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Convertible debt and the pandemic: driven by corporate finance rationales?

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ABSTRACT

Convertible bonds have been a popular security during the COVID-19 crises. The number of issuances has increased, but also the average amounts offered. At the same time, coupon rates decreased. Not only convertible debt has seen an increase, but firms also relied more on straight bond issuances during the crises. Firms were more likely to issue convertible debt if they had low chances of being in financial distress during the pandemic. An event study on the announcement returns of issuing firms during the pandemic showed a mean CAR of -5.60%. The announcement returns found in this study are in line with the trend of increasing negative CARs. Convertible bonds were popular during the crisis because firms tried to attract capital. Furthermore, the backdoor-equity theory could potentially explain why firms wanted to issue convertible debt during the pandemic.

Keywords: Convertible bond, announcement returns, event study, COVID-19, logistic regression, corporate finance
JEL: C12, G14, G30, G32

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1. Introduction

Convertible bonds have become a popular source of financing for firms over the past years and especially in 2020, the year in which the COVID-19 crisis hit the economy hard. In March 2020, the pandemic resulted in lockdowns and social restrictions all around the world. There was a negative sentiment around equity markets and some firms had a really challenging time. At the same time, the issuance of convertible debt reached high levels in 2020. Reuters reported in July 2020 that the volume of convertible bond sales reached levels like 2007 with a global issue of bonds worth $89 billion. Firms tried to attract capital and increase liquidity when the crisis started, and convertibles were an attractive option.

Many studies have written about the theoretical and empirical reasons to issue convertible securities. One of the popular theories to issue convertible debt is the equity-backdoor theory by Stein (1992). Stein argues that a convertible debt issue might be a way for firms to get equity financing in times when a stock issue is unattractive. An alternative reason to issue convertible debt might be because of the lower interest rates compared to the rates of common debt. Other studies also argue that convertible debt could have the ability to mitigate adverse selection costs.

Knowing there are many reasons firms might want to issue convertible debt, it is interesting whether these theories could explain the increase in popularity of the security during the COVID-19 crisis. This research therefore tries to answer the following research question: *Did convertible bond financing reached record levels during the COVID-19 crisis and how could this be explained by corporate finance theory?* This study contributes to the literature on convertible bonds by examining the recent convertible bond issues, what the company characteristics of the issuing firms are, and the market reaction to these issues.

It is first established what the number of convertible bond issues has been over the years and, in 2020. It was found that the convertible bond markets have been in decline since the Financial Crisis of 2008 but have recouped to higher levels in more recent years, and in 2020 specifically. Whereas the number of issuances equals roughly to the levels observed during the years before the Financial Crisis, the average amount offered increased substantially over the past years. At the same time, coupon rates have dropped to lower levels. Furthermore, a logit regression showed which type of firms would be more likely to issue a convertible bond during the pandemic. In general, firms that were less likely to be in financial distress would be more inclined to issue a convertible bond during the COVID-19

pandemic. The announcement returns of the convertible debt issues during the pandemic were very negative with a mean cumulative abnormal return of -5.60% for the issues considered by this study. Announcement returns of convertible bonds have been traditionally low, but not so extreme as the results found by this study. However, it is in line with the findings of the more recent study by Dutordoir et al. (2023) and a general trend of decreasing convertible bond announcement returns.

This study was able to show that convertible bonds were very popular during the pandemic and especially the companies not in distress were making use of the security. The popularity of the security could be explained by the need for financing for firms during the crisis, and the low coupon rates convertible debt offered. However, corporate finance theories could also provide explanations on the popularity of convertible debt. Because of uncertainty in the equity markets, the theory of Stein (1992) could provide rationales for issuing bonds. Stein believes convertible debt might be an alternative to equity if an equity issue is unattractive for a firm. The results differ to Dutordoir et al. (2023) that could not explain the increase in convertible bond issues with traditional corporate finance theories.

The paper is organized in the following way: Chapter 2 describes the literature on convertible bonds and states the hypotheses of this study. The third chapter describes the data sources used whereas the fourth chapter explains the methodology used by this study. Chapter 5 shows the results of the different analyses and tries to answer the different hypotheses. To end, Chapter 6 deals with the concluding remarks, limitations, and suggestions for further research.

2. Literature

The literature on firm financing starts with the work of Modigliani and Miller (1958) who argue that a firm's capital structure does not influence the value of a firm. Modigliani and Miller do mention that this holds in an efficient financial market where there are no taxes, a perfect capital market and no costs of financial distress. In practice, this assumption does not hold. Modigliani and Miller (1963) introduced the static trade-off theory. This theory argues that firms face a trade-off between the tax benefits from debt and, on the other hand, the costs of financial distress. Therefore, they choose a target debt ratio that maximizes this trade-off.

Another popular capital structure theory is the pecking order theory by Myers and Majluf (1984). The pecking order theory assumes that firms rather use internal funds, debt, and hybrid securities before issuing equity. Equity is less attractive in this framework because of information asymmetry costs of equity. Next to these basic theories, many other researchers have focused on capital structure theories and what might influence a firm's financing decision. Most of the traditional corporate finance theories explain the choice between either equity or debt. Convertible bond literature typically shows a combination of the two. Therefore, the literature that researches the motives behind convertible debt could also give more insights into why firms issue equity, debt, or a combination of the two.

2.1 Theoretical motivations to issue convertible debt

Firms that want to attract capital have several options to choose from. Generally, they can choose between equity, debt, or hybrid securities. Issuing equity is one of the options where a company sells a part of its ownership in exchange for cash. Another option for companies is to make use of debt financing where the company has the option to attract capital without giving up part of the company's ownership. Convertible bonds are a mixture of the two forms of financing. The bonds are a hybrid debt instrument which is convertible into common equity of the company that is issuing the bond. Where investors that purchase convertible bonds have the choice to convert their debt into shares.

There are multiple reasons for firms to issue convertible debt and many researchers have studied the motives behind issuing the security. Dutordoir et al. (2014) mention that companies have implausible and plausible reasons to issue convertible bonds. The implausible motives reasoning implies that convertible debt is cheaper compared to both

normal debt and equity financing. Because the coupon rate is lower compared to straight debt and the equity is cheaper as the conversion price is usually higher compared to the stock price at the issuance of the security. The plausible motives are a collection of theories written by different authors over the years. Although the plausible motives also argue that convertibles reduce financing cost compared to traditional forms of capital raising, they also imply that convertible debt does not always dominate common forms of capital raising in all situations. Most plausible theories that can be found in the literature explain how convertible securities could solve adverse selection and agency costs.

Information asymmetry costs typically arise when there is one party that has more or better information than the other party. There could be information asymmetry between management and investors on the risk of a firm. Brennan and Kraus (1987) mention how convertible bond financing can help reduce these information asymmetry costs. Some firms must forgo investments because they are not able to communicate their prospects credibly to investors which leads to adverse selection problems for these firms. Firms are either unable to communicate the returns of the investment of the firms or the variance of the returns. Brennan and Kraus therefore propose convertible bonds as an option to reduce the information asymmetry and make it easier for firms to attract capital.

Brennan and Schwartz (1988) also think that convertible bonds can be an option for firms that are deemed as risky by the market. Because the convertible bond is a hybrid security with equity upside, a company can finance itself cheaper compared to regular debt which comes along with higher coupon payments due to the information asymmetry on the riskiness of the company.

The studies of Brennan and Kraus (1987) and Brennan and Schwartz (1988) agree on the ability of convertible bonds to reduce asymmetric information between firms and investors. Stein (1992) also wrote on how convertible bonds could mitigate asymmetry information. However, the study differs with respect to the other studies in that it focuses on asymmetric information on firm value whereas other studies focus on asymmetric information on firm risk. Stein builds on the work of Myers and Majluf (1984) that build a model where asymmetric information between firms and investors on firm value leads to adverse selection problems. According to Stein, firms can use convertible bonds as an indirect method to get equity financing when it is unfavourable to issue equity because the market feels the firm to be overvalued at the current equity prices. The market will not perceive a convertible bond issue as firm overvaluation because the equity component is smaller for convertible bond issues compared to a full equity issuance.

It is only being discussed how information asymmetry could explain a convertible bond issue, but agency costs also appear to be a motivation for firms to issue the security. Green (1984) described the risk-shifting hypothesis and argued that convertible debt can reduce agency costs that arise between the holders of debt and equity. Shareholders typically have incentives to take on riskier projects due to their limited liability compared to bondholders. These projects are very risky and can sometimes be value destructive which results in bondholder-stockholder conflicts. Green proposes the issuance of convertible debt as this will imply that shareholders will need to share potential future gains from high-risk strategies with investors that bought convertible debt. This will reduce the gains of shareholders which will make them more cautious of investing in high-risk strategies.

