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Corporate Quantitative Easing in Europe During the COVID-19 Crisis and Debt Overhang

Asli Demirgüç-Kunt, Bálint L. Horváth, and Harry Huizinga

Abstract

This paper finds that shareholders of highly leveraged firms benefit relatively less compared to bondholders from the corporate quantitative easing (QE) announcements by the European Central Bank and the Bank of England in March 2020, as evidence of debt overhang. Firms more heavily impacted by the pandemic gain less from corporate QE, which could also reflect debt overhang. The monetary and fiscal responses to the pandemic are complements in the sense that a stronger pandemic-related fiscal response and higher pre-announcement sovereign credit default swap (CDS) spreads enhance the positive effects of corporate QE on equity and debt valuations.

KEYWORDS
Quantitative easing, debt overhang, pandemic

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1. Introduction

The COVID-19 pandemic caused a sharp reduction of economic activity in the first months of 2020, which negatively affected the revenues, liquidity and potentially solvency of many firms. In response to this crisis, the European Central Bank (ECB) announced the Pandemic Emergency Purchase Program (PEPP) in the evening of March 18, 2020. The PEPP earmarked 750 billion euros for the purchase of government and private debt securities until the end of 2020 without a preset allocation rule.[1] PEPP-eligible private debt instruments are investment-grade, issued by non-bank companies incorporated in the euro area, and dominated in euros.[2] Similarly, the Bank of England (BoE) announced an expansion of its asset-purchase program by 200 billion pounds in the afternoon of March 19, 2020. Eligible assets include investment-grade bonds issued by companies that make a substantial contribution to economic activity in the UK, as indicated, for instance, by significant employment in the UK or company headquarters in the UK.

The COVID-19 shock was special in three main respects, which make it an interesting episode to study the impact of corporate quantitative easing (QE) on firms in Europe. First, the pandemic implied a large negative real shock that was highly asymmetric across industries, with industries that require interpersonal contacts, such as the retail, restaurant and travel industries, hit particularly hard. Second, the outcome of the pandemic was initially highly uncertain, giving rise to widespread doubts about corporate solvency. Third, the fiscal policy responses to the pandemic were variable across euro area countries, while these countries share a common monetary policy. Using an event study methodology, this paper examines how the combined ECB and BoE corporate QE announcements affected the valuations of corporate equities and debts in Europe as implicit in share price and credit default swap (CDS) spread reactions, taking into account, among other things, whether firms were highly affected by the pandemic as well as variation in the national fiscal responses to the pandemic.

The empirical analysis is motivated by an illustrative model of the expected effects of QE announcements on the valuations of corporate equities and debts. QE implies a lower interest rate which has two separate effects on the valuations of equity and debt. First, a lower interest rate increases the valuation of both equities and debt, as future payouts are less heavily discounted. Second, the lower interest rate reduces the cost of a firm's current borrowing, which increases payouts to equity holders in non-bankruptcy states, and payouts to pre-existing debtholders in bankruptcy states. Lower current borrowing costs thus create positive valuation effects for equities and bonds that are proportional to the firm's probabilities of survival and bankruptcy, respectively. In addition, these valuation effects are proportional to the volume of current borrowing.

1 The ECB announced an increase in the potential size of the PEPP to €1350 billion on June 4, 2020, and to €1850 billion on December 10, 2020.

2 In addition, remaining maturity has to be at least 6 months in the case of bonds, and at least 28 days for commercial paper.

The pandemic has affected survival probabilities and current borrowings of firms in an uneven way, suggesting varying equity and debt valuation responses to the QE announcements.

Using leverage as a proxy for the probability of bankruptcy, we find evidence that is in line with the model. In particular, we find that the change in a firm's market value of equity is negatively related to leverage, while the change in the market value of the firm's debt, as implicit in the CDS spread change following Veronesi and Zingales (2010), is positively related to leverage.

Concerning the COVID-19 shock, we find that firms in industries that are highly affected benefited relatively less from the QE announcements, as they experienced a relatively lower abnormal stock return and a relatively smaller decline in the CDS spread. These results could reflect that highly affected firms are expected to borrow relatively less at the market interest rates that are influenced by QE, either because these firms face diminished and uncertain prospects or because of borrowing constraints. The failure of monetary policy to be particularly beneficial for highly affected firms reflects it untargeted nature, which makes it a blunt policy instrument, if the primary aim is to assist firms hit disproportionately by a large negative real shock.

Our finding that QE was not particularly beneficial to highly affected firms qualifies earlier research on the effects of unconventional monetary policy on the operation of zombie firms. Acharya et al. (2019) find that the ECB's Outright Monetary Transactions (OMT) program announced in 2012 generated additional bank lending that enabled zombie firms to hold more cash rather than to undertake real economic activity. Similarly, Hong et al. (2021) find that QE in Japan enabled zombie firms to refinance some liabilities without increasing investment. Our analysis sheds a potentially more positive light on the operation of QE, as we find that firms that experienced a large negative shock on account of the pandemic, some of which may have become de facto zombies, benefited relatively less.

Firms generally benefit from pandemic-related fiscal measures, either directly as in the case of, say, wage subsidies, or indirectly to the extent that fiscal measures serve to avert a deep recession with a concomitant fall in demand for the firm's output. Thus, supportive fiscal measures could have moved firms farther away from insolvency and they could have increased current borrowing needs, potentially influencing how corporate QE affects firms. We find that firms that rely relatively more on bond finance experience higher abnormal stock returns, if located in countries with stronger overall fiscal responses to the pandemic. At the same time, the CDS spread declines more with a firm's dependence on bond finance if it is located in a country with a stronger fiscal response to the pandemic.

Using the sovereign CDS spread as an alternative fiscal indicator, we similarly find that investment-grade firms benefit more if located in countries with high sovereign CDS spreads that stand to gain more from purchases of government debt as part of QE. Overall, these results suggest that monetary and fiscal policy are complements in the sense that a stronger fiscal response at the time of the

pandemic enhances the potential for QE to benefit firms. This complementarity could reflect that fiscal policy increases prospective new corporate borrowings, and hence the potential for higher equity and debt valuations following a reduction in the interest rate.

We further find a more positive excess stock return for investment-grade firms, consistent with the announced corporate QE applying to investment-grade debt securities. At the same time, the CDS spread of investment-grade firms declined relatively more, suggesting improved expectations of solvency for such firms. As evidence of spillovers, European firms with a non-investment grade rating also experienced a more positive abnormal stock return compared to firms without a credit rating, although the stock price response for non-investment grade firms is weaker than for investment-grade firms.

Our finding that the shareholders of highly leveraged firms gain relatively little from QE compared to debtholders suggests that there is a debt overhang effect on financial asset valuation in case of a monetary easing. Debt overhang, however, can also have important real effects. In particular, too much debt can give rise to underinvestment (Myers, 1977, Hennessy, 2004, and Diamond and He, 2014), and it was implicated in a slow recovery in Europe from the previous financial crisis (Kalemli-Ozcan, Laeven, and Moreno, 2022). These real effects of debt overhang can occur, as some of the gains of additional investments accrue to debtholders in bankruptcy states. Thus, the financial and real effects of debt overhang generally co-exist, as they are both predicated on a positive probability of firm bankruptcy.

This paper contributes to a literature that examines the impact of monetary policy on equity prices.[3] Most of this literature predates QE and hence examines changes in conventional monetary policy. Using an event study methodology, Thorbecke (1997) finds a significantly negative relation between policy-related changes in the federal funds rate and the return on the DJIA stock index. Bernanke and Kuttner (2005) similarly find a negative response of the overall stock market to unexpected federal funds rate changes relative to Federal funds futures. Ehrmann and Fratzscher (2004) consider how the share prices of individual firms react to surprise monetary policy changes on FOMC meeting days, finding that firms with low cash flow-to-income ratios, small size, high price-earnings ratios and high Tobin's q are affected significantly more by monetary policy changes.[4] The observed heterogeneity in the share price response to monetary policy is attributed to how monetary policy changes differentially affect firms' access to credit given informational asymmetries. Using a VAR methodology, Maio (2014) similarly finds a heterogeneous stock market response to monetary policy as based on variables such as size and the book-to-market capitalization ratio.

3 Rigobon and Sack (2003) document that monetary policy reacts to the stock market as well, with the Fed being more likely to tighten monetary policy after a fall in the stock market.

4 Cieslak, Morse, and Vissing-Jorgensen (2019) find evidence that communication by the FED about monetary policy between FOMC meetings also affects equity returns.

Studies that examine the financial market effects of unconventional monetary policy changes primarily focus on bond markets. Krishnamurthy and Vissing-Jorgensen (2011), for instance, find that the announcement of QE1 in the US significantly reduced yields on US Treasury debt, US agency debt and on MBS.[5] In a recent paper, Hartley and Rebucci (2020) find that 24 COVID-19 QE announcements by 21 global central banks caused a 1-day reduction in the yield on 10-year government bonds of −0.14% on average. The ECB first purchased corporate bonds as part of its Corporate Sector Purchase Program (CSPP) that was announced in March 2016, with eligibility criteria similar to the PEPP.[6] Several papers have examined the effects of the CSPP on euro area credit markets. Todorov (2020) finds that bond yields dropped on average by 30 basis points after the CSPP announcement, while bid-ask spreads narrowed as evidence of improved liquidity. In addition, firms issued 25% more in QE-eligible debt after the CSPP announcement compared to other types of debt. Focusing on the primary market, Zaghini (2019) finds a significant impact of the CSPP on yield spreads of eligible and other bonds during the first year of CSPP operation. Grosse-Rueschkamp, Steffen, and Streitz (2019) study the transmission channel of CSPP to firms' capital structures via the banking sector. Lower bond yields after the CSPP announcement cause firms that can issue eligible debt to substitute additional bond finance for bank finance. This enables previously constrained banks to increase their lending to profitable private firms. Betz and De Santis (2022), Ertan, Kleymenova, and Tuijn (2018), and Arce, Gimeno, and Mayordomo (2021) similarly find evidence of a bank credit reallocation effect of the CSPP towards firms that cannot issue CSPP-eligible debt.[7] This paper adds to the literature on the CSPP by examining how corporate QE affects euro area equity prices at the time of the COVID-19 crisis.

