorably during the pandemic in such countries. Column 3 incorporates COVID19 with fiscal measures, which incorporates the USD amount of economic stimulus policies adopted in

Table 4
ESG scores and stock price reactions to COVID-19.

	(1) (Environment)	(2) (Social)	(3) (Governance)	(4) (CSR Strategy)
COVID19	−6.240***	−6.562***	−6.298***	−6.835***
	(1.43)	(1.40)	(1.50)	(1.47)
COVID19*Environment	−0.006			
	(0.01)			
COVID19*Social		−0.022***		
		(0.01)		
COVID19*Governance			−0.004	
			(0.01)	
COVID19*CSR Strategy				−0.013***
				(0.00)
Constant	−0.759***	−0.759***	−0.759***	−0.759***
	(0.13)	(0.13)	(0.13)	(0.13)
R2	0.5024	0.5029	0.5024	0.5027
Observations	9300	9300	9300	9300
Number of Banks	465	465	465	465
Bank FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Bank characteristics*COVID19	Yes	Yes	Yes	Yes
Country characteristics*COVID19	Yes	Yes	Yes	Yes

Note: This table presents the regression results regarding the influence of ESG scores on stock price reactions during the COVID-19 pandemic. The dependent variable is the weekly stock returns (Return) in all columns. Bank characteristics*COVID19 and Country characteristics*COVID19 are included in the regressions. Standard errors are clustered at the bank level and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$.

Table 5
Government policy responses and stock price reactions to COVID-19.

	(1) (Income support)	(2) (Debt contract relief)	(3) (Fiscal measures)	(4) (International support)
COVID19	−8.516***	−8.947***	−6.833***	−6.985***
	(1.36)	(1.39)	(1.24)	(1.23)
COVID19*Income support=1	1.412***			
	(0.41)			
COVID19*Income support=2	3.006***			
	(0.30)			
COVID19*Debt Contract relief=1		3.388***		
		(0.29)		
COVID19*Debt Contract relief=2		3.889***		
		(0.48)		
COVID19*Fiscal measures			0.001***	
			(0.00)	
COVID19*International support				0.000
				(0.00)
Constant	−0.506***	−0.505***	−0.506***	−0.506***
	(0.11)	(0.11)	(0.11)	(0.11)
R2	0.3704	0.3743	0.3678	0.3631
Observations	18159	18159	18159	18159
Number of Banks	908	908	908	908
Bank FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Bank characteristics*COVID19	Yes	Yes	Yes	Yes
Country characteristics*COVID19	Yes	Yes	Yes	Yes

Note: This table presents the regression results regarding the influence of government policy responses on stock price reactions during the COVID-19 pandemic. The dependent variable is the weekly stock returns (Return) in all columns. Bank characteristics*COVID19 and Country characteristics*COVID19 are included in the regressions. Standard errors are clustered at the bank level and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$.

the countries because of the pandemic. Even though the magnitude is smaller, the coefficient appears positive and significant, showing that countries that adopted higher fiscal measures, including spending and tax cuts, have experienced significantly fewer reductions in bank stock prices. Column 4 documents that international support to other countries for COVID-19-related aid spending does not significantly impact stock price reactions.

Table 6 displays the regression results of the government policy response indices and stock price reactions to COVID-19. These indices measure the strictness of government policies during the pandemic, which includes stringency, government response, containment health, and economic support index and their interactions with COVID-19. The coefficient estimates all appear positive

Table 6
Government policy response indices and stock price reactions to COVID-19.

	(1) (Stringency Index)	(2) (Government Response Index)	(3) (Containment health index)	(4) (Economic support index)
COVID19	−8.340***	−9.282***	−8.225***	−9.219***
	(1.26)	(1.27)	(1.25)	(1.40)
COVID19*Stringency index	0.018***			
	(0.01)			
COVID19*Government Response Index		0.035***		
		(0.01)		
COVID19*Containment health index			0.018***	
			(0.01)	
COVID19*Economic support index				0.053***
				(0.01)
Constant	−0.506***	−0.506***	−0.506***	−0.505***
	(0.11)	(0.11)	(0.11)	(0.11)
R2	0.3637	0.365	0.3636	0.3734
Observations	18159	18159	18159	18159
Number of Banks	908	908	908	908
Bank FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Bank characteristics*COVID19	Yes	Yes	Yes	Yes
Country characteristics*COVID19	Yes	Yes	Yes	Yes

Note: This table presents the regression results regarding the influence of government policy responses on stock price reactions during the COVID-19 pandemic. The dependent variable is the weekly stock returns (Return) in all columns. Bank characteristics*COVID19 and Country characteristics*COVID19 are included in the regressions. Standard errors are clustered at the bank level and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$.

and significant, showing that such policy responses mitigate the pandemic-induced negative bank stock return behavior. The coefficients with the highest magnitudes are the economic support and government response indices because the government response index also comprises economic response components, and such pandemic-induced policy measures related to the economy highly benefit the stock return reaction of banks.

4. Conclusion

We examined the impact of bank financial characteristics, ESG scores, and variation in government policy responses to empirically answer what banking characteristics and government policy responses assist banks' resilience to COVID-19. We used a sample of 1,927 publicly listed banks from 110 countries.

To our knowledge, this is among the first papers shedding light on the impact of COVID-19 on global banking stock returns while revealing the financial characteristics that make banks more resilient. Our findings indicate that countries' exposure to the pandemic concerning the weekly growth rate of the cumulative number of deaths negatively influences the bank stock market performance. We then observe that banks with stronger pre-2020 financial conditions experience less negative stock responses to COVID-19. However, environment and governance scores of banks do not have a significant impact. Higher social and CSR strategy scores, in comparison, intensify the negative stock price reaction to COVID-19.

Governments impose several restrictions, containment and health measures, and monetary, fiscal, and regulatory policy responses to diminish the negative consequences of COVID-19. Our findings indicate that these responses do help and the negative reaction in bank stock prices is mitigated as the stringency of government policy responses increases, mainly through economic responses such as income support, debt and contract relief, and fiscal measures from governments. Overall, our findings indicate that while bank stock prices negatively respond to COVID-19, this response can be mitigated when banks are financially strong. Investors value such banks more favorably because they might be expected to recover from the pandemic more quickly. Moreover, worldwide government policy responses, especially the economy-related ones, have helped banks incur less damage in their stock returns.

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Author statement

Ender Demir: Conceptualization; Writing - Original Draft; Methodology; Visualization.
Gamze Ozturk Danisman: Conceptualization; Writing - Original Draft; Methodology; Visualization; Data Curation; Formal analysis.

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