Other agency costs could arise due to conflicts between management and shareholders. Mayers (1998) proposes a model where convertible debt can mitigate agency costs between management and shareholders. Management has incentives to overinvest, and this could potentially harm shareholders. Therefore, the debt component of convertibles helps to counter the incentives to overinvest as management needs to repay the debt component of the security.

2.2 Empirical evidence on the issuance of convertible bonds

So far, the most important theoretical motives for convertible bond issues have been described. The empirical studies on whether convertible debt might be an alternative to common debt or equity show whether firms issue convertible debt based on these theoretical motivations. To observe what the motives of managers are to issue convertible securities; the use of a questionnaire can provide a lot of insights. The study of Billingsley and Smith (1996) performed a questionnaire amongst multiple managers to find the motives for issuing convertible debt. The results showed that managers used convertible debt more as an alternative to normal debt to get debt financing with lower coupon rates. Although many researchers have argued convertible bonds to be a form of delayed equity financing, Billingsley and Smith argue that firms decreasingly rely on convertibles as delayed equity financing.

However, the study of Lewis, Rogalski and Seward (1999) found different results. The authors focused on whether convertible debt is a substitute for debt or equity. Both the risk-shifting hypothesis, which is explained by Green (1984) and the backdoor-equity hypothesis by Stein (1992) are considered in the research. Where the risk-shifting hypothesis

would give evidence for convertible debt as a substitute for common debt, and the backdoor-equity hypothesis would imply convertible debt as a substitute for equity. Lewis, Rogalski and Seward were able to find evidence for both theories.

Graham and Harvey (2001) performed a large study on the factors that determine the capital structures of firms. To do so, the authors held a survey among CFOs of large corporations. Based on the answers to the survey, Graham and Harvey found evidence for the equity-backdoor hypothesis. The study also gave some evidence for the studies of Brennan and Kraus (1987) and Brennan and Schwartz (1988) but not for Green (1984).

It is already becoming clear that most studies find evidence for multiple theories. This also holds for Bancel & Mittoo (2004) who surveyed 229 firms that issued convertible debt. They could not find clear evidence that supports one specific theory to issue convertible debt, but they found that firms have a variety of reasons to issue convertible debt. However, the most frequent reason firms had to issue convertible bonds was the rationale behind "delayed equity" financing. Firms hoped that investors would convert the debt to equity and thus finance the firm rather with the equity component of the convertible.

Most studies focused on convertible bond issues by firms in the U.S. Dutordoir and Van de Gucht (2009) tried to answer why firms issue convertible debt instead of straight debt or common equity where they focus on Western European companies. The researchers found that European convertible bonds mainly serve to reduce debt financing costs rather and not as delayed equity financing.

A more recent study also found no clear evidence for one theory in specific, but acknowledged there are many motivations to issue convertible debt. Dong, Dutordoir & Veld (2011) concluded this by interviewing executives of firms that issued convertible debt. The study found some evidence that supports the theory of Brennan and Schwartz (1988) but there was also strong support for more traditional financing theories like the pecking order theory. The authors stated that managers choose for convertible debt because the interest payments are lower compared to normal forms of debt, and they prefer convertible debt over equity because of perceived stock undervaluation by the market.

2.3 Announcement effects of convertible bond issues

When public firms announce they will issue convertible bonds, investors typically react to these announcements. Many studies find convertible bond announcements of U.S. firms to have a negative effect on the stock price. Dann and Mikkelson (1984) concluded that convertible bond issues in the U.S. resulted in an average abnormal stock return of -2.31%. This is in line with the study of Davidson, Glascock and Schwartz (1995) who found an average abnormal return of -1.4%. The convertible bond announcements of U.S. firms show negative announcement returns, but this does not hold for every country around the world. De Roon and Veld (1998) researched the announcement effects of convertible securities for the Dutch market. They found positive announcement effects but could not conclude statistical significance for these. Dutordoir et al. (2016) found convertible bond announcements in Japan to show positive or neutral announcement effects. A possible explanation could be that Japanese firms do motivate their reasons behind their issuance more compared to their U.S. counterparts.

The negative returns of U.S. convertible debt issues could be explained by arbitrage theories. Brown et al. (2012) wrote that firms for which a seasoned equity offering is too expensive, a convertible bond issuance might be a cheaper alternative. In doing so, these bonds are often offered to hedge funds who simultaneously short the underlying stock to hedge their positions. These actions could be a force of the negative announcement returns for convertible bond issuing firms. The arbitrage theory does not only result into negative announcement effects, but also made these effects increasingly negative over time. Duca et al. (2012) wrote that between 1984 and 1999 the abnormal stock return of a convertible bond offering was -1.69%. However, this decreased to -4.59% in the period between 2000-2008. The study concluded that the announcement returns are increasingly more negative due to the presence of arbitrage funds in the convertible investor market.

2.4 The COVID-19 crisis

In March 2020, the COVID-19 virus was declared as a pandemic and caused panic all around the globe. Governments were forced to impose strict lockdowns on local economies to stop the spread of the virus. Although the events are very recent, some studies have already been observing what the effects of this crisis were on firm financing. Miescu and Rossi (2021) studied the effects of COVID-19 induced shocks. One of the findings of the authors is the increased risk and uncertainty in markets and that the pandemic has a great influence on industries relying to face-to-face interactions.

Dutordoir et al. (2023) have written on the security offerings during the pandemic and tried to answer whether traditional corporate finance theories did still hold. The study found an increase in equity offerings and the issuances of both convertible and normal bonds. While the authors can explain the increase in equity offerings by shifts in macroeconomic conditions, they were not able to explain the increases in convertible and straight bond offerings with traditional corporate finance theories.

It lies within expectation that the pandemic has its influence on firm financing. Usually, macroeconomic conditions tend to influence capital raising. Erel et al. (2012) concluded that macroeconomic conditions have an impact on the type and structure of securities issued by firms, but also the type of firms that can receive financing. When macroeconomic conditions appear to worsen, capital will see a flight-to-quality where poor-quality companies struggle to obtain financing and must rely on private placements.

2.5 Hypotheses

There are signals that the issuance of convertible bonds sparked in 2020. Reuters reported in July 2020 that the volume of convertible bond sales reached levels like 2007 with an issue of bonds worth $89 billion. Some firms were hit hard by the social restrictions and needed financing. At the same time, equity markets were falling which made it unattractive to issue equity. This might explain the need for financing and therefore the large increases in convertible bonds. Furthermore, Dutordoir et al. (2023) also found that convertible bonds have been popular during the COVID-19 crisis. Therefore, the first hypothesis is as follows:

H1: Firms issued more convertible bonds in 2020 than the years before and increased the offering amounts of these issues.

From the literature we know there are several reasons for firms to issue convertible debt. It might be that adverse selection costs or agency problems drive firms to issue convertible securities. Stein (1992) mentioned that convertible debt might be an alternative to equity for firms that find an equity issue unattractive. These firms typically face different forms of adverse selection costs. Due to information asymmetry between the management and the market, an equity issue is typically unfavourable. Furthermore, information asymmetry could arise on the market due to differences between the market and management about the risks a company faces due to the COVID-19 crises. Also, equity markets were falling due to the crises. A stock issue under these circumstances could be difficult because of the negative sentiment around the markets. A convertible bond issue could therefore be a valid alternative for firms that need money but do find it difficult to attract debt or equity because firm risk and uncertainty has increased during the pandemic. Therefore, the following hypothesis can be made up:

H2: Firms issuing convertible debt were less likely to be in financial distress and found an equity issue unattractive because of the macroeconomic conditions and negative market sentiment.

Next to the levels and the motives of the issues, it is interesting to observe what the market reactions are to the issuances of convertible bonds during 2020. Based on what is written before in this chapter, firms that issue convertible securities tend to show negative announcement returns for their shareholders in the U.S. For example, Dann and Mikkelson (1984) found an average cumulative abnormal return of -2.31% for U.S. firms that issued convertible securities. Interestingly, the study of Dutordoir et al. (2023) documented an average announcement effect of -6.06% for convertible bonds issued during the COVID-19 pandemic. Hence, it can be expected that the announcement returns for the convertible bonds in this study will also be negative. Thus, hypothesis three will look as follows:

H3: The announcement returns for firms that issued convertible bonds in 2020 were negative in the U.S.

3. Data

In this section it is explained what type of data is used in this research and how it is obtained. Furthermore, the rationales behind certain variables are explained and for which type of analyses they will be used.

3.1 Convertible bond & normal bond issues

A sample of convertible bond issues between January 2005 and January 2022 in the U.S. is obtained from the Mergent FISD database to measure the popularity of convertible bond issuances over the past years and in 2020. The following selection of criteria is made to obtain the sample on convertible bonds:

1. The convertible bond must be issued by a U.S. based company;
2. The company that issues the convertible must be an industrial company. Issues from firms active in the financial sector or utilities may face severe regulation which is why they are not included. Companies with the SIC codes 4900 to 4999 (e.g., utilities), 6000 to 6199 (banks) and 6200 to 6999 (non-bank financial firms) are excluded;
3. The offering date of the issue must be known.