In the US, the Federal Reserve announced the establishment of two new facilities to acquire corporate bonds in the primary and secondary market on March 23, 2020, called the Primary Market Corporate Credit Facility (PMCCF) and the Secondary Market Corporate Credit Facility (SMCCF). Ramelli and Wagner (2020, Table 7) relate the CAPM-adjusted cumulative stock returns of US firms following this announcement to a small set of variables (leverage, cash-to-assets, and foreign revenues), thus not taking into account a firm's credit rating or extent of bond finance. Acharya and Steffen (2020, Figure 6) picture the stock market performance of US firms by rating category around the time of the announcement. Their figure suggests that non-investment grade firms benefited from the announcement as well, consistent with bond market spillovers to these firms. Gilchrist, Wei, Yue and Zakrajšek (2020) find that the announcements of the SMCCF on March 23, 2020 and of its expansion on April 9 reduced spreads on eligible bonds by 70 basis points

5 Additional studies, surveyed by Kuttner (2018), similarly find that QE announcements in the US significantly reduced yields in the US bond market. Analogously, Dell'Ariccia, Rabanal, and Sandri (2018) survey studies on the impact of QE in the euro area, Japan and the United Kingdom, also documenting reductions in bond yields following QE announcements. Arrata, Nguen, Rahmouni-Rousseau, and Vari (2020) find that the ECB's purchasing of public bonds in the euro area has made these assets relatively scarce, causing a decline in the repo rate involving these bonds.

6 Under the CSPP the ECB could only purchase corporate bonds to the exclusion of commercial paper.

7 Rischen and Theissen (2021) find that the CSPP has tended to reduce the initial underpricing of newly issued bonds in the euro area bond market.

in absolute terms, and by 20 basis points relative to non-eligible counterparts issued by same issuers. Haddad, Moreira, and Muir (2021) similarly find that the SMCCF announcement reduced yields on investment-grade bonds by about 75 basis points, with effects concentrated at lower maturities and lower credit risk. Fahlenbrach, Rageth, and Stulz (2021) examine the impact of indices of a firm's financial flexibility on the share prices of US firms before and after March 24, 2020 when large US fiscal stimulus became more likely, finding that financially more flexible firms had lower share price declines before March 24, and continued to perform better subsequently.

Going beyond existing studies, this paper examines the impact of QE on relative equity and debt valuations to ascertain the differential impact of QE on firms that are subject to debt overhang at the time of the pandemic. Our focus on Europe enables us to examine the interaction between QE and national fiscal policies as well as the international spillover effects of QE. In the remainder, section 2 presents the model. Section 3 discusses the data and the methodology. Section 4 provides the empirical results, and section 5 concludes.

2. The model

In this section, we present a concise two-period model that illustrates the impact of monetary policy easing on the absolute and relative valuations of a firm's equity and debt. In the first period, the firm needs to borrow to finance 'working capital' at an interest rate that is taken to be influenced by monetary policy. In the second period, the firm produces output that is used to service the debt incurred to finance its working capital, to repay other pre-existing debt, and to provide a residual return to shareholders.

The firm, specifically, produces a random, second-period output y. This output is distributed on the interval $\left[\underline{y}, \bar{y}\right]$, with a density function $f(y)$ and a mean μ. The firm is financed by equity, E, pre-existing debt, D, and debt incurred in the first period to finance working capital, W. Pre-existing debt, D, carries a contractually fixed interest rate r_D. The interest rate on the newly raised debt, W, in turn is r. The debt W is taken to be senior to the debt D. This implies that the holders of D receive higher payouts in bankruptcy states, if the interest r on debt W is lower.[8] In addition, we assume that output y is always sufficient to service the debt W in the second period, i.e. $(1+r)W \leq \underline{y}$. Together, these assumptions imply that the debt W is riskless, and hence that r is a risk-free interest rate.

The firm goes bankrupt if its output in the second period is insufficient to service all debts, i.e. if $y < \hat{y}$, with $\hat{y} = (1+r_D)D + (1+r)W$. The probability of bankruptcy, denoted π, is given by $\pi = \int_{\underline{y}}^{\hat{y}} f(y)dy$. We assume that investors in equity and debt are risk neutral. This implies that the values of equity

8 This also is the case if D and W are equally senior. In this instance, the model is more cumbersome, though qualitatively similar.

and pre-determined debt in the first period, denoted V_E and V_D, equal the present values of the expected second-period payouts to shareholders and pre-existing debtholders as follows:

$$V_E = \Delta \int_{\hat{y}}^{\bar{y}} [y - (1+r_D)D - (1+r)W] f(y) dy \tag{1}$$

$$V_D = \Delta \int_{\underline{y}}^{\hat{y}} [y - (1+r)W] f(y) dy + \Delta(1-\pi)(1+r_D)D \tag{2}$$

where $\Delta = \frac{1}{1+r}$ is the discount factor. The two terms on the right-hand-side of (2) represent the payouts to debtholders in bankruptcy and non-bankruptcy states. Note that there is a valuation identity given by $V_E + V_D + W = \Delta\mu$.

We assume that monetary policy—through variation in quantitative easing—can affect the risk-free interest rate, *r*, that applies to new borrowing, *W*.[9] In practice, monetary policy can affect the entire term structure, and the interest rate *r* should be interpreted as the interest rate on any new borrowing regardless of maturity after the monetary policy change. Altavilla et al. (2019) show evidence for the euro area that the effect of QE on the interest rate gets larger as maturity increases, peaking at the 10-year maturity.

An interest rate adjustment affects the cost to the firm of servicing the debt *W* in the second period, and thus the range of values of output, *y,* for which the firm becomes insolvent. In particular, a lower interest rate *r* reduces the bankruptcy threshold value of output, $\hat{y}$, as $\frac{d\hat{y}}{dr} = W > 0$. As a corollary, a lower interest rate lowers the default probability, π, as $\frac{d\pi}{dr} = f(\hat{y})W > 0$.

Using (1) and (2), we can see that an unexpected change in the interest, *r*, generates the following first-period returns to shareholders and pre-existing debtholders:

$$\frac{1}{V_E}\frac{dV_E}{dr} = -\Delta\left[1 + (1-\pi)\frac{W}{V_E}\right] < 0 \tag{3}$$

$$\frac{1}{V_D}\frac{dV_D}{dr} = -\Delta\left[1 + \pi\frac{W}{V_D}\right] < 0 \tag{4}$$

In each of these expressions, there are two terms within the squared brackets, which reflects that, say, a lower interest rate has two separate effects on equity and debt valuations. First, a lower interest rate generates a higher discount factor Δ, which increases the valuations of equity and debt in the same proportion Δ. Second, a lower interest rate implies that the firm can finance its working capital, *W*, more cheaply, reducing interest expenses in the second period. This benefit is shared between shareholders and pre-existing debtholders in the second period. In particular, shareholders receive

9 We do not consider that monetary policy could also affect the distribution of output *y* with possible implications for the probability of default and the valuations of debt and equity.

a higher net-of-interest payout in non-bankruptcy states, which translates into a higher first-period equity return equal to $\Delta(1-\pi)\frac{W}{V_E}$. The lower interest rate, in contrast, generates a higher payout for pre-existing debtholders in bankruptcy states, providing an additional first-period return of $\Delta\pi\frac{W}{V_D}$. Note that both of these additional return elements are proportional to the firm's first-period borrowing *W*. Heterogeneity in equity and bond returns following an interest rate reduction thus importantly depends on firms' probabilities of bankruptcy and on their current borrowings, both of which may have been affected unevenly across firms by the COVID-19 pandemic.

Using (1), (3) and (4) and the valuation identity $V_E + V_D + W = \Delta\mu$, we can derive an expression for the share of the gains to shareholders relative to the joint shareholder and debtholder gains as follows:

$$\frac{\frac{dV_E}{dr}}{\frac{dV_E}{dr}+\frac{dV_D}{dr}} = \frac{1}{\mu}\int_{\hat{y}}^{\bar{y}}[y-(1+r_D)D]f(y)dy \qquad (5)$$

The relative shareholder gain in (5) declines with the firm's overall debt service burden, and, in particular, with the two debt levels, i.e. *D* and *W*, and with the two interest rates, i.e. r_D and *r*, as $\hat{y} = (1+r_D)D + (1+r)W$.

Equations (3)–(5) together illustrate a 'debt overhang effect' of monetary policy on the returns to financial assets. In particular, firms that face a higher probability of bankruptcy, for instance on account of higher debt *D*, can experience lower equity returns (also relative to bond returns), and higher bond returns following an interest rate reduction. In the empirical work, we explain equity and bond returns, and the relative shareholder gain, in part by variation in firms' leverage and book-to-market ratios, as potential proxies for the firm's probability of bankruptcy.

Finally, it is interesting to note that the present model can also give rise to a real debt overhang effect, as the firm's indebtedness could reduce its incentive to invest (Myers, 1977, Hennessy, 2004, and Diamond and He, 2014). To fix ideas, let us assume that the firm could implement a potential marginal investment project with a cost of 1 (in the first period) that delivers a certain additional output of δ (in the second period). The net present value of this potential project is positive if $\Delta\delta > 1$. Let us assume that the project needs to be equity financed, due to restricted access to additional credit. The project will increase the overall valuation of equity if $(1-\pi)\,\Delta\delta > 1$, as the return to the project only accrues to shareholders in non-bankruptcy states, which occur with probability $1-\pi$. A positive probability of bankruptcy thus generates a real debt overhang effect in the sense that shareholders may wish to forego equity-financed projects that have a positive present value.[10] In the present model, the financial and real effects of debt overhang generally co-exist, as they are both predicated on a positive probability of bankruptcy, π. In the empirical work, we estimate versions of equations (3)–(5), and thus only address a potential debt overhang effect on financial asset returns.

10 A positive present value project will be implemented if it can be financed with senior debt.

3. Data and methodology

3.1 Data

We obtain data on publicly traded firms headquartered in Europe from Thomson Reuters. We exclude financial firms, utilities and not for profit and governmental firms (firms with primary SIC codes between 6000 and 6999, 4900 and 4949, and 8000 and above). We select firms for which price information on common shares is available, but discard firms with illiquid shares that display zero daily stock returns more than 90 trading days in the year before January 24, 2020 when the first coronavirus case was reported in Europe. We also exclude firms with a share price that dropped to zero during this one year window. Furthermore, we only retain ultimate parent firms (by abandoning firms with a name that differs from the ultimate parent company name), and firms for which we can obtain accounting data.

As a stock valuation variable, we consider the abnormal stock return on March 19, 2020 when European financial markets could first react to the ECB and BoE QE announcements (see Table A1 in the Appendix for variable definitions and data sources). The abnormal return is calculated as the difference between the actual stock return and the predicted stock return, derived from an estimated relation between the firm's stock return and the return on the euro denominated MSCI World Index during the year from January 24, 2019 to January 23, 2020 (this is the year prior to the discovery of the first COVID-19 infection in Europe on January 24, 2020).[11] The mean abnormal return was 0.56% for 2211 European firms (see Table 1; see Table A2 in the Appendix for the number of firms per country). This positive abnormal return followed a week of negative average abnormal returns for European firms (see Figure 1), perhaps in part driven by market disappointments over the absence of any similar QE before. On March 19, 2020, the average absolute stock return was 1.7% (see Figure 2), given a positive return on the MSCI World Index of 0.04% on that day.