Note that many studies on convertible bonds typically tend to exclude private offerings that do not fall under the SEC rule 144A. This study does not make this distinction as the purpose is to find out what the level of convertible bond issues has been during the year 2020. To have sufficient data, these offerings are included in the dataset. A sample of 2047 convertible bond issues is obtained for the sample period. Table 1 shows the descriptive statistics for these issuances. The criteria listed above are also used to obtain data on normal bonds for the years 2005 until 2022. Descriptive statistics for these issues are shown in Table 7 in Appendix A.

Table 1: Descriptive statistics for the convertible bond issues during 2005 and 2022.

Variable	N	Mean	Std.Dev	Min	Max
Number of issuances over the years	2,047	133	43.7	2	225
Coupon	2,038	3.19	2.49	0	20
Offering amount	2,047	354.351	406.313	3.734	4500
Conversion premium	2,031	69.9	1265.7	-98.92	56874
Maturity	1,976	8.44	7.04	0.27	60.0

Note. Descriptive statistics for convertible bond issues between January 2005 and January 2022. Offering amount is in millions of U.S. dollars. Conversion premium is in percentages. Maturity is measured in years.

3.2 Likelihood of issuing

To observe what type of firms made a convertible bond issue during the pandemic in 2020, certain firm-specific variables are considered that might influence an issue. The literature has already described the various motives firms could have to issue convertible debt. Most theories write about convertible debt being either a substitute for straight debt or common equity. As firms needed financing, it could be insightful to observe whether convertible bonds were seen as an alternative to straight debt or equity financing during the crisis of 2020. Furthermore, the predicament of a firm before the crisis could tell us more about the motives of firms issuing convertible debt. The variables described in this chapter tell something about the financial state of the issuing firm or try to explain the motives behind issuing a convertible bond during the pandemic.

The existence of *Slack* increases the chances to spend on NPV-projects which can lead to agency costs for firms (De Jong and Veld, 2001). It could therefore be a reason for firms to issue convertible debt instead of equity. *Slack* is measured as cash and short-term investments over total assets. Also, the variable tells something about the financial state a company is in. If firms have relatively large amounts of cash and cash equivalents, they are probably better

able to cope with changes in macroeconomic conditions. It is therefore also a good measure of financial distress.

The profitability of a firm is also an indicator of the financial performance of a firm. Just as in Lewis, Rogalski and Seward (1999), *Cash flow* is used as a measure for the profitability of a firm. Firms with low probability ratios are more likely to face higher costs of financial distress. The variable is calculated by dividing the cash flow of a firm by its total assets.

Another variable which could be helpful to explain the rationales behind issuing convertible bonds is *Dividends*. Firms that can pay a lot of dividends are likely to be mature firms with stable profits over the years. *Dividends* is therefore another proxy for the financial stability of a firm. Firms that pay out most of their profits to shareholders are also less likely to have conflicts with their shareholders because excess profits are returned to shareholders. *Dividends* is calculated by dividing the total dividends by total assets.

Firm size is another variable that could be helpful to determine the likelihood of a convertible bond issue. Larger firms typically have lower costs of financial distress and are also more likely to have less asymmetric information on the value and risk of a firm (Dutordoir et al., 2016). *Firm size* is calculated by taking the logarithm of total assets.

The amount of debt firms have could also be a good proxy for the costs of financial distress of a firm. The higher the leverage of a firm, the larger the chances are it is in financial distress. *Debt* is calculated by dividing the total debt of a firm by its assets.

One of the advantages of debt is the tax-deductibility of the interest payments resulting from the debt. Therefore, the amount of taxes paid by a firm could influence the choice of financing. According to Duca et al. (2012), firms with lower tax ratios and high leverage face higher costs when attracting new capital. The variable *Tax* is the ratio of taxes paid by total assets. Lewis, Rogalski and Seward (1999) also showed in their study that firms which issue convertible bonds that are debt-like, pay less taxes compared to firms which issue straight debt. However, convertible bond issuers pay relatively more tax compared to firms that issue equity.

A firm's productivity could also give insights into the predicament of a firm and whether it is well run. Therefore, this study measures the productivity of a firm by dividing the total sales by total assets. This ratio will show how efficient the assets of a firm are and the revenue generating power of these assets. It could therefore be a good proxy for the ability of a firm to choose positive NPV-projects. Hence, the variable *Sales* is also considered.

The past stock performance of a firm is a good indicator on whether investors believe a company is in distress or not. Firms which witnessed high stock returns in the period before the issue probably have better investment projects, as highlighted in Lewis, Rogalski and Seward (1999). However, it is also argued that previous high stock returns could indicate firm overvaluation (Lucas and McDonald, 1990). To control for the market-to-book ratio of a firm, the variable *Tobin's Q* is considered. Detailed information on how this variable is calculated can be found in Table 14 in Appendix D.

Knowing that the pandemic drastically changed macroeconomic conditions in the first months of 2020, insights could be obtained by adding some extra distress variables. For the variables *Slack*, *Cash flow* and *Tobin's Q*, dummy variables have been created that equal the value of 1 for the companies that have values that represent the lowest 25th percentile of all the observations in the dataset. The companies that fall in this range score relatively low on these values and were probably in a worser financial state, compared to the other companies, before the pandemic started. Insights can be obtained by observing the impact of these dummy variables on the likelihood of issuing convertible debt during the pandemic.

The firm-specific variables are obtained from Compustat for both the issuing firms and non-issuing firms. Non-issuing firms were identified by all the firms that did not make a convertible bond issue during the pandemic, and for which data was available on Compustat. Companies were not allowed to have SIC codes between 4900-4999 and 6000-6999 and must be U.S. based to be considered.

To control for outliers, all the firm-specific variables are windsorized were the top and bottom 1% of observations are replaced. Still, the variable *Firm size* showed negative values, these observations were deleted from the dataset.

Descriptive statistics for both issuing and non-issuing firms can be found in Appendix A in Table 8 and Table 9. Descriptive statistics on both groups are shown in Table 10 in Appendix A. Table 2 shows the most important descriptive statistics of the two groups and whether the means of these variables differ between the two groups.

Table 2: Descriptive statistics for the firm characteristics of both issuing and non-issuing firms.

Variable definition	Mean issuing firms	Mean non-issuing firms	Diff. in means
Slack	.326	.263	-.062**
Debt	.594	.641	.046
Cash flow	-.050	-.219	-.169***
Sales	.624	.784	.161***
Dividends	.382	2.143	1.761***
Tobin's Q	3.729	2.820	-.909***
Tax	.002	.002	.001

Note. Data is obtained from the fiscal year 2019.

3.3 Announcement returns

An important part of this study is the analysis of the announcement returns of convertible bond issues during the pandemic in 2020. These returns are obtained by performing an event study around the announcement dates of convertible bond issues made by firms during the pandemic.

To perform an event study, the announcement dates for the convertible bonds issued during the pandemic had to be retrieved by hand as Mergent FISD did not provide these dates. Most announcement dates were found from either the website of a firm or newspapers which made the announcement public. For some firms it was impossible to find an announcement date, possibly because the corresponding bond was issued privately and therefore the firm did not have to make an announcement. These firms are not considered for the event study analysis. In some cases, not only a convertible bond issue was announced, but also an equity issue. These announcements were also not considered as they do not provide a pure effect of the reaction to the convertible bond announcement. Daily stock price data is retrieved from the Centre for Research in Security Prices.

Furthermore, certain firm-specific variables are possibly able to explain the results from the event study on the convertible bond announcements. Just as in the logit regression, the variable *Firm size* is considered for the regression on the convertible bond announcement effects. Dutordoir et al. (2016) found *Firm size* to have a positive effect on the announcement returns of issuing firms.

The amount of debt a firm already had before issuing a convertible bond might also play a role when explaining the announcement returns. Firms with relatively large amount of

debt have, as predicted earlier, more chances to be in financial distress and could therefore face higher costs of financing. The variable *Debt* is also in the regression included, where it is to be expected, just as in Dutordoir et al. (2016), to have a negative influence on the announcement returns.

Firms with high market-to-book ratios are more likely to have positive future investment projects which lowers financing costs that are equity related (Viswanath, 1993). On the other hand, investors might worry that firms with high market-to-book values are overvalued. To control for these effects, two variables are considered. First, just as in the logit regression, *Tobin's Q* is used as a proxy for the market-to-book ratio of a firm.

Stock performance is also used. This variable shows the stock price return of issuing firms in the year 2019. *Stock performance* is calculated by annualizing the monthly returns of firms during 2019. The stock prices in the first months of 2020 are not considered as the market witnessed a large crash in February 2020 due to growing uncertainties about the COVID-19 virus. As higher stock market returns and market-to-book ratios might show positive future growth projects but also possible overvaluation, it is unclear what the effects of the variables will have on the announcement returns.

High amounts of *Slack*, as explained earlier, could indicate that firms are more likely to spend excess cash on negative NPV-projects. As this could possibly lead to problems between the management of a firm and its shareholders, the variable will also be used in the regression. As these agency problems could be a cause of concern for investors, it is expected that high amounts of slack will have a negative influence on the convertible bond issues during the crisis in 2020.

In line with what is explained earlier, low tax ratios and high amount of leverage are associated with higher financing costs in the finance literature. Therefore, the variable *Tax* is expected to have a positive effect on the announcement returns of convertible bonds.

Next to these firm-specific variables, issue-specific characteristics might be able to explain the abnormal returns of firms issuing convertible bonds during the pandemic. The maturity of the bond is included as firms have incentives to include longer maturities if they expect their stock to grow in the future and therefore postpone the conversion (Datta et al., 2000). *Maturity* is measured as the difference between the maturity date and the issue date of a convertible bond.

The issue size, on the contrary, is expected to have a negative influence on the stock market reaction of a convertible bond issue. De Jong, Dutordoir and Verwijmeren (2011) found more short selling activity around the issue of large size convertible bond issues.

Furthermore, from an equity standpoint, larger offerings tend to be seen as a signal of overvaluation (Krasker, 1986). To control for these larger offerings, the variable *Offering amount* is considered, where the offering amount of the bond is divided by the total assets of the issuing firm.

The last issue-related variable considered is *Conversion premium*. Duca et al. (2012) expect convertible bonds that are designed in an equity-like way to be associated with more negative announcement returns. A larger conversion premium makes it less likely for the investor to convert the bond into shares, which is why a larger conversion premium makes the bond less equity-like. *Conversion premium* is calculated relative to the total assets of a firm.

In 2020, 154 convertible bonds have been issued. From these, 132 were issued after February 2020, the period that can be considered as the start of the COVID-19 crisis. For 84 issuances it was possible to retrieve announcement dates and stock price data. Table 3 will show the descriptive statistics for the variables described for the issuing firms for which this study was able to retrieve announcement dates based on the information available on the internet.

Table 3: Descriptive statistics for the firm characteristics of firms that made a convertible bond announcement.

Variable	N	Mean	Std.Dev.	Min	Max
Slack	84	0.31	0.25	0	0.86
Cash Flow	83	-0.02	0.17	-1.01	0.25
Firm Size	84	7.30	1.27	4.91	10.41
Debt	84	0.53	0.24	0.71	1.32
Stock performance	70	0.54	0.89	-0.70	4.80
Tobin's Q	82	3.94	3.01	0.60	18.24
Tax	83	0.0	0.00	0	0.04
Offering amount	84	0.37	0.32	0.02	1.66
Maturity	84	5.46	0.84	3.01	7.05
Conversion premium	84	30.71	43.56	-98.93	272.05

4. Methodology

In this chapter the methods are explained that are used in this study. The first part of the analysis will observe the level of convertible bond issuances over the years. A logit regression will show the influence of some important firm-specific variables on the likelihood to issue a convertible bond. An event study is used for the third part of the research to obtain the reaction of investors to the issuance of convertible debt during the pandemic.

4.1 Level of issuances

To analyse Hypothesis 1, it needs to be observed how convertible bond issuances have advanced over the years. The analysis will start by observing the amount of convertible bond issues every year, starting in 2005 and ending in 2021. Not only the number of issues will be considered, but also the offering amount, conversion premium and maturity of the bonds issued.

4.2 Logit regression

To determine what type of companies issued a convertible bond during the COVID-19 crisis, a logit regression can show meaningful insights. With a logit regression, it can be shown what the effects of certain firm-specific characteristics are on the likelihood of a convertible bond issue during the pandemic. In specific, the variables described in Chapter 3.2 will be used in this regression. These variables will help to answer what type of firm characteristics makes a firm more likely to issue a convertible bond. A logistic regression is characterized by the ability of the dependent variable to take on a binary variable (either 0 or 1). The methodology used for this regression is based on Brooks (2019). The logistic function will look as follows:

$$F(z_i) = \frac{e^{z_i}}{1+e^{z_i}} = \frac{1}{1+e^{-z_i}} \quad (1)$$

In the model above, e represents the exponential used in the logit approach. z_i represents any random variable. It results into the following logistic model that is used in this study:

$$P(y_{i,t}) = \frac{1}{1+ e^{-(y_{i,t})}} \quad (2)$$

Where $y_{i,t}$ is the function with all the independent variables used in the model as shown by Equation 3.

$$y_{i,t} = \alpha + \beta_1 x_{1,i,t} + \cdots + \beta_k x_{k,i,t} + \mu_{i,t} \quad (3)$$

The logistic model yields results that fall in between the range of 0 and 1 and will never be exactly zero or one because they are asymptotes to the function. This study wants to test whether certain factors will have any influence on the likelihood of companies issuing convertible debt. *Slack*, *Cash flow*, *Dividends*, *Firm size*, *Debt*, *Sales,* and *Tobin's Q* will be used as variables in the function. Furthermore, the regression will be controlled for robust standard errors. Equation 4 will show how this will look like.

$$y_{i,t} = \alpha + \beta_1 Slack_{i,t} + \beta_2 Cash\ flow_{i,t} + \beta_3 Dividends_{i,t} + \beta_4 Firm\ size_{i,t} + \beta_5 Debt_{i,t} + \beta_6 Sales_{i,t} + \beta_7 Tobin's\ Q_{i,t} + \mu_{i,t} \quad (4)$$

As previously mentioned, a second logit regression will also be considered where three dummy variables are added. For each of the variables *Slack*, *Cash flow* and *Tobin's Q*, a dummy variable will be added which equals the value of 1 if the observation is within the 25th lowest percentile of all the observations of that variable. These variables try to highlight the effects of financial distress on whether a firm issues a convertible bond or not. Equation 5 shows the second logit regression. This regression will also be controlled for robust standard errors.

$$y_{i,t} = \alpha + \beta_1 Slack_{i,t} + \beta_2 Cash\ flow_{i,t} + \beta_3 Dividends_{i,t} + \beta_4 Firm\ size_{i,t} + \beta_5 Debt_{i,t} + \beta_6 Sales_{i,t} + \beta_7 Tobin's\ Q_{i,t} + \beta_8 Slack\ dummy_{i,t} + \beta_9 Cash\ flow\ dummy_{i,t} + \beta_{10} Tobin's\ Q\ dummy_{i,t} + \mu_{i,t} \quad (5)$$

4.3 Event study

An event study will also be used in the analysis of this study. With the use of an event study, it can be determined how the stock market reacts to convertible bond announcements. Based on the difference between the stock market returns calculated during an event window, compared to the expected returns derived from the period during the estimation window, one can make inferences about the reaction of investors on the announcement made by a firm. This study will make use of the event study methodology as presented by Brooks (2019) for all firms that issued convertible bonds in 2020, starting in March 2020. In this context, the differences between the actual stock prices during the event window compared to the expected stock prices are defined as abnormal returns. Equation 6 will show the exact formula.

$$AR_{it} = R_{it} - E(R_{it}) \quad (6)$$

$ARit$ represents the abnormal return for firm i at time t, R_{it} shows the actual return for firm i at time t and $E(\mathrm{R_{it}})$ as the expected return for firm i at time t. The expected returns are calculated by a markets model as shown in Equation 7.

$$r_{it} = \alpha_i + B_i\, r_{m,t} + \epsilon_{it} \quad (7)$$

$\mathrm{r_{it}}$ represents the expected return for firm i at time t which can be calculated by taking the α of firm i and adding the multiplication of the β of firm i with the return on the market at time t.