As a measure of the change in the value of a firm's debt, we consider the change in a firm's CDS spread on March 19, 2020. The CDS spread is the cost of ensuring against default, and hence a lower CDS spread suggests lower expected credit losses for debt security holders. We consider CDS spreads for five-year contracts written on senior bonds.[12] We drop illiquid CDS contracts, for which the quoted CDS spread was the same as on the day before for more than 90 days in the year beginning on January 24, 2019. If available, we select euro denominated contracts, and otherwise we take dollar or Swiss franc denominated contracts (106 of the 111 CDS contracts in our sample are euro denominated). The mean CDS spread decreased by 4.5 basis points on March 19, following increases during the prior week (see Figure 3).

11 To deal with outliers and data inconsistencies we drop the bottom and top one percentiles of all returns in the estimation window.

12 In addition, we select CDS spreads with an MM14 restructuring clause (Modified-Modified Restructuring for data referencing the 2014 ISDA Definitions).

Arguably, monetary policy at a time of crisis is especially effective if it reduces expectations of bankruptcy and debt overhang, rather than if it mainly creates additional shareholder wealth. Thus, it is interesting to consider to what extent and for what firms the monetary policy interventions reduced the CDS spread relatively more compared to the equity return. To be able to compare CDS spread and share price changes more directly, we examine the changes in the values of the firm's overall equity and of its overall debt as implied by the observed share price and CDS spread changes, both scaled by the book value of assets at the end of 2019. In particular, dMVE/Book assets is the change in the market value of equity on March 19, 2020 (calculated as the change in the share price times the number of shares outstanding), divided by the book value of assets at the end of 2019. The mean of dMVE/Book assets is 2.94% for a sample of 2211 observations.

Analogously, dMVD/Book assets is the estimated change in the value of the firm's overall debt implicit in the CDS spread change on March 19, 2020, divided by the book value of assets at the end of 2019. We follow the methodology of Veronesi and Zingales (2010) to calculate the change in the value of debt as the change in the cost of insuring the debt against default implicit in the CDS spread change.[13] At any moment, the cost of ensuring the firm's debt against default in the CDS market is given by

$$I = \sum_{t=0}^{T} \frac{CDS(t)}{10000} D(t)Q(t)Z(t), \tag{6}$$

where $CDS(t)$ is the cost of ensuring debt in year t, $D(t)$ is the amount of debt that will not have matured by year t, $Q(t)$ is the probability of not defaulting up to year t, $Z(t)$ is the t-year risk-free discount factor, and T is the maximum maturity of debt. The CDS spread in (6) is divided by 10000, as the CDS spread is normally expressed in basis points. The change in the market value of debt at the time of the corporate QE announcements is then given by:

$$\Delta MVD = -\left[\sum_{t=0}^{T} \frac{CDS_1(t)}{10000} D(t)Q_1(t)Z(t) - \sum_{t=0}^{T} \frac{CDS_0(t)}{10000} D(t)Q_0(t)Z(t) \right], \tag{7}$$

where the subscripts 0 and 1 denote $CDS(t)$ and $Q(t)$ observed before and after the announcements, respectively. To implement equation (7), we assume a constant risk-free rate of 2% implying that $Z(t) = exp(-0.02t)$. Also, we assume a constant instantaneous probability of default so that $Q(t) = e^{-t\frac{CDS(t)}{10000(1-\delta)}}$ where δ is the recovery rate (see Veronesi and Zingales, 2010, Appendix A), which we set equal to 0.4.[14] Furthermore, we take the remaining maturity of all the firm's debt to be 3 years (close the average mean remaining maturity of bonds and loans of 2.31 and 4.27 years for the firms in our sample, calculated from Capital IQ data), and we assume that firms repay the outstanding debts

13 We consider the change in the valuation of debt attributable to the CDS spread change given the liquidity and comparability of CDS contracts. The change in the valuation of debt on account of the change in the risk-free interest rate, which is common to all firms, is not taken into account.

14 This is the historical average recovery rate of bonds according to Veronesi and Zingales (2010).

in equal annual payments, i.e. they repay a third of their debts each year. Using these assumptions, we calculate the mean dMVD/Book assets to be 5.7 basis points for a sample of 111 firms.

We also consider the increase in the market value of equity relative to the sum of the increases in the market values of equity and debt, i.e. dMVE/(dMVE + dMVD) in case both dMVE and dMVD are positive, which is the case for 63 firms. The mean of dMVE/(dMVE + dMVD) is 0.882, i.e. on average 88.2% of the total valuation gains accrue to shareholders. Alternatively, we compute dMVE/(dMVE + dMVD) conditional on the sum of dMVE and dMVD being positive, yielding 84 observations with a mean of 80.8%.

We relate the various valuation variables reflecting share price and CDS spread changes to a range of independent variables that capture (i) the likely relative impact of the monetary policy interventions on the firm as indicated by the firm's credit rating and reliance on bond finance, (ii) other firm characteristics that potentially proxy for credit constraints and debt overhang, (iii) whether a firm belongs to an industry that is highly affected by COVID-19, and, finally, (iv) the strength of pertinent national fiscal policy measures to counter the pandemic that potentially affect the implications of monetary policy for the firm.

The ECB and BoE are restricted to purchasing corporate bonds that are investment grade, which suggests that corporate issuers with an investment grade rating are more directly affected by these purchases. To test this, we construct the Investment grade dummy variable, which signals that the firm had a long-term issuer credit rating of at least BBB-/Baa3 issued by either Moody's, S&P or Fitch on March 17, 2020. We use both domestic and foreign currency credit ratings to create this variable. Analogously, the Non-investment grade dummy variable refers to firms that had an issuer rating below BBB-/Baa3 on March 17, 2020. In our sample, 9.9% of firms had an investment grade rating, while 4.6% of had a non-investment grade rating. The remaining firms had no issuer rating.

Firms that rely more heavily on bond finance are potentially more strongly affected by the corporate QE, as the QE programs are restricted to purchasing marketable debt securities. To represent a firm's bond issuance, Bonds/assets is calculated as the ratio of the sum of the principal amounts of all outstanding bonds as of the most recent reporting date in 2019 available in S&P's Capital IQ (most commonly, end of Q2 or Q4 in 2019) divided by total assets. Bonds are defined to include commercial papers and notes. Assets for the same reporting date as bonds are obtained from Compustat. We matched data from Capital IQ and Compustat with data from Eikon based on ISIN security numbers. In our sample, firms finance on average 5.75% of assets using bonds.

The implications of monetary policy for a firm depend, among other things, on whether it serves to alleviate credit constraints and debt overhang. Some firms no doubt were already subject to credit constraints and debt overhang before the COVID-19 crisis, while the occurrence of this crisis can only have aggravated these problems for many firms, even if to different extents. To proxy for potential pre-existing credit constraints and debt overhang, we consider a range of firm-level

variables similarly to Ehrmann and Fratzscher (2004) and Maio (2014), measured as of the end of 2019 and thus predating the COVID-19 crisis.

Among these, Leverage is the ratio of liabilities to assets. Highly leveraged firms potentially experience greater credit constraints and debt overhang that could be alleviated by corporate QE. The sample mean of Leverage in our sample is 53.1%. Log assets is the natural logarithm of total assets, and it proxies for firm size. Larger firms may be less credit constraint. Return on assets (ROA) is net income before extraordinary items divided by assets, with a mean of –2.91%. More profitable firms are less likely to experience credit constraints and debt overhang. Book-to-market is the book value of equity divided by the market value of equity with a mean of 0.650. A high book-to-market can result from limited growth prospects and depressed asset valuation, suggesting that a firm with a higher book-to-market could be subject to greater debt overhang.

In some specifications, we include several additional variables that potentially are indicative of credit constraints. Among these, Cash-to-price ratio is the cash-flow per share divided by the share price with a mean of 0.083, and Earnings to-price is net income per share divided by the share price with a mean of -0.0259. Firms with a lower cash flow or net income per share could be more subject to credit constraints. Cash/assets is cash balances divided by assets with a mean of 0.157. A greater cash/assets ratio could be a sign of lower credit constraints as the firm can fund itself for a while, but alternatively it could signal greater credit constraints as firms could accumulate greater cash balances exactly because they know that they are credit constrained (Almeida, Campello, and Weisbach, 2004). Finally, redeployability is a measure of asset redeployability based on Kim and Kung (2017), computed as the value-weighted average of asset-level redeployability indices across a firm's business segments using market capitalizations in each industry-year as weights. Firms with more redeployable assets are less likely to experience credit constraints.

The COVID-19 crisis has differentially impacted the earning power of firms, and as a corollary the financing needs as well as credit constraints that they may experience. We capture the degree to which firms have been affected by COVID-19 by two different variables. First, the Affected industry dummy represents the following industries that were particularly affected by the pandemic according to the OECD (2020): Entertainment; Construction materials; Automobiles and trucks; Aircraft; Shipbuilding, railroad equipment; Personal services; Business services; Transportation; Wholesale; Retail; Restaurants, hotels, motels. Second, Turnover decline is the change in turnover at the 2-digit NACE industry level in the first quarter of 2020 as a share of turnover in the first quarter of 2019 multiplied by minus 1, with a mean of 0.020.

Firms are not only helped by monetary policy in the form of corporate QE, but also by fiscal policies at the national level. Firms located in countries with strong fiscal responses to the COVID-19 crisis arguably were already less distressed at the time the QE was announced. This suggests that corporate QE has more potential to raise the share prices of firms that are located in countries with stronger prior fiscal responses to the COVID-19 crisis. To test this, we consider the Fiscal response/

GDP variable, which is the total amount of pandemic-related economic stimulus spending in a firm's headquarter country announced up to March 17, 2020 divided by the country's GDP. Fiscal response/GDP has a mean of 0.044. These data are obtained from Hale et al. (2020). In addition, we consider whether the QE announcements had a more positive impact on firms headquatered in countries with higher sovereign CDS spreads, as the public part of the QE potentially relaxes public financing constraints more in countries with higher government CDS spreads. The mean sovereign CDS spread on five-year contracts as of December 31, 2019 was 29.66 basis points.

3.2 Methodology

Using an event study methodology, we estimate specifications of the following general form:

$$P_{ijk} = \beta_1 F_{ijk} + \beta_2 X_{ijk} + \beta_3 Pandemic\ impact_{ijk} + \beta_4 F_{ijk} * Fiscal\ variable_k + \alpha_k + \epsilon_{ijk} \quad (8)$$

where P_{ijk} is a valuation change variable, such as the excess stock return or the change in the CDS premium, for firm i in industry j and country k on the event day of March 19, 2020. F_{ijk} is a set of firm financing variables (Investment grade, Non-investment grade, and Bonds/assets) that reasonably imply greater benefits for a firm from corporate QE. Thus, the estimated coefficients β_1 are expected to be positive and negative, if P_{ijk} stands for the excess stock return and the change in the CDS premium, respectively. X_{ijk} is a set of additional firm-level variables (at a minimum, Leverage, Log of assets, ROA, and Book-to-market) that potentially affect the benefits of corporate QE for the firm. $Pandemic\ impact_{ijk}$ is either the affected industry variable or the industry-level turnover decline. A priori, is it not clear whether firms that are more impacted by the pandemic stand to gain more or less from corporate QE. Hence, the pertinent estimated coefficient β_3 could be of either sign. $F_{ijk} * Fiscal\ variable_k$ is a set of interactions of firm-level financing variables with either the fiscal response variable or the sovereign CDS spread for country k. A strong fiscal response to the pandemic or a high pre-pandemic sovereign CDS spread could enlarge the scope for a firm to benefit from corporate QE, which would be consistent with the estimated coefficients β_4 being positive in an excess stock return regression, and negative in a CDS premium change regression. The specification further includes a set of country fixed effects α_k to control for any country-level news on the event day, such as on the national development of the pandemic, that could affect the valuation variables.[15] The uninteracted fiscal variable is subsumed in these country fixed effects. The errors are clustered at the country level to accommodate any commonality at this level.

15 On March 19, 2020 the European edition of the Financial Times published an article entitled 'Italian deaths sour and Merkel warns Germans of challenges'. In addition, there was an article on support measures put in place by Turkey, Poland and Denmark. News of this kind could have had an effect on financial markets on that day.

4. Empirical results

This section presents empirical evidence on the effects of corporate QE at the time of the pandemic on the valuations of equity and debt claims on European firms. Subsection 4.1 examines abnormal equity returns and changes in CDS spreads as well as changes in the relative valuation of equity and debt. Subsection 4.2 considers the differential impact of QE on sectors and firms that have been more heavily affected by the pandemic. Finally, subsection 4.3 examines the complementarity between QE and fiscal variables in affecting equity prices and CDS spreads.

4.1 QE and equity and debt valuations

We first examine abnormal stock returns for the full sample of European firms, comprising firms headquartered in the euro area, the UK and in other European countries. Specifically, Table 2 shows regressions of the abnormal stock return on March 19, 2020 when the stock market could first react to the ECB and BoE announcements. In regression 1, the issuer-level Investment grade dummy is estimated with a coefficient of 0.0206 that is significant at 1%, suggesting that firms that can issue investment grade debt benefited relatively more from the corporate QE announcements. ROA is estimated with a negative and significant coefficient, as less profitable firms potentially gain more from corporate QE due to a relaxation of financial constraints. Regression 2 additionally includes the Non-investment grade dummy. In this regression, the Investment grade and Non-investment grade dummy variables receive coefficients of 0.0232 and 0.0137 that are significant at 1% and 10%, respectively. Thus, the additional corporate bond buying benefits firms with a non-investment grade rating as well (relative to firms without a credit rating), although less strongly than firms with an investment-grade rating. Instead of these dummy variables, regression 3 includes Bonds/assets to reflect the extent to which a firm relies on bond finance, which is estimated to be insignificant. In this regression, Book-to-market is negative and significant, perhaps because firms with a high Book-to-market are closer to bankruptcy so that accommodative monetary policy has less potential to benefit shareholders rather than debtholders. Regression 4 includes the financing variables included in regressions 2 and 3 as well as the interaction Bonds/assets * Investment grade. In this regression, Investment grade is estimated to be positive and significant. In addition, Bonds/assets is negative and significant, and Bonds/assets * Investment grade is positive and significant. This suggests that firms with an investment grade rating benefit more from the corporate QE announcements, if they rely relatively more on bond finance. Further, Book-to-market is negative and significant.

Starting from regressions 1–4, regressions 5–8 include several additional independent variables that proxy for financing constraints that are potentially alleviated by corporate QE (the additional variables are Cash-to-price, Earnings-to-price, Cash/assets and Redeployability). In these regressions, Cash/assets receives positive and significant coefficients, as high cash balances could reflect financial constraints that are mitigated by corporate QE. Other estimated effects are similar to regressions 1–4.

The ECB will only purchase bonds of firms that are incorporated in a euro area country. The BoE in turn targets bonds issued by companies that make a material contribution to economic activity in the UK. Companies with significant employment in the UK or with their headquarters in the UK will normally be regarded as meeting this requirement (see Bank of England, 2020). European firms that do not meet the eligibility requirements of the ECB and the BoE could still be affected, if there are spillovers in the bond markets to other firms and other countries. To test whether European firms are differently affected depending on the country of location, regression 9 includes interaction variables of the investment grade variable with EA and UK dummy variables, flagging that a firm is headquartered in the euro area or the UK, in regression 1. In this regression, the investment grade variable is estimated with a coefficient of 0.0253 that is significant at 1%, while the two interaction variables are insignificant, consistent with a more positive effect of the announced QE on investment-grade firms throughout Europe.[16]

Table 3 presents regressions of the change in the CDS spread that are analogous to Table 2 for the full sample of European firms. These regressions are based on a much smaller sample of observations (for instance, 111 observations in regression 1), compared to the excess returns regressions of Table 2. In regression 1, the Investment grade dummy is estimated to be negative and significant, suggesting lower expected credit losses on securities issued by investment-grade firms after the QE announcements, consistent with increased demand for such securities by the ECB and the BoE. In this regression, the estimated coefficient for Leverage is negative and significant. This could reflect that highly leveraged firms face a higher probability of bankruptcy, so that the potential for corporate QE to reduce expected credit losses is greater, consistent with equation (4) in the modelling section. Book-to-market is also estimated to be negative and significant, which could similarly reflect that firms with a high Book-to-market are closer to bankruptcy and subject to debt overhang. In regression 2, the Non-investment grade dummy is insignificant, while in regression 3 Bonds/assets is insignificant. In regression 4, all the financing related variables turn out to be insignificant. In regressions 5–8, Cash/assets is positive and significant, perhaps because bond investors see a smaller potential for corporate QE to reduce expected credit losses for firms with high cash/assets ratios, as they think that firms with large cash balances can use this cash to pay off debts. Otherwise, regressions 5–8 are very similar to regressions 1–4. In regression 9, investment grade and its interactions with the EA and UK dummies are insignificant.

16 We estimated regressions 1–4 separately for samples of firms that are headquartered or incorporated in either the euro area, the UK or in other European countries. The results of these regressions confirm a differentially positive impact of the QE announcements on investment-grade firms throughout Europe. We also estimated regression 1 of Table 2 for individual countries with more than 25 incorporated firms, and alternatively more than 25 headquartered firms. This yields a significant positive effect of the investment grade dummy on the excess returns of firms incorporated in Belgium (euro area country) and the UK, and insignificant effects for firms incorporated in other countries. In addition, there is a significant positive effect of the investment grade dummy on the excess returns of firms headquartered in Belgium and Greece (euro area countries) and Russia (non-euro area country), and insignificant effects for firms that are headquartered in other countries. These results are not reported.

Overall, Table 3 shows evidence that investment grade firms see expected credit losses on their debts decline relatively more on account of corporate QE, as this increases demand for such securities. In addition, firms that are closer to bankruptcy and thus are likely to suffer more from debt overhang, as indicated by higher leverage and book-to-market values, are shown to experience relatively larger declines in CDS spreads, suggesting larger reductions in expected credit losses for bond investors.

To make the gains that accrue to shareholders and debtholders more comparable, we next examine how the corporate QE announcements have affected the valuations of equity and debt separately and relatively to each other, as indicated by dMVE/Book assets, dMVD/Book assets and the two versions of dMVE/(dMVE + dMVD), conditional on whether dMVE and dMVD are both or in the aggregate positive.

Table 4 shows the results of regressions of the four pertinent variables on the same set of variables as in regression 1 of Table 2 plus the firm's market Beta which is the coefficient of a regression of the daily log stock return on the daily log return of the MSCI World index for the period from January 24, 2019 to January 23, 2020. In regressions 1 and 2, the Investment grade dummy is estimated with positive and significant coefficients of 0.0219 and 0.00121, indicating that both shareholders and debtholders of investment grade firms benefit relatively more from the corporate QE announcements (consistent with the results of Tables 2 and 3). In regressions 3 and 4, the estimated coefficients are significantly negative at -0.151 and -0.214, suggesting that for investment grade firms, a relatively smaller share of the total gains accrues to shareholders.[17] The leverage and book-to-market variables are both negative and significant in regression 1, positive and significant in regression 2, and negative and significant in regressions 3 and 4. Thus, firms that appear to be closer to bankruptcy (with a higher leverage or book-to-market) experience smaller shareholder gains, larger debtholder gains, and correspondingly smaller shareholder gains relative to total shareholder and debtholder gains, consistent with equations (3)–(5) of the model in section 2.

4.2 Sectors and firms highly affected by the pandemic

In this subsection, we consider whether the corporate QE announcements affected firms differently depending on whether they were impacted relatively heavily by the COVID-19 crisis. Highly affected firms possibly face a higher probability of bankruptcy (a higher π in the model), which could explain relatively low (high) returns to shareholders (bondholders) compared to less affected firms (equations 3 and 4). Furthermore, current borrowing by highly affected firms (W in the model) could be relatively low on account of a dearth of profitable projects or borrowing constraints, giving rise to relatively low equity and bond returns (equations 3 and 4). Alternatively, however, some highly affected firms could borrow more to make up for lower revenues, which would explain relatively high equity and bond returns.

17 In robustness checks, we considered dependent variables in regressions 2–4 of Table 4 calculated using recovery rates of 0.2 or 0.6 instead of 0.4, yielding very similar results that are not reported.

Panel A of Table 5 shows the results of equity return and CDS change regressions that include the Affected industry variable as a proxy for how strongly a firm has been impacted by the pandemic. Specifically, regression 1 includes the Affected industry variable in the abnormal return regression 1 of Table 2, yielding a negative and significant coefficient for this variable consistent with relatively smaller gains for shareholders of highly affected firms. Regression 2 additionally includes the interaction Affected industry * Investment grade, which is estimated to be significantly negative, suggesting smaller gains for highly affected firms that are investment-grade.

In regressions 3 and 4, the dependent variable is the change in a firm's market value relative to its market value at the end of 2019, to control for variation in how a firm's valuation has been affected by the pandemic. Otherwise, these regressions are analogous to regressions 1 and 2. Affected industry is negative and significant in regressions 3 and 4, while the interaction of affected with investment grade is negative and significant in regression 4. Thus, highly affected firms experience smaller stock market gains relative to pre-pandemic valuations, especially if they are investment-grade. In regressions 5 and 6, the dependent variable is the change in a firm's market value relative to its market value loss in 2019 up to March 18, 2020. Affected industry and Affected industry * Investment grade are negative and significant in regressions 5 and 6, respectively, suggesting that firms in affected industries recouped smaller shares of their pandemic-related losses, especially if they are investment grade.

In the CDS premium regressions 7 and 8, Affected industry obtains positive and significant coefficients. Thus, CDS spreads declined relatively little for firms in highly affected industries, indicating relatively smaller gains for debtholders.