An event study also requires an event window during which the abnormal returns of the firm are calculated around the days that the firm announced a convertible bond issuance. It means that both the day before and after the announcement are considered together with the announcement date itself. Furthermore, to complete the event study, an estimation window is needed. An estimation window is the time before the announcement and should represent the normal returns that the firm made in the past (i.e., it shows how the firm performed without investors knowing of the announcement). Therefore, an estimation window should not be too close to the announcement date, but also needs to represent some form of actuality. The estimation window in this study is measured in trading days. The estimation window (-240, -

40) is used and a minimum of 30 non-missing returns are required which is both in line with Dutordoir et al. (2023). This study uses the market returns that are value-weighted by CRSP to estimate the market return. With the abnormal returns calculated from the event window, cumulative abnormal returns (CARs) can be calculated. These are in essence the over- or underperformance of a company during the event window. The formula for the CARs as used in this study will be shown by Equation 8.

$$CAR(T_1, T_2) = \sum_{T=T1}^{T2} AR_{it} \quad (8)$$

T_1 is the period during the event window and T_2 is the estimation window period. Equation 9 will show what the CARs will look like for *N* sample firms.

$$CAR(T_1, T_2) = \frac{1}{N} \sum_{i=1}^{N} CAR_i(T_1, T_2) \quad (9)$$

The formula shown in Equation 9 shows the average effect that convertible bond announcement returns have on our sample of firms. To be able to test whether the outcome of Equation 9 will hold, a t-statistic will be used that follows a standard normal distribution. The outcome will be statistically significant when the statistic can be rejected which implies that the announcement of a convertible bond will have a statistical effect. The t-statistic is determined as follows.

$$SCAR(T_1, T_2) = \frac{CAR((T_1, T_2))}{\left[\sigma i^2 \left(CAR((T_1, T_2))\right)\right]^{\frac{1}{2}}} \sim (0,1) \quad (10)$$

4.4 Linear regression

The last part of the analysis performed by this study makes use of a standard ordinary least squares (OLS) regression to determine what the effects of company characteristics are on the CARs of issuing firms during the pandemic. The CARs are calculated with an event window of 3 days. This means that the regression will looks as follows:

$$CAR_{[-1,1]} = \alpha_0 + \beta_1 \chi_{it} + \varepsilon_{it} \quad (11)$$

The variable $\mathrm{CAR}_{[-1,1]}$ represents the average abnormal return of a convertible bond issue during the COVID-19 crisis. The dependent variable will be explained by the constant α_0, the explanatory variables $\beta_1 \chi_{\mathrm{it}}$ and the error term $\varepsilon_{\mathrm{it}}$. The following firm characteristics will serve as explanatory variables: *Firm size, Debt*, *Stock performance*, *Slack*, *Tax*, *Tobin's Q*, *Offering amount*, *Maturity* and *Conversion premium*. Furthermore, the regression will be controlled for robust standard errors. The regression will look as follows:

$$CAR_{[-1,1]} = \alpha + \beta_1 Firm\ size_{it} + \beta_2 Debt_{it} + \beta_3 Stock\ performance_{it} + \beta_4 Slack_{it} + \beta_5 Tax_{it} + \beta_6 Tobin's\ Q_{it} + \beta_7 Offering\ amount_{it} + \beta_8 Maturity_{it} + \beta_7 Conversion\ premium_{it} + \varepsilon_{it} \quad (12)$$

5. Results

This chapter shows the results of the various analyses made by this study. It is first shown what the level of convertible bond issues has been over time and during the COVID-19 crisis in 2020. Furthermore, a logit regression gives insight into the effects of certain firm-specific characteristics on the likelihood of issuing convertible debt. The chapter ends with the results of the cumulative abnormal returns of the convertible bond announcements made by firms during the pandemic.

5.1 Issues over the years

The first hypothesis, as shown in Chapter 2, stated that the issuances of convertible bonds was higher in 2020 than the years before and that these issues had higher offering amounts. Based on the results in Figure 1 it becomes clear that the issuance of convertible bonds reached high levels in 2007 after which they collapsed in the years after. Exact numbers can be found in Table 11 in Appendix B. The number of issuances started to increase steadily from 2018 reaching to 154 issuances during 2020. Although the number of issuances in 2020 was not as high as in 2007, it is still the highest in recent years.

The increase in normal bonds is also notable to remark. Table 12 in Appendix B shows detailed information regarding the issuance of normal bonds over the sample period. It appears that both the convertible as the normal bonds show similar trends with respect to the number of issues over the sample period. As mentioned in the introduction, the popularity of convertible bonds could be explained by the accessibility of convertible bond markets compared to normal bond and equity markets. The question can be answered by comparing the monthly bond issues in 2020 for both convertible and non-convertible bonds. See Table 13 in Appendix B for the results of this comparison. From this figure, no clear drop or increase in either convertible or non-convertible bonds can be seen that could explain that convertible bond markets remained open during 2020 whereas normal bond markets closed. In fact, during March 2020, the normal bond market increased compared to the level of issuances in the first two months of 2020.

Figure 1: Convertible bond and normal bond issues over the sample period.

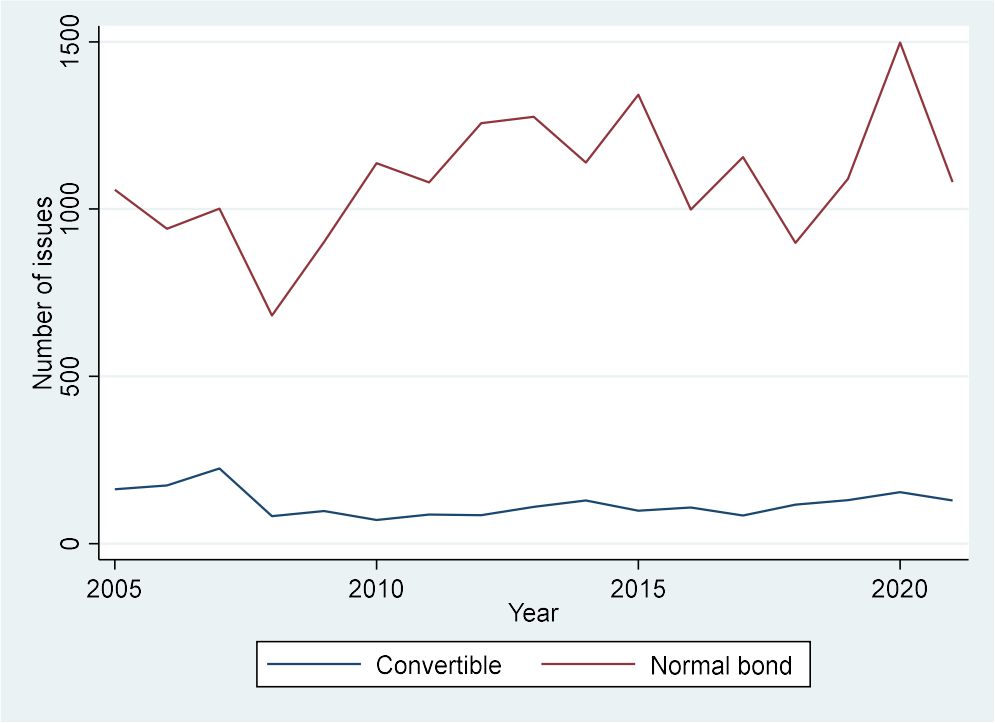
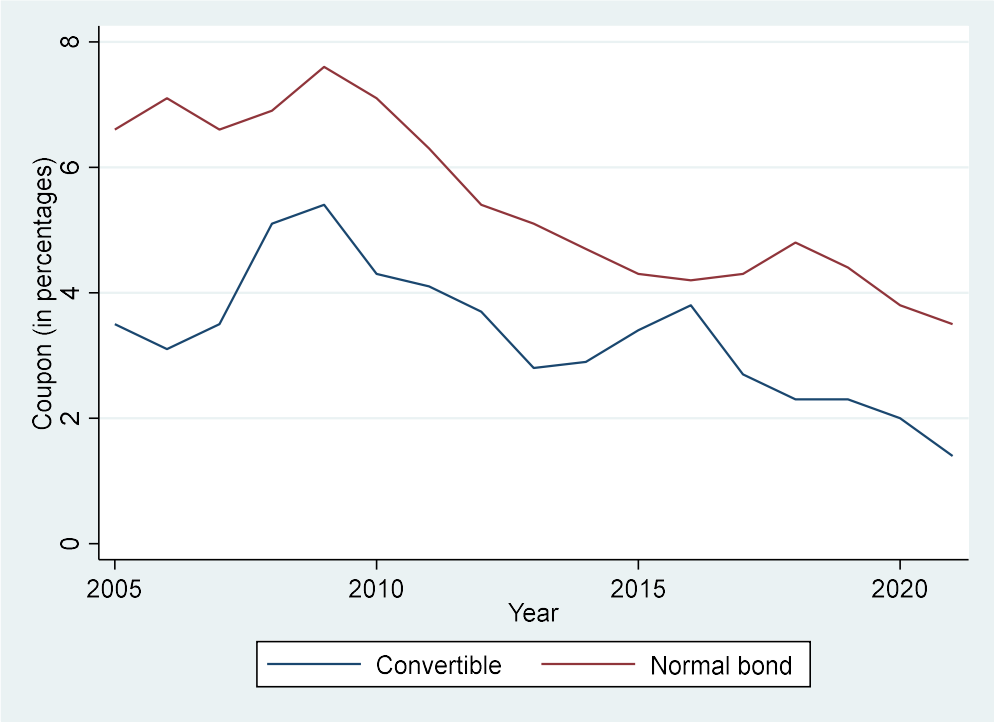