Overall, Panel A of Table 5 indicates that shareholders as well as debtholders of firms in highly affected industries benefited relatively less from the QE announcements, consistent with the notion that highly affected firms had relatively less inclination or capacity to borrow at the reduced interest rate. These findings suggest that monetary policy, given its untargeted nature, was a rather blunt policy instrument, if the aim was to assist especially industries that were highly affected by the pandemic.

Panel B of Table 5 presents an analogous set of regressions that include Turnover decline as an alternative proxy for how much firms have been affected by COVID-19. Turnover decline obtains negative and significant coefficients in regressions 2–6, suggesting that firms in industries with larger turnover declines experienced smaller abnormal stock returns, and smaller valuation gains relative to pre-COVID-19 valuations as well as relative to their valuation losses during the COVID-19 period, consistent with the results of Panel A.[18] Turnover decline is insignificant in the CDS change

18 In a robustness check, we computed Turnover decline using turnover data for the full year of 2020 relative to 2019, yielding negative and significant coefficients for Turnover decline in regressions 3–6 (unreported).

regressions 7 and 8 in Panel B.[19] Overall, the evidence in Table 5 shows that firms that were directly affected by the pandemic benefited relatively less from corporate QE. In the case of the pandemic, monetary policy thus was less effective in supporting firms that were hit disproportionately by a very large negative real shock.

4.3 The interaction between QE and fiscal variables

In this subsection, we consider how the effects of the QE announcements on equity and debt valuations depend on fiscal variables. Firms generally benefit from pandemic-related fiscal measures, either directly as in the case of, say, wage subsidies, or indirectly to the extent that fiscal measures serve to avert a deep recession with a concomitant fall in demand for the firm's output. As a result of these effects, firms located in countries with stronger fiscal responses to COVID-19 could face a relatively lower probability of bankruptcy (a lower π in the model), and potentially a greater need to borrow to finance ongoing projects (a greater W in the model). Thus, equity holders of firms in countries with more expansive fiscal policies could experience more positive abnormal stock returns (equation 3), while the returns to bondholders would be less clearly affected (equation 4).

Table 6 provides empirical evidence on the interaction effects of corporate QE and pandemic-related fiscal policies on the abnormal stock return and the CDS premium change. In particular, to examine the impact of this interaction on abnormal returns, we include interactions of Fiscal policy/GDP with pertinent financing variables in regressions 1–4 of Table 2, with the results reported as regressions 1–4 of Table 6. Thus, regression 1 includes the interaction Fiscal response/GDP * Investment grade, which is estimated to be positive and significant, indicating a greater abnormal return following the QE announcements for investment-grade firms in countries with stronger fiscal measures. Similarly, Fiscal policy/GDP * Investment grade and Fiscal policy/GDP * Non-investment grade are both estimated to be positive and significant in regression 2. In regression 3, Fiscal response/GDP * Bonds/assets is positive and significant, indicating that more heavily bond-financed firms gain more from corporate QE if located in countries with stronger fiscal measures. The interaction Fiscal response/GDP * Bonds/assets * Investment grade has a positive and significant coefficient in regression 4, hinting at greater benefits of corporate QE for investment-grade firms that are more heavily bond-financed and located in countries that took more extensive fiscal measures.

Analogously, we include interactions of Fiscal policy/GDP with pertinent finance variables in the CDS premium change regressions 1–4 of Table 3, with the results reported as regressions 5–8 in Table 6. In regression 7, the interaction Fiscal policy/GDP * Bonds/assets is negative and significant, indicating that debtholders benefit more from corporate QE if firms are more dependent on bond finance and located in countries with a stronger fiscal response. In regressions 5 and 7–8, the

19 Koren and Petõ (2020) construct industry-level measures of business disruption from social distancing. After replacing Affected industry in Table 5A by an aggregated measure also used by Fahlenbrach, Rageth and Stulz (2021) in the regressions of either panel of Table 5, we find insignificant coefficients for this variable and its interaction with investment grade (unreported).

interactions of Fiscal response/GDP with included financing variables are insignificant. Overall, Table 6 provides evidence of a complementarity between corporate QE and pandemic-related fiscal measures in their effects on equity and debt valuations, as these fiscal measures are shown to enhance the benefits of the corporate QE announcements for firms that are more dependent on bond finance, consistent with the pertinent firms having higher current borrowing that can benefit from an interest reduction (a larger *W* in the model).

In practice, QE implies the purchases of corporate as well as public bonds. The QE announcements of March 19, 2020 thus raised market expectations of purchases of public bonds by central banks, implying an alleviation of sovereign financing pressures especially for sovereigns with higher CDS spreads. Lower financing pressures in turn could trigger higher future fiscal spending or lower taxes, benefiting firms. This suggests that QE could be especially advantageous for firms that are headquartered in countries with high sovereign CDS spreads. To test this, we replace Fiscal response/GDP by the Sovereign CDS spread in the regressions of Table 6, with the results reported in Table 7.

In the abnormal return regressions 1 and 2, both Investment grade and Sovereign CDS * Investment grade are positive and significant, indicating that investment-grade firms benefit more from QE if located in countries with high sovereign CDS spreads. In regression 3, the interaction of Sovereign CDS and Bonds/assets is estimated to be positive and significant, suggesting that firms with a greater reliance on bond finance benefit more if located in countries with a high government CDS spread. In the CDS spread change regression 6, Non-investment grade and Sovereign CDS * Non-investment grade receive positive significant and negative significant coefficients, respectively, implying that a non-investment grade firm's CDS spread declines more if the firm is situated in a country with a high government CDS spread.

Overall, the results of this section suggest that monetary and fiscal policies are complements in the pandemic, as shareholders and bondholders of firms located in countries with stronger actual or prospective fiscal policies tend to experience more positive returns following the QE announcements. This could reflect that fiscal policies improve the prospects of firms, enabling them to benefit more from better credit conditions following the implementation of QE.

5. Conclusion

Expanded corporate QE by the ECB and the BoE are a key element of the European policy response to the COVID-19 pandemic. The ECB's PEPP initially enabled the ECB to spend an additional 750 billion euros to purchase debt securities including corporate bonds, while similarly the BoE enlarged its asset-purchase program by 200 billion pounds. By increasing demand for corporate bonds, the ECB and BoE make it easier for corporations to issue additional bonds, thereby improving firms' chances of surviving the pandemic.

Using an event study methodology, this paper examines how the combined ECB and BoE corporate QE announcements affected the valuations of the equities and debts of European companies. Comparing shareholder and debtholder gains, we find that the share of shareholder gains in total shareholder and debtholder gains is negatively related to a book-to-market ratio and to leverage. These results are consistent with a debt overhang effect on financial asset prices following a monetary easing, as explored in our model. While our study is limited to the valuation effects of monetary policy, it is suggestive of possible real effects. In particular, a firm that experiences larger valuation gains of its debts relative to its equities may be further removed from bankruptcy, suggesting lower costs associated with possible financial distress.

Highlighting the untargeted nature of the policy, we find that firms in industries that are highly affected by the pandemic benefited relatively less from the QE announcements, as evidenced by a relatively lower abnormal stock return and a smaller decline in the CDS spread. As suggested by our model, these results are consistent with relatively smaller current borrowings by highly affected firms that can benefit from an interest rate reduction, either because highly affected firms have a dearth of profitable projects or because they are subject to greater borrowing constraints.

To the contrary, firms located in countries with stronger fiscal responses to the pandemic are shown to benefit relatively more from the QE announcements. In particular, firms that rely relatively more on bond finance experience higher abnormal stock returns and greater CDS declines, if located in countries with stronger fiscal responses. Using the sovereign CDS spread as an alternative fiscal indicator, we similarly find that investment-grade firms gain more, if located in countries with high sovereign CDS spreads that stand to gain more from purchases of government debt as part of QE. The revealed complementarity between monetary and fiscal policy could reflect that expansive fiscal policy creates rationales for additional corporate borrowings, and hence enhances the scope for higher equity and debt valuations following a reduction in the interest rate.

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Figures and tables

FIGURE 1. Cumulative abnormal stock returns around the corporate QE announcements

This graph shows the unweighted average of the cumulative abnormal stock returns of publicly traded European firms, excluding non-financial firms, utilities, not for profit and governmental firms, in a two-week window centered around the time of the ECB QE announcement in the evening of March 18, 2020 and the BoE QE announcement on March 19, 2020. Only ultimate parent companies are included. Abnormal stock returns are calculated as the difference between the predicted and the actual returns for a stock, using regressions of stock returns on returns of the MSCI World index.

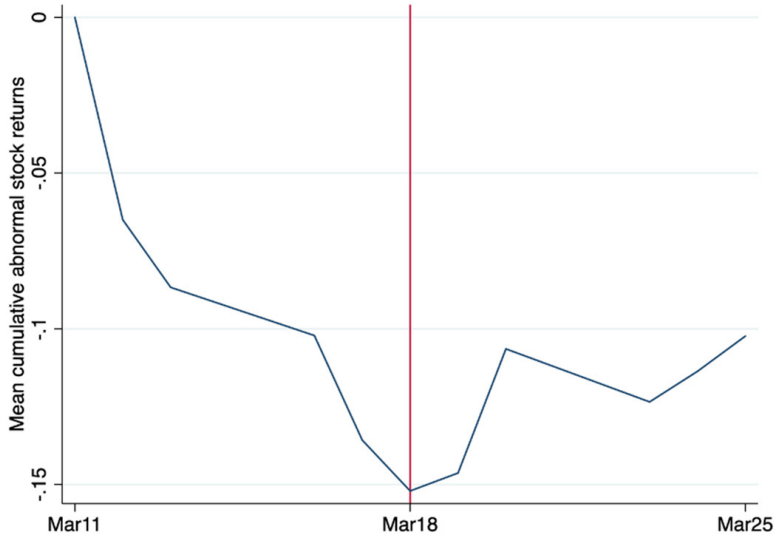

FIGURE 2. Cumulative stock returns around the corporate QE announcements

This graph shows the unweighted average of the cumulative stock returns of publicly traded European firms, excluding non-financial firms, utilities, not for profit and governmental firms, in a two-week window centered around the time of the ECB QE announcement in the evening of March 18, 2020 and the BoE QE announcement on March 19, 2020. Only ultimate parent companies are included.

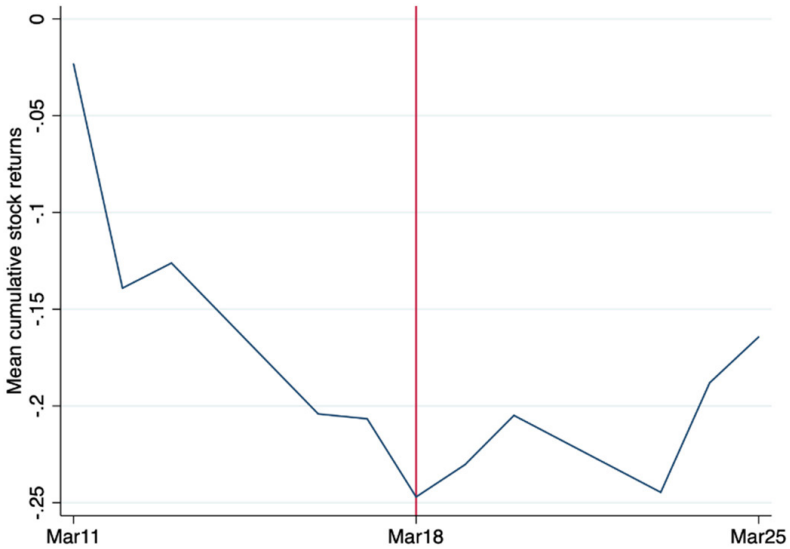

FIGURE 3. CDS spread changes around the corporate QE announcements

This graph shows the unweighted average of the cumulative CDS spread changes of publicly traded European firms, excluding non-financial firms, utilities, not for profit and governmental firms, in a two-week window centered around the ECB QE announcement in the evening of March 18, 2020 and the BoE QE announcement on March 19, 2020. Only ultimate parent companies are included.

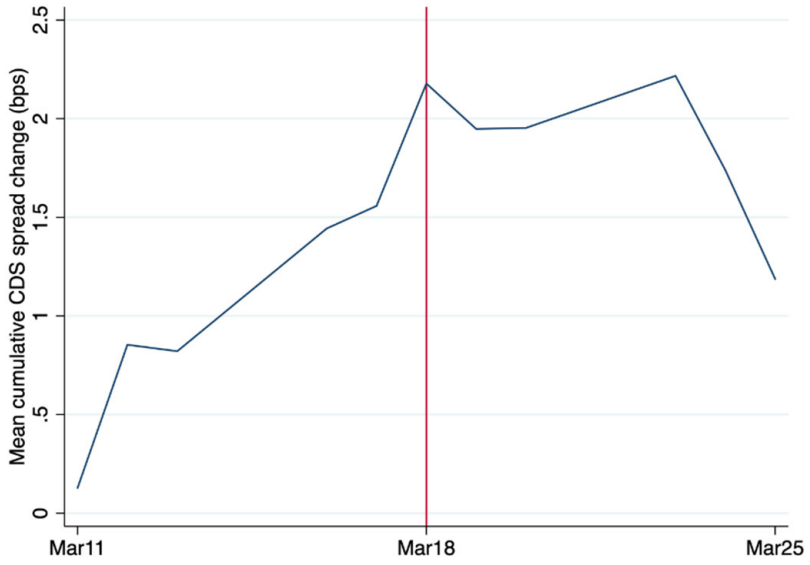

TABLE 1. Descriptive statistics

This table provides summary statistics. See Table A1 in the Appendix for variable definitions.

	Observations	Mean	SD	Min	Max
Abnormal return	2211	0.00555	0.0626	−0.157	0.150
CDS change	111	−4.508	7.874	−26.68	39.25
dMVE/Book assets	2211	0.0294	0.115	−0.671	0.510
dMVD/Book assets	111	0.000570	0.00107	−0.00608	0.00370
dMVE/(dMVE + dMVD), dMVE > 0, dMVD > 0	63	0.882	0.200	0.110	1.000
dMVE/(dMVE + dMVD), dMVE + dMVD > 0	84	0.808	0.597	−3.785	1.189
Investment grade	2211	0.0991	0.299	0	1
Non-investment grade	2211	0.0461	0.210	0	1
Bonds/assets	1873	0.0575	0.102	0	0.444
Leverage	2211	0.531	0.215	0.0323	0.964
Log assets	2211	19.62	2.516	14.33	26.44
ROA	2211	−0.0291	0.224	−1.203	0.304
Book-to-market	2211	0.650	0.705	0.0322	5.194
Cash-to-price	2195	0.0831	0.203	−0.694	1.048
Earnings-to-price	2211	−0.0259	0.225	−1.309	0.358
Cash/assets	2208	0.157	0.166	0.000189	0.903
Redeployability	2211	0.387	0.104	0.0603	0.600
EA	2211	0.413	0.492	0	1
UK	2211	0.164	0.371	0	1
Beta	2211	0.616	0.503	−2.194	2.810
Affected industry	2211	0.288	0.453	0	1
Turnover decline	1966	0.0204	0.0877	−0.144	0.439
Fiscal response/GDP	2182	0.0441	0.0629	0	0.179
Sovereign CDS	2026	29.66	35.01	5.080	530

TABLE 2. Abnormal stock returns

The dependent variable is the abnormal return observed on March 19, 2020. Investment grade (Non-investment grade) is a dummy variable indicating a long term, domestic or foreign, issuer credit rating of at least (lower than) BBB-/Baa3 issued by either Moody's, S&P or Fitch. Leverage is liabilities divided by assets at the end of 2019. Log of assets is the natural logarithm of assets at the end of 2019. ROA is net income before extraordinary items divided by assets at the end of 2019. Book-to-market is the book value of equity divided by the market value of equity at the end of 2019. Bonds/assets is the sum of the principal amounts of outstanding bonds divided by the book value of assets at the last reporting date in 2019. Cash-to-price is cash from operating activities in 2019 divided by the market value of equity at the end of 2019. Earnings-to-price is net income before extraordinary items in 2019 divided by the market value of equity at the end of 2019. Cash/assets is the sum of cash, cash and equivalents and short-term investments divided by assets at the end of 2019. Redeployability is a measure of asset redeployability at the four-digit SIC industry level as of 2015 from Kim and Kung (2017). EA (UK) is a dummy variable indicating that a firm is incorporated in the euro area (United Kingdom). Regressions include country fixed effects. Robust standard errors clustered at the country level are in parentheses. *, ** and *** denote significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Investment grade	0.0206***	0.0232***		0.0134**	0.0207***	0.0232***		0.0131*	0.0253***
	(0.00464)	(0.00515)		(0.00641)	(0.00462)	(0.00505)		(0.00682)	(0.00717)
Leverage	−0.0133	−0.0145	−0.0159	−0.0117	−0.00383	−0.00494	−0.00672	−0.00291	−0.0138
	(0.00959)	(0.00889)	(0.0103)	(0.00997)	(0.00590)	(0.00557)	(0.00896)	(0.00831)	(0.00939)
Log assets	−0.000924	−0.00134	0.000463	−0.00161	−0.000796	−0.00120	0.000741	−0.00130	−0.000876
	(0.000950)	(0.000936)	(0.000951)	(0.00106)	(0.00103)	(0.00100)	(0.00106)	(0.00110)	(0.000983)
ROA	−0.0225***	−0.0211***	−0.0342***	−0.0288***	−0.0215***	−0.0204***	−0.0348***	−0.0289***	−0.0229***
	(0.00639)	(0.00604)	(0.00818)	(0.00740)	(0.00505)	(0.00494)	(0.00912)	(0.00901)	(0.00663)
Book-to-market	−0.00277	−0.00274	−0.00625***	−0.00487**	−0.00121	−0.00107	−0.00427***	−0.00302*	−0.00274
	(0.00202)	(0.00196)	(0.00157)	(0.00181)	(0.00144)	(0.00142)	(0.00153)	(0.00158)	(0.00203)
Non-investment grade		0.0137*		0.00811		0.0131**		0.00747	
		(0.00681)		(0.00662)		(0.00643)		(0.00673)	
Bonds/assets			−0.00475	−0.0374*			−0.00516	−0.0376*	
			(0.0195)	(0.0187)			(0.0194)	(0.0189)	
Bonds/assets * Investment grade				0.0864*				0.0862*	
				(0.0443)				(0.0475)	
Cash-to-price					−0.000355	−0.00133	0.000131	0.000904	
					(0.0104)	(0.00984)	(0.00853)	(0.00907)	
Earnings-to-price					0.00537	0.00610	0.00991	0.00848	
					(0.0109)	(0.0105)	(0.0124)	(0.0127)	
Cash/assets					0.0281***	0.0273***	0.0363***	0.0362***	
					(0.00635)	(0.00674)	(0.00532)	(0.00576)	

TABLE 2. (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Redeployability					−0.00496	−0.00535	0.000360	−0.000421	
					(0.0168)	(0.0167)	(0.0156)	(0.0158)	
EA * Investment grade									−0.0101
									(0.0107)
UK * Investment grade									0.00175
									(0.00938)
Observations	2211	2211	1873	1873	2192	2192	1864	1864	2211
Adjusted R-squared	0.045	0.047	0.043	0.055	0.048	0.049	0.048	0.059	0.045
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

TABLE 3. CDS spread changes

The dependent variable is the change in the CDS spread observed on March 19, 2020. Investment grade (Non-investment grade) is a dummy variable indicating a long term, domestic or foreign, issuer credit rating of at least (lower than) BBB-/Baa3 issued by either Moody's, S&P or Fitch. Leverage is liabilities divided by assets at the end of 2019. Log of assets is the natural logarithm of assets at the end of 2019. ROA is net income before extraordinary items divided by assets at the end of 2019. Book-to-market is the book value of equity divided by the market value of equity at the end of 2019. Bonds/assets is the sum of the principal amounts of outstanding bonds divided by the book value of assets at the last reporting date in 2019. Cash-to-price is cash from operating activities in 2019 divided by the market value of equity at the end of 2019. Earnings-to-price is net income before extraordinary items in 2019 divided by the market value of equity at the end of 2019. Cash/assets is the sum of cash, cash and equivalents and short-term investments divided by assets at the end of 2019. Redeployability is a measure of asset redeployability at the four-digit SIC industry level as of 2015 from Kim and Kung (2017). EA (UK) is a dummy variable indicating that a firm is incorporated in the euro area (United Kingdom). Regressions include country fixed effects. Robust standard errors clustered at the country level are in parentheses. *, ** and *** denote significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Investment grade	−7.971**	−8.587**		−2.344	−8.941**	−10.00**		−3.291	−8.194
	(3.146)	(3.367)		(3.443)	(3.000)	(3.933)		(3.513)	(5.638)
Leverage	−13.34**	−13.25**	−8.237	−12.63*	−9.732*	−9.626*	−4.639	−7.495	−13.07**
	(4.168)	(4.105)	(4.609)	(5.876)	(4.448)	(4.523)	(6.554)	(4.960)	(4.496)
Log assets	0.690	0.720	0.105	0.666	0.865	0.938	0.229	0.911	0.783
	(0.667)	(0.669)	(0.573)	(0.566)	(0.701)	(0.734)	(0.664)	(0.690)	(0.713)
ROA	5.945	5.114	11.30	12.49	4.337	4.448	10.64	8.967	9.476
	(9.943)	(10.93)	(9.374)	(12.83)	(17.97)	(18.02)	(23.36)	(17.64)	(14.45)