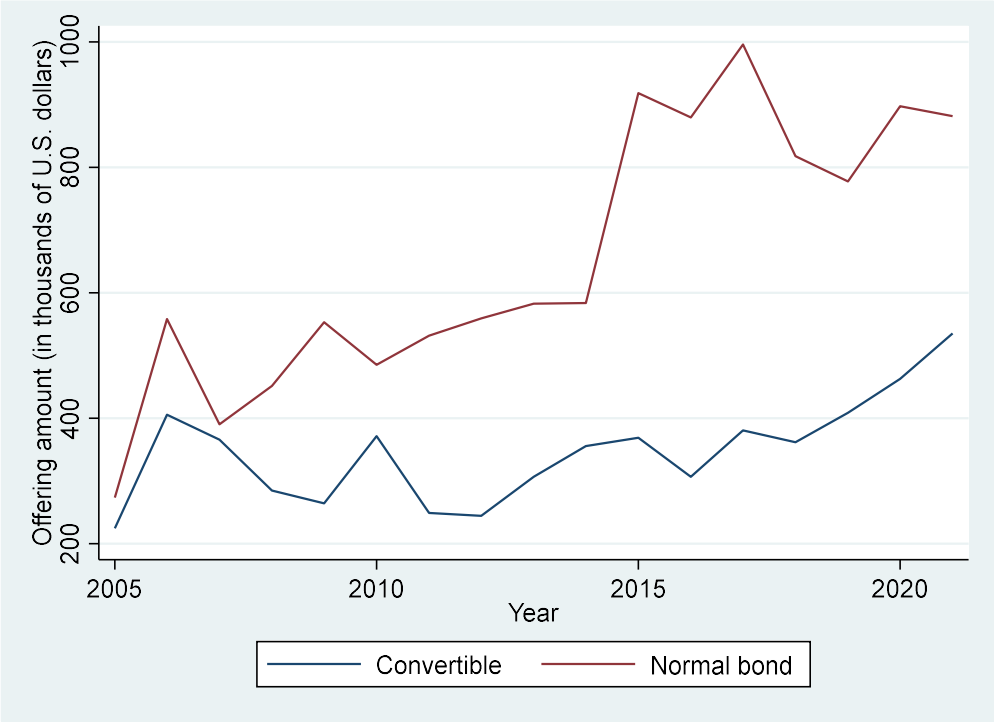
Figure 2 shows that the coupon rates of convertible bonds differ over time with higher levels around the years 2008-2009 that drop to lower rates in the years 2018-2021 with a coupon rate of 2% in 2020. The coupon rate for a normal bond would be close to 8% in 2010, whereas this was below 4% in 2020. The convertible and normal bond markets therefore show similar trends regarding the coupon rates. It is not odd to observe these lower levels of coupon rates. Central bankers have lowered interest rates in the years after the Financial Crisis in 2008 which has set new standards for markets. Figure 4 in Appendix C shows the Federal Funds Effective Rate over the sample years of this study.

Figure 2: Coupon rates for convertible and normal bonds over the sample period.



Next to the number of issuances and the accompanying coupon rates, this study also observed what the average offering amounts of convertible and normal bonds were over the sample period of this study. From Figure 3 it can be observed that average offering amount for convertible debt has fluctuated over the years with a rapid increase from 2019 onwards. The average offering amount of a convertible bond was 462.9 million dollars in 2020. Normal bonds have also seen an increase in offering amounts over the sample period but witnessed significant offering amounts from 2015 onwards.

Figure 3: Offering amount of convertible and normal bonds over the sample period.



It is reasonable to assume that the number of convertible bond issues has fluctuated over the sample period but reached higher levels during the pandemic whereas the offering amounts increased to very high levels during 2020 and 2021. The first hypothesis can therefore be confirmed based on these results. However, not only convertible debt experienced a rapid increase, but normal bonds also gained in popularity over the years and especially in 2020.

5.2 The likelihood of issuing convertible bonds

To answer Hypothesis 2, it is examined whether firm-specific characteristics influence the issuance of a convertible bond during the COVID-19 crisis. This study constructed a logistic regression where certain firm characteristics are regressed on the likelihood of a convertible bond issue during the pandemic. Table 4 shows the results from the logit regression. If the dependent value equals one for a convertible bond issue, positive regression coefficients increase the probability of a convertible bond issue by a firm during the pandemic. Whereas more negative values decrease the probability of a convertible bond issue. The first regression shows what the effects of firm-specific characteristics are on the likelihood of a convertible

bond issue, whereas the second regression adds three dummy variables that represents the firms that are in the 25th lowest percentile of all the observations of the variable chosen and are more likely to be in distress during the pandemic.

Table 4: Logistic regressions of firm-specific variables on the likelihood of issuing a convertible bond during 2020.

Variables	**(1)**	**(2)**
Slack	2.110***	1.985***
	(0.40)	(0.46)
Cash flow	0.880***	0.013
	(0.35)	(0.26)
Dividends	-0.291**	-0.285**
	(0.09)	(0.09)
Firm size	0.508***	0.486***
	(0.05)	(0.05)
Debt	0.618**	0.562**
	(0.19)	(0.20)
Sales	-0.219	-0.277
	(0.17)	(0.19)
Tobin's Q	0.113***	0.086**
	(0.02)	(0.03)
Tax	-19.805***	-20.471***
	(4.30)	(4.35)
Slack dummy		-0.629
		(0.33)
Cash flow dummy		-1.300**
		(0.48)
Tobin's Q dummy		-0.434
		(0.30)
Constant	-7.406***	-6.753***
	(0.52)	(0.58)
Observations	3,141	3,141
Pseudo R-squared	0.1497	0.1655
Robust standard errors in parentheses		
*** p<0.01, ** p< 0.05, * p< 0.1		

In Regression (1) it is shown that firms are more likely to issue convertible debt when they already had high amounts of *Slack*. This is in line with what is expected based on the theories described in the literature. Firms with high amounts of *Slack* typically have higher chances of agency costs and might therefore choose for convertible bonds instead of common equity. Furthermore, it also shows that these firms have relatively more cash and cash equivalents which makes the chances of financial distress lower for these firms. Note that this variable is highly significant in both regressions.

Cash flow has also a positive influence on the likelihood of issuing convertible debt based on the results of the first regression. The variable is significant in the first regression but not anymore in the second regression and has a lower influence on the dependent variable in Regression (2) compared to the *Cash flow* coefficient in Regression (1). A company's *Cash flow* is a good proxy for the profitability of a firm. Firms with higher profits are less likely to be in financial distress and therefore face lower costs associated with these forms of distress.

It was already mentioned that *Dividends* could also help answering the question whether a firm is in distress or not because firms that pay high dividends are usually mature and stable firms. As can be seen from both regressions, *Dividends* decreases the probability of a convertible bond issue. Again, in both regressions the variable is significant. Firms that pay high dividends also show that they want to redistribute their profits to shareholders. This would be perceived as a positive signal by shareholders and could therefore mitigate possible conflicts between management and shareholders. This would explain why firms that pay many *Dividends* are less inclined to issue convertible debt.

Larger firms are more likely to issue convertible bonds based on the results, as *Firm size* is positive and significant in both regressions. It was written in the literature that larger firms were less likely to be in financial distress or have information asymmetries. The literature on convertible bond financing gives asymmetric information as one of the reasons for firms to issue convertible debt. The coefficient of *Firm size* is difficult to explain based on this theory.

Debt has a positive and significant influence on the issuance of convertible bonds during the pandemic in 2020 based on the regression coefficients of the variable. It shows that firms which already had proportionally more debt, were more inclined to issue convertible debt during the crisis. *Debt* can also be a proxy for financial distress. It therefore shows that, unlike many of the other financial distress variables, firms which have higher chances of being in financial distress were more likely to issue convertible bonds.

More productive firms were less likely to issue convertible debt during the pandemic. Productivity is measured with the variable *Sales* which has a negative influence on the dependent variable. Note that the coefficients are, unlike many other variables in both regressions, not significant. The more productive a firm is with its assets, the less likely it is to be in financial distress. Also, one could see this productivity measure as a signal that the management of these firms is better able in choosing positive NPV-projects. It would imply that these firms do not have an over-investment problem and are therefore less likely to issue convertible debt.

Tobin's Q has in both regressions a positive and significant impact. Higher market-to-book ratios show that a firm has more positive future projects. However, firms with higher Tobin's Q ratios are also more likely to be perceived as overvalued by investors. An equity issue could be unattractive for these overvalued firms as investors do not want to buy shares at current market prices. Furthermore, sentiments around the equity market were negative because of the macroeconomic uncertainties that were brought along by the pandemic. This would therefore be evidence for the equity-backdoor theory.

Tax has a very negative effect on the likelihood of a convertible bond issue and the coefficients are also significant. As explained earlier, firms with low tax ratios and high leverage face more difficulties when attracting new capital. It shows that firms do not consider convertible debt because of tax benefits. Lewis, Rogalski and Seward (1999) also showed in their study that firms which issue convertible bonds that are debt-like, pay less taxes compared to firms which issue straight debt.

In Regression (2), three dummy variables are added that try to specifically capture the effects of financial distress on the issuance of convertible bonds. The *Slack dummy* has a negative effect, and the coefficient is also not significant. Whereas *Slack* in general has a positive influence on the likelihood of issuing convertible debt, the firms with the lowest amounts of *Slack* were less likely to finance themselves with convertible bonds.

The *Cash flow dummy* has an even more negative effect compared to the *Slack dummy*. Furthermore, the coefficient is also significant. Whereas *Slack* did not change when the *Slack dummy* was included, the opposite is true for *Cash flow*. Although still positive, it is not significant anymore and its impact on the dependent variable decreased. Based on the results, the lowest scoring firms on profitability were less likely to issue convertible bonds and therefore show evidence that distressed firms did not issue convertible debt.

As for the *Tobin's Q dummy*, the variable has a negative influence on the convertible bond issuances during the pandemic, but the coefficient is not significant. The coefficient of

Tobin's Q became a bit lower with the inclusion of the dummy variable but still has impact and is significant. The results show furthermore that firms with the lowest market-to-book ratios were less likely to make a convertible bond issuance. Furthermore, it also gives more evidence for the backdoor-equity theory.

As stated in Chapter 2, the second hypothesis implied that firms which were less likely to be in financial distress and found an equity issue unattractive, were more likely to use convertible debt financing during 2020. The logit regression results show evidence for this hypothesis as firms issuing convertible debt were less likely to be in financial distress based on most of the financial distress variables shown in our model. It also seems that firms with high market-to-book ratios were more likely to issue a convertible bond. Given that there was a negative sentiment around equity markets, this would imply evidence for convertible debt to be an alternative to common equity and therefore confirming the equity-backdoor theory by Stein (1992). Furthermore, the variable *Firm size* gives more insights into whether adverse selection could costs could be a motive to issue a convertible bond, as larger firms typically have lower costs of asymmetry information. However, it is found in the regression that larger firms were more likely to issue convertible debt. Hence, the recent popularity of convertible debt cannot be explained by Brennan and Kraus (1987) and Brennan and Schwartz (1988).

5.3 Announcement returns during the COVID-19 crisis

Convertible bond announcement returns by U.S. firms have always been very negative as shown in the literature. This study also observed the CARs of the firms that made a convertible bond issue during the pandemic. As described earlier, an estimation window of [-240, -40] is used with the appropriate event window of [-1, 1]. It was possible to perform an event study for 84 companies identified out of the list of 85 companies for which the announcement date was known. The mean CAR found at day 1 is -5.60%. The development is interesting because at day -1 the mean CAR is still 0.82%, whereas it is at day 0 already -4.47%. This could indicate that there is no information leakage around a convertible bond announcement. Furthermore, it can be concluded that this indicates that the negative market reaction is attributable to the convertible bond announcement made by the issuing firm. The event study was focused on the companies for which this study was able to retrieve a public announcement of the issue. Possible reasons for no announcement date could be that the issue was held privately and was disclosed after the issue.

As the event study focuses only on 84 firms, more insights could be obtained by including the firms for which it was not possible to obtain announcement dates. For these firms the issue dates are used to observe the market reaction. The resulting mean CAR for all the firms that made a convertible bond issue during the pandemic equalled -4.01%. Again, on day -1 the CAR is positive with a value of 0.72% whereas the CAR on day 0 is -3.35%. Still, the market reaction towards the issuance of convertible bonds during the pandemic is negative. However, it does become less negative by including the firms that did not make an announcement. It is likely that the market was unaware of a possible bond issue by these firms because there was no announcement made.

Because 2020 was a turbulent year with respect to stock markets, different estimation and event windows might yield other results. Table 5 shows the results of the event study with different estimation and event windows for the companies for which an announcement date was found. It is surprising to observe that the results do not change at all when choosing different estimation or event windows.

Table 5: Mean cumulative abnormal returns for different event and estimation windows.

	Event window	
Estimation window	*(-1,1)*	*(-3,3)*
(-240, -40)	-5.60	-2.62
(-180, -10)	-5.60	-2.62
(-110, -10)	-5.60	-2.62

Note. Mean CARs are denoted in percentages.

As written in Chapter 2, most studies find negative announcement returns around the issuance of convertible bonds. It is remarkable that the CARs observed in this study are far more negative compared to what is usually found in the literature. For example, Dann and Mikkelson (1984) found announcement returns of -2.31% for U.S. firms. However, the results shown in this study are not the first to observe the substantial negative announcement returns during the pandemic; Dutordoir et al. (2023) documented -6.06%. The substantial decrease could be explained by the findings of Duca et al. (2012) who observed decreasing announcement returns of convertible bonds over the past years. In their study they also find lower announcement returns for convertible bonds during the Financial Crisis where they

argue that a combination of short-selling price pressure and macroeconomic conditions might cause these decreasing returns. This could also explain the announcement returns observed during the pandemic.

Based on the results from the event studies it can be concluded that the market reaction has been very negative towards convertible bond issues during 2020. Hypothesis 3 stated that the announcement returns for firms that issued convertible bonds in 2020 were negative in the U.S. This hypothesis is confirmed based on the results of the event study.

5.3.1 What explains the negative CARs?

It was no surprise to find that the market reaction to the announcements of the convertible bond issues in 2020 was negative. As explained in the literature, many studies find negative abnormal announcement returns around convertible bond announcements. Furthermore, a trend has been ongoing in the past years where issuer CARs are becoming more negative. But just as many other studies on convertible bond announcements, more insights could be obtained on what might influence these returns by regressing several firm-specific characteristics on the CARs found in this study.

Table 6 shows the results of the two regressions made by this study. The first regression shows the effect of issuer-specific characteristics on the returns around the announcement dates of a convertible bond issue during the pandemic in 2020. Regression (2) also adds some issue-specific variables to the firm-specific variables as shown in Regression (1).

Table 6: The effect of firm-specific characteristics on CARs for firms issuing convertible bonds 2020.

Variables	(1)	(2)
Firm size	0.025*	0.019
	(0.01)	(0.01)
Debt	0.051	0.059
	(0.03)	(0.04)
Stock performance	0.015	0.013
	(0.02)	(0.2)
Slack	0.019	0.013
	(0.06)	(0.07)
Tax	-0.934*	-1.050**
	(0.39)	(0.38)
Tobin's Q	0.009*	0.010*
	(0.00)	(0.00)
Offering amount		-0.043
		(0.05)
Maturity		-0.002
		(0.01)
Conversion premium		0.000
		(0.00)
Constant	-0.311***	-0.258*
	(0.08)	(0.11)
Observations	70	70
R-squared	0.1980	0.2370
Robust standard errors in parentheses		
*** p<0.01, ** p< 0.05, * p< 0.1		

Note. Regression is based on the cumulative abnormal returns of firms issuing convertible debt in 2020, from March until December.

Firm size has a positive effect on the cumulative abnormal returns of a convertible bond announcement. In the first regression, the coefficient is still significant, however this is not the case in the second regression. The results differ to Lewis, Rogalski and Seward (1999) who found total assets to have a negative, but almost close to zero, effect on convertible bond announcement returns. Dutordoir et al. (2016) also found that the size of a firm has a negative influence on announcement returns of convertible bonds.

Debt has a positive coefficient in both regressions but is in both not significant. Lewis, Rogalski and Seward (1999) also found debt to have a positive influence on the abnormal returns of convertible bond announcements. Whereas the more recent study by Dutordoir et al. (2023) found that leverage had a negative impact on the announcement returns of firms issuing convertible bonds.

Stock performance is in both regressions positive but not significant. It means that if a firm had a strong stock performance in the year preceding the convertible bond announcement, it was more likely to show positive announcement returns. This is interesting because Dutordoir et al. (2023) found that a firm's stock return had a negative effect on the announcement returns. However, this variable was measured differently compared to the one used in this study. Dutordoir et al. (2014) found that a firm's preceding stock run-up had a positive effect on the announcement returns.

The more *Slack* a firm has, the higher the chances are that its convertible bond announcement returns are higher based on the findings in Table 6. Both regression coefficients are positive, but again, not significant. Lewis, Rogalski and Seward (1999) also found cash and liquid assets to have a positive impact.

Tax has a strong negative effect on the announcement returns of companies issuing convertible debt during the pandemic as can be seen by the negative coefficients which are also significant. This finding differs to the studies of Lewis, Rogalski and Seward (1999) and Dutordoir et al. (2023) who both found the variable to have a positive effect on announcement returns. However, Duca et al. (2012) did find negative tax coefficients in many of their regressions.