TABLE 3. (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Book-to-market	−7.389***	−7.487***	−5.874***	−7.422***	−5.730**	−5.784**	−4.280	−5.408**	−7.453***
	(1.723)	(1.818)	(1.602)	(1.945)	(2.156)	(1.972)	(3.440)	(2.192)	(1.566)
Non-investment grade		−1.561		−4.766		−2.657		−6.433	
		(5.117)		(5.967)		(4.003)		(6.431)	
Bonds/assets			−8.823	48.27			−9.099	54.76	
			(9.180)	(56.25)			(8.121)	(57.17)	
Bonds/assets * Investment grade				−59.18				−66.01	
				(53.72)				(57.46)	
Cash-to-price					−14.46	−14.64	−12.25	−18.05	
					(11.42)	(11.38)	(13.91)	(13.48)	
Earnings-to-price					4.568	2.920	4.219	6.983	
					(17.11)	(18.56)	(16.83)	(10.36)	
Cash/assets					27.99**	28.31**	22.45*	27.81**	
					(10.47)	(10.79)	(11.28)	(10.60)	
Redeployability					0.0565	1.211	2.137	1.311	
					(6.544)	(5.967)	(6.182)	(6.928)	
EA * Investment grade									0.755
									(5.235)
UK * Investment grade									−2.650
									(4.156)
Observations	111	111	108	108	111	111	108	108	111
Adjusted R-squared	0.111	0.102	0.036	0.155	0.134	0.127	0.037	0.200	0.100
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

TABLE 4. Changes in the absolute and relative valuations of equity and debt

The dependent variable in regression 1 is the change in the market value of equity on March 19, 2020 divided by the book value of assets at the end of 2019. The dependent variable in regression 2 is the change in the market value of debt on March 19, 2020 divided by the book value of assets at the end of 2019. The dependent variable in regression 3 is the change in the market value of equity on March 19, 2020 divided by the sums of the changes in the market values of equity and debt on March 19, 2020, conditional on both of these being positive. The dependent variable in regression 4 is the change in the market value of equity on March 19, 2020 divided by the sums of the changes in the market values of equity and debt on March 19, 2020, conditional on the sum of these being positive. Investment grade is a dummy variable indicating a long term, domestic or foreign, issuer credit rating of at least (lower than) BBB-/Baa3 issued by either Moody's, S&P or Fitch. Leverage is liabilities divided by assets at the end of 2019. Log of assets is the natural logarithm of assets at the end of 2019. ROA is net income before extraordinary items divided by assets at the end of 2019. Book-to-market is the book value of equity divided by the market value of equity at the end of 2019. Beta is the coefficient of a regression of the daily log stock return on the daily log return of the MSCI World index. Regressions include country fixed effects. Robust standard errors clustered at the country level are in parentheses. *, ** and *** denote significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
	dMVE/Book Assets	dMVD/ Book Assets	dMVE/(dMVE + dMVD)	dMVE/(dMVE + dMVD)
			dMVE > 0, dMVD > 0	dMVE + dMVD > 0
Investment grade	0.0219***	0.00121*	−0.151***	−0.214**
	(0.00718)	(0.000536)	(0.0228)	(0.0769)
Leverage	−0.0661**	0.00205***	−0.530***	−0.988**
	(0.0247)	(0.000545)	(0.134)	(0.340)
Log assets	−0.00286	−0.000115	0.0212	−0.0133
	(0.00203)	(0.0000853)	(0.0153)	(0.0347)
ROA	−0.0805***	−0.000695	−0.130	1.588
	(0.0143)	(0.00158)	(0.242)	(1.161)
Book-to-market	−0.0239***	0.00105***	−0.241***	−0.301***
	(0.00503)	(0.000258)	(0.0641)	(0.0733)
Beta	0.0141**	−0.000310	−0.0736	−0.128
	(0.00563)	(0.000296)	(0.0501)	(0.115)
Observations	2211	111	63	84
Adjusted R-squared	0.094	0.130	0.373	−0.032
Country FE	Yes	Yes	Yes	Yes

TABLE 5. Firms in industries that are highly affected by the pandemic

In regressions 1 and 2 of Panels A and B the dependent variable is the abnormal stock return observed on March 19, 2020. In regressions 3 and 4 of Panels A and B the dependent variable is the change in the market value of equity on March 19, 2020 divided by the market value of equity at the end of 2019. In regressions 5 and 6 of Panels A and B the dependent variable is the change in the market value of equity on March 19, 2020 divided by the decrease in market value of equity between the end of 2019 and March 18, 2020. In regressions 7 and 8 of Panels A and B the dependent variable is the change in the CDS spread observed on March 19, 2020. Affected industry is a dummy variable indicating industries that are relatively affected by the COVID-19 crisis. Turnover decline is the change in the turnover of a 2-digit NACE industry in the first quarter of 2020 divided by the turnover in the first quarter of 2019 multiplied by minus one. Investment grade is a dummy variable indicating a long term, domestic or foreign, issuer credit rating of at least (lower than) BBB-/Baa3 issued by either Moody's, S&P or Fitch. Leverage is liabilities divided by assets at the end of 2019. Log of assets is the natural logarithm of assets at the end of 2019. ROA is net income before extraordinary items divided by assets at the end of 2019. Book-to-market is the book value of equity divided by the market value of equity at the end of 2019. Regressions include country fixed effects. Robust standard errors clustered at the country level are in parentheses. *, ** and *** denote significance at 10%, 5%, and 1%, respectively.

Panel A	**Abnormal Return**		**dMVE/End-of-2019 MVE**		**dMVE/Jan–March Change in MVE**		**CDS Change**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Affected industry	−0.00511**	−0.00392	−0.00479***	−0.00374**	−0.0148*	−0.00498	2.438*	8.553**
	(0.00220)	(0.00252)	(0.00140)	(0.00155)	(0.00854)	(0.00949)	(1.311)	(2.779)
Investment grade	0.0204***	0.0242***	0.0115***	0.0148***	0.0498**	0.0809***	−7.871**	−2.733
	(0.00451)	(0.00539)	(0.00297)	(0.00349)	(0.0203)	(0.0285)	(3.036)	(3.034)
Affected industry * Investment grade		−0.0104*		−0.00911***		−0.0833**		−7.131
		(0.00609)		(0.00297)		(0.0330)		(4.004)
Leverage	−0.0110	−0.0109	−0.0128	−0.0127	−0.0623*	−0.0613*	−16.57***	−15.08***
	(0.0103)	(0.0103)	(0.00824)	(0.00826)	(0.0356)	(0.0358)	(3.003)	(2.123)
Log assets	−0.000848	−0.000924	0.000994*	0.000927	0.00247	0.00182	0.852	0.668
	(0.000934)	(0.000943)	(0.000551)	(0.000553)	(0.00325)	(0.00318)	(0.719)	(0.682)
ROA	−0.0221***	−0.0221***	−0.0206***	−0.0206***	−0.0651***	−0.0650***	3.543	4.169
	(0.00629)	(0.00630)	(0.00382)	(0.00383)	(0.0226)	(0.0222)	(9.186)	(9.049)
Book-to-market	−0.00259	−0.00254	−0.00474***	−0.00469***	−0.0191***	−0.0186**	−8.429***	−8.047***
	(0.00197)	(0.00199)	(0.000955)	(0.000961)	(0.00683)	(0.00689)	(1.241)	(1.055)
Observations	2211	2211	2211	2211	2111	2111	111	111
Adjusted R-squared	0.046	0.046	0.059	0.059	0.031	0.034	0.120	0.128
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

TABLE 5. (Continued)

Panel B	Abnormal Return		dMVE/End-of-2019 MVE		dMVE/Jan-March Change in MVE		CDS Change	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Turnover decline	−0.0234	−0.0244*	−0.0342***	−0.0368***	−0.189***	−0.176***	−0.237	−59.11
	(0.0145)	(0.0137)	(0.00960)	(0.0105)	(0.0472)	(0.0385)	(29.25)	(67.76)
Investment grade	0.0204***	0.0201***	0.0109***	0.00990**	0.0484*	0.0534*	−8.515**	−11.83
	(0.00494)	(0.00499)	(0.00370)	(0.00399)	(0.0240)	(0.0302)	(3.472)	(7.093)
Turnover decline * Investment grade		0.0113		0.0302		−0.148		71.63
		(0.0853)		(0.0423)		(0.236)		(56.24)
Leverage	−0.0135	−0.0134	−0.0168**	−0.0166**	−0.0794**	−0.0801**	−13.27***	−13.91***
	(0.00956)	(0.00945)	(0.00752)	(0.00751)	(0.0345)	(0.0347)	(4.009)	(3.661)
Log assets	−0.00105	−0.00105	0.00107*	0.00107*	0.00339	0.00340	0.657	0.679
	(0.000991)	(0.000992)	(0.000612)	(0.000611)	(0.00347)	(0.00348)	(0.746)	(0.818)
ROA	−0.0220***	−0.0220***	−0.0192***	−0.0192***	−0.0636**	−0.0636**	6.831	14.38
	(0.00782)	(0.00783)	(0.00461)	(0.00462)	(0.0283)	(0.0282)	(9.694)	(11.47)
Book-to-market	−0.00226	−0.00224	−0.00419***	−0.00414***	−0.0153**	−0.0155**	−7.323***	−7.548***
	(0.00229)	(0.00231)	(0.00110)	(0.00115)	(0.00729)	(0.00743)	(1.162)	(1.209)
Observations	1966	1966	1966	1966	1875	1875	106	106
Adjusted R-squared	0.045	0.044	0.060	0.060	0.040	0.040	0.101	0.147
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

TABLE 6. The interaction of corporate QE and national fiscal responses to COVID-19

In regressions 1 to 4 the dependent variable is the one-day abnormal return observed on March 19, 2020. In regressions 5 to 8 the dependent variable is the CDS spread change observed on March 19, 2020. Investment grade (Non-investment grade) is a dummy variable indicating a long term, domestic or foreign, issuer credit rating of at least (lower than) BBB-/Baa3 issued by either Moody's, S&P or Fitch. Fiscal response/GDP is the total amount of economic stimulus spending announced in a country until March 17, 2020 divided by GDP. Bonds/assets is the sum of the principal amounts of outstanding bonds divided by the book value of assets at the last reporting date in 2019. Leverage is liabilities divided by assets at the end of 2019. Log of assets is the natural logarithm of assets at the end of 2019. ROA is net income before extraordinary items divided by assets at the end of 2019. Book-to-market is the book value of equity divided by the market value of equity at the end of 2019. Regressions include country fixed effects. Robust standard errors clustered at the country level are in parentheses. *, ** and *** denote significance at 10%, 5%, and 1%, respectively.