Furthermore, high market-to-book ratios also have a positive influence on the CARs of issuing firms. *Tobin's Q* shows for both regressions positive and significant coefficients. Lewis, Rogalski and Seward (1999) and Duca et al. (2012) also found positive values for the market-to-book ratio.

Next to these firm-specific variables, Regression (2) adds issue-related characteristics to capture the influence of the convertible bond design on the announcement returns. The variable *Offering amount* is negative and the coefficient is not significant in the regression. It means that the larger the issue, the more negative the announcement returns are. This is in line with Dutordoir et al. (2023) that also find issue size to have a negative effect on the announcement returns. This also found by Lewis, Rogalski and Seward (1999).

Maturity is found to have a negative effect on the announcement returns of convertible bonds issued during the pandemic. The variable is, like many others, not

significant. The results are in line with Duca et al. (2012) and Dutordoir et al. (2014). However, the study of Dutordoir et al. (2023), which is more recent, found maturity to have a positive effect on the announcement returns.

Although *Conversion premium* is positive, the coefficient is almost close to zero. Furthermore, the variable is also not significant. It means that the conversion premium has a positive, but almost negligible, effect on the announcement returns of a firm. Dutordoir et al. (2023) also found the conversion premium of a bond to have a positive effect on the announcement returns of firms which issued convertible bonds.

The results from the regression give more insights into what explained the negative announcement returns of firms during the COVID-19 pandemic. Only *Tax*, *Offering amount* and *Maturity* have a negative effect on the announcement returns of firms issuing convertible bonds during the pandemic in 2020. However, only the *Tax* is significant, and the variables differ in magnitude. All the other variables in the regression have a positive impact on the announcement returns but many of them are not significant. It means there still might be other factors that influence the announcement returns of firms.

6. Conclusion

This research contributed to the literature on convertible bonds by observing the level of convertible bond issues during 2020, and in specific, the months during which the COVID-19 crisis broke out. Furthermore, it is highlighted what firm-specific characteristics increased the likelihood of a convertible bond issue during the pandemic. This study also observed the convertible bond announcement returns during the crises in 2020.

The level of convertible bond issues over the years 2005-2022 showed that it could be concluded that the market for convertible bonds had collapsed after the Financial Crisis in 2008 but recovered in the years 2018-2021. The average amounts these issues offered grew larger over time. On the other hand, the coupon rate decreased which is in line with the lower interest rates on the market as shown by the levels of the Federal Funds rate. The issuances of straight bonds showed similar results.

A logit regression provided insights into the type of firms that were more likely to issue a convertible bond in 2020 from March onwards. *Slack*, *Cash flow*, *Firm size*, *Debt*, *Tobin's Q* and *Tax* had a positive influence on the likelihood of a convertible bond issue during the pandemic. A firm was less inclined to issue convertible debt if it had high *Dividends*, *Sales*, and was more likely to be in financial distress. Based on these variables it can be concluded that an issue was more likely to be made by a firm that was performing well before the crisis started. It can also be concluded that convertible debt was an attractive alternative to equity in 2020. Firms issuing convertible bonds were more likely to be overvalued before the crisis had started. These firms potentially found a convertible bond issue unattractive due to the negative sentiments in equity market which were caused by the pandemic. This would be in line with the backdoor-equity theory by Stein (1992).

Moreover, by using an event study it was observed what the market reaction has been around firms issuing convertible bonds during the pandemic. The mean CAR equalled -5.60% for the issues made by firms during the COVID-19 crisis in 2020. As expected, and shown by other studies, the mean CAR for convertible bond issues has always been negative. However, the mean CAR found in this study appears to be much more negative compared to these studies but this in line with what is found by Dutordoir et al. (2023). Miescu and Rossi (2021) indicated that COVID-19-induced shocks had a big impact on the stock market, something that could have amplified the negative abnormal returns found in this study. Furthermore, a regression also showed what the influence of firm-specific characteristics has

been on the cumulative announcement returns of firms issuing convertible bonds during the pandemic. Firms had better announcement returns if they were larger, had more debt and slack and if they and had higher previous stock price returns and market-to-book ratios. If firms paid relatively more in taxes, their announcement returns tend to decrease. The offer size and maturity also had a negative influence on the market reactions of convertible debt offerings. Furthermore, it is likely that the increasing negative announcement returns can be explained by Duca et al. (2012).

As explained, the equity-backdoor hypothesis could be one of the explanations of the popularity of convertible debt during the pandemic. No evidence was found for the theories of Brennan and Kraus (1987) and Brennan and Schwartz (1988). The results found in this study differ to Dutordoir et al. (2023) who could not find any links between corporate finance theory and the popularity of convertible bonds during the pandemic. It is also likely that convertible bonds were popular because of a general need for liquidity during the pandemic. This is also seen from the increase in straight debt offerings found by this study and the recent popularity of equity offerings as shown by Dutordoir et al. (2023).

This study comes with some limitations. The logit regression that tried to explain the likelihood of issuing convertible bonds had far more non-issuing firms than issuing firms, this might influence the outcome of the regression. More insights on the likelihood of issuing convertible debt could be obtained by comparing convertible bond issuing firms with firms that issued straight debt and firms that issued common equity. Also, the number of observations in the event study is quite low and some outliers could therefore influence the outcome of the study. Avenues for further research could be on whether corporate finance theories are still applicable on convertible bond offerings during the pandemic.

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Appendix A: Descriptive statistics

Table 7: Descriptive statistics for normal bond issues during 2005 and 2022.

Variable	N	Mean	Std.Dev	Min	Max
Number of issuances over the years	18,564	1120	187.93	28	1498
Coupon	18,340	5.32	2.86	0	19
Offering amount	18,564	668.37	252.42	0.00	250000
Maturity	18,447	9.95	8.62	0.14	100.49

Note. Descriptive statistics for normal bond issues between January 2005 and January 2022. Offering amount is in millions of U.S. dollars. Maturity is measured in years.

Table 8: Descriptive statistics for firm characteristics of issuing firms.

Variable	N	Mean	Std.Dev.	Min	Max
Issue	123	1	0	1	1
Slack	123	0.33	0.26	0.00	0.94
Debt	123	0.59	0.27	0.71	1.80
Cash flow	122	-0.05	0.26	-1.14	0.25
Sales	123	0.62	0.43	0	3.09
Dividends	121	0.38	1.27	0	6.98
Firm size	123	7.27	1.32	4.69	11.00
Tobin's Q	121	3.73	2.86	0.60	18.24
Tax	123	0.00	0.02	-0.07	0.05
Slack dummy	123	0.12	0.33	0	1
Cash flow dummy	122	0.10	0.30	0	1
Tobin's Q dummy	121	0.12	0.33	0	1

Note. Data is from the fiscal year 2019 of firms that did not issue a convertible bond during the pandemic.

Table 9: Descriptive statistics for firm characteristics of non-issuing firms.

Variable	N	Mean	Std.Dev.	Min	Max
Issue	3,737	0	0	0	0
Slack	3,516	0.26	0.29	0.00	0.97
Debt	3,520	0.64	0.60	0.03	4.33
Cash flow	3,491	-0.22	0.63	-3.62	0.33
Sales	3,501	0.78	0.71	0	3.34
Dividends	3,087	2.14	8.23	0	63.99
Firm size	3,529	5.85	2.49	-0.40	11.37
Tobin's Q	3,058	2.82	3.26	0.57	22.24
Tax	3,513	0.01	0.02	-0.07	0.07
Slack dummy	3,516	0.25	0.44	0	1
Cash flow dummy	3,491	0.25	0.44	0	1
Tobin's Q dummy	3,058	0.25	0.44	0	1

Note. Data is from the fiscal year 2019 of firms that did not issue a convertible bond during the pandemic.

Table 10: Descriptive statistics for firm characteristics of both issuing and non-issuing firms.

Variable	N	Mean	Std.Dev.	Min	Max
Issue	3,860	0.03	0.18	0	1
Slack	3,639	0.27	0.29	0.00	.98
Debt	3,643	0.64	0.59	0.03	4.33
Cash flow	3,613	-0.21	0.62	-3.62	0.33
Sales	3,624	0.78	0.70	0	3.34
Dividends	3,208	2.08	8.08	0	63.99
Firm size	3,652	5.89	2.47	0.40	11.37
Tobin's Q	3,179	2.85	3.25	0.57	22.24
Tax	3,636	0.01	0.02	-0.07	0.07
Slack dummy	3,639	0.25	0.43	0	1
Cash flow dummy	3,613	0.25	0.43	0	1
Tobin's Q dummy	3,179	0.25	0.43	0	1

Note. Data is from the fiscal year 2019 of firms that both issued and did not issue a convertible bond during the pandemic.

Appendix B: Convertible bond issues

Table 11: Convertible bond issues over the sample period.

Year	Number of issuances	Average offering amount (in millions)	Coupon