	Abnormal Return				CDs Change			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Investment grade	0.0164***	0.0184***		0.0180**	−8.585*	−9.842*		−5.792
	(0.00539)	(0.00570)		(0.00871)	(3.905)	(4.702)		(7.114)
Fiscal response/GDP * Investment grade	0.0696*	0.0823**		−0.146**	14.00	21.12		−44.39
	(0.0347)	(0.0354)		(0.0582)	(21.39)	(24.76)		(54.71)
Non-investment grade		0.00655		0.00218		−0.666		−11.65
		(0.00868)		(0.00880)		(5.222)		(10.64)
Fiscal response/GDP * Non-investment grade		0.133*		0.112*		−288.3		477.5
		(0.0675)		(0.0652)		(392.7)		(635.4)
Bonds/assets			−0.0242	−0.0358			−0.263	96.13
			(0.0226)	(0.0233)			(10.80)	(79.29)
Fiscal response/GDP * Bonds/assets			0.420***	−0.0702			−142.7*	−5744.3
			(0.144)	(0.202)			(67.60)	(5016.7)
Fiscal response/GDP * Bonds/assets * Investment grade				1.310***				5636.3
				(0.309)				(4993.7)
Bonds/Assets * Investment grade				0.0277				−100.7
				(0.0409)				(76.60)
Leverage	−0.0149	−0.0166*	−0.0178*	−0.0141	−13.23**	−13.23**	−7.539	−10.17*
	(0.00962)	(0.00865)	(0.0102)	(0.00958)	(4.179)	(4.176)	(4.414)	(4.565)
Log assets	−0.000787	−0.00119	0.000549	−0.00136	0.621	0.615	0.132	0.807
	(0.000962)	(0.000937)	(0.000967)	(0.00106)	(0.640)	(0.648)	(0.596)	(0.820)

TABLE 6. (Continued)

	Abnormal Return				CDs Change			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ROA	−0.0226***	−0.0211***	−0.0344***	−0.0294***	5.704	4.361	18.45	15.96
	(0.00647)	(0.00614)	(0.00819)	(0.00754)	(9.553)	(11.05)	(10.86)	(13.97)
Book-to-market	−0.00287	−0.00293	−0.00645***	−0.00490**	−7.355***	−7.356***	−6.145***	−7.144**
	(0.00203)	(0.00189)	(0.00154)	(0.00186)	(1.740)	(1.866)	(1.500)	(2.257)
Observations	2182	2182	1859	1859	111	111	108	108
Adjusted R-squared	0.043	0.045	0.047	0.058	0.103	0.089	0.049	0.209
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

TABLE 7. The interaction of corporate QE and pre-pandemic sovereign default risk

In regressions 1 to 4 the dependent variable is the one-day abnormal return observed on March 19, 2020. In regressions 5 to 8 the dependent variable is the CDS spread change observed on March 19, 2020. Investment grade (Non-investment grade) is a dummy variable indicating a long term, domestic or foreign, issuer credit rating of at least (lower than) BBB-/Baa3 issued by either Moody's, S&P or Fitch. Sovereign CDS is the spread of CDS contracts written on sovereign bonds with a maturity of five years observed on December 31, 2019. Bonds/assets is the sum of the principal amounts of outstanding bonds divided by the book value of assets at the last reporting date in 2019. Leverage is liabilities divided by assets at the end of 2019. Log of assets is the natural logarithm of assets at the end of 2019. ROA is net income before extraordinary items divided by assets at the end of 2019. Book-to-market is the book value of equity divided by the market value of equity at the end of 2019. Regressions include country fixed effects. Robust standard errors clustered at the country level are in parentheses. *, ** and *** denote significance at 10%, 5%, and 1%, respectively.

	Abnormal Return				CDs Change			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Investment grade	0.0153**	0.0168**		0.0103	−9.651**	−7.926		6.692
	(0.00567)	(0.00623)		(0.00724)	(3.969)	(4.303)		(5.006)
Sovereign CDS * Investment grade	0.000166*	0.000183**		0.0000188	0.0710	0.000996		−0.160*
	(0.0000813)	(0.0000816)		(0.000246)	(0.0582)	(0.0486)		(0.0852)
Non-investment grade		0.00315		−0.000236		6.141*		3.277
		(0.00771)		(0.00694)		(3.037)		(5.677)
Sovereign CDS * Non-investment grade		0.000193		0.000116		−0.329***		−0.222
		(0.000117)		(0.000116)		(0.0491)		(0.120)
Bonds/assets			−0.0231	−0.0425			1.097	114.5
			(0.0266)	(0.0292)			(12.08)	(90.07)

TABLE 7. (Continued)

	Abnormal Return				CDs Change			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sovereign CDS * Bonds/assets			0.000763***	0.000290			−0.299	−2.144
			(0.000252)	(0.000483)			(0.165)	(1.715)
Sovereign CDS * Bonds/assets * Investment				0.000749				1.995
grade				(0.00126)				(1.720)
Bonds/assets * Investment grade				0.0739*				−119.7
				(0.0424)				(87.08)
Leverage	−0.0138	−0.0149	−0.0158	−0.0119	−12.18**	−11.72**	−6.657	−11.79
	(0.0101)	(0.00916)	(0.0106)	(0.00998)	(4.828)	(4.423)	(5.032)	(6.520)
Log assets	−0.000900	−0.00120	0.000242	−0.00159	0.612	0.909	0.0380	0.868
	(0.000999)	(0.000992)	(0.000985)	(0.00113)	(0.658)	(0.610)	(0.675)	(0.600)
ROA	−0.0231***	−0.0220***	−0.0340***	−0.0293***	1.038	6.376	14.28	32.63
	(0.00683)	(0.00643)	(0.00849)	(0.00786)	(14.42)	(14.28)	(14.84)	(22.27)
Book-to-market	−0.00249	−0.00254	−0.00575***	−0.00438**	−6.677***	−6.513***	−5.264***	−5.099*
	(0.00209)	(0.00200)	(0.00154)	(0.00186)	(1.788)	(1.774)	(1.420)	(2.411)
Observations	2026	2026	1727	1727	104	104	101	101
Adjusted R-squared	0.040	0.041	0.043	0.052	0.088	0.105	0.022	0.229
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix

TABLE A1. Description of variables

Variable	Description	Source
Abnormal return	Excess stock return observed on March 19, 2020. It is calculated as the difference between the actual and predicted returns for a stock. Actual returns are calculated as the difference between the natural logarithms of the closing prices between March 19 and 18, 2020.	Thomson Reuters Eikon
CDS change	Change of the CDS spread observed on March 19, 2020.	Thomson Reuters Eikon
dMVE/Book assets	Change in the market value of equity on March 19, 2020 divided by the book value of assets at the end of 2019. Market value of equity is calculated as the sum of the market values of issued shares.	Thomson Reuters Eikon
dMVD/Book assets	Change in the market value of debt on March 19, 2020 divided by the book value of assets at the end of 2019. The change in the market value of debt is calculated using CDS spreads on March 18 and 19, 2020.	Thomson Reuters Eikon
dMVE/(dMVE + dMVD) dMVE > 0, dMVD > 0	Change in the market value of equity on March 19, 2020 divided by the sum of the changes in the market values of equity and debt on March 19, 2020, conditional on both of these being positive.	Thomson Reuters Eikon
dMVE/(dMVE + dMVD) dMVE + dMVD > 0	Change in the market value of equity on March 19, 2020 divided by the sum of the changes in the market values of equity and debt on March 19, 2020, conditional on the sum of these being positive.	Thomson Reuters Eikon
Investment grade	Dummy variable indicating a long term, domestic or foreign, issuer credit rating of at least BBB-/Baa3 issued by either Moody's, S&P or Fitch.	Thomson Reuters Eikon
Non-investment grade	Dummy variable indicating a long term, domestic or foreign, issuer credit rating lower than BBB-/Baa3 issued by either Moody's, S&P or Fitch.	Thomson Reuters Eikon
Bonds/assets	The sum of the principal amounts of outstanding bonds divided by the book value of assets at the last reporting date in 2019. Bonds include Commercial Paper, Bonds and Notes as reported in Capital IQ.	S&P Capital IQ, Compustat
Leverage	Liabilities divided by assets at the end of 2019.	Thomson Reuters Eikon
Log assets	Natural logarithm of assets at the end of 2019.	Thomson Reuters Eikon
ROA	Net income before extraordinary items divided by assets at the end of 2019.	Thomson Reuters Eikon
Book-to-market	Book value of equity divided by market value of equity at the end of 2019.	Thomson Reuters Eikon
Cash-to-price	Cash from operating activities in 2019 divided by the market value of equity at the end of 2019.	Thomson Reuters Eikon
Earnings-to-price	Net income before extraordinary items in 2019 divided by the market value of equity at the end of 2019.	Thomson Reuters Eikon
Cash/assets	The sum of cash, cash and equivalents and short-term investments divided by assets at the end of 2019.	Thomson Reuters Eikon

TABLE A1. (Continued)

Variable	Description	Source
Redeployability	A measure of asset redeployability at the four-digit SIC industry level as of 2015. The measure is computed as the value-weighted averages of asset-level redeployability indices across business segments for Compustat firms, using market capitalization of Compustat firms in each industry-year as the weight.	Kim and Kung (2017)
Beta	The coefficient of a regression of the daily log stock return on the daily log return of the MSCI Europe index.	Datastream
Affected industry	Dummy variable indicating the following Fama-French-49 industries: Entertainment; Construction materials; Automobiles and trucks; Aircraft; Shipbuilding, railroad equipment; Personal services; Business services; Transportation; Wholesale; Retail; Restaurants, hotels, motels.	OECD (2020)
Turnover decline	The change in the turnover of a 2-digit NACE industry in the first quarter of 2020 divided by the turnover in the first quarter of 2019 multiplied by minus one.	Eurostat
Fiscal response/ GDP	The total amount of economic stimulus spending announced in a country until March 17, 2020 divided by GDP.	Hale et al. (2020)
Sovereign CDS	The spread of CDS contracts written on sovereign bonds with a maturity of five years observed on December 31, 2019.	Datastream

TABLE A2. Number of firms in the sample by headquarter country

Country	Number of Firms	
	With Abnormal Returns	With CDS Spread Changes
Austria	20	
Belgium	36	
Bulgaria	3	
Croatia	6	
Cyprus	6	
Denmark	53	2
Finland	100	5
France	226	28
Germany	205	16
Greece	34	
Guernsey	2	
Hungary	8	
Iceland	9	
Ireland	45	
Isle of Man	4	
Italy	100	5
Jersey	8	
Luxembourg	18	
Macedonia	2	
Malta	5	
Monaco	8	
Netherlands	63	9
Norway	78	
Poland	136	
Portugal	10	
Romania	5	
Russia	38	
Slovenia	3	
Spain	50	3
Sweden	429	8
Switzerland	109	7
Ukraine	2	
United Kingdom	390	28
Total	2211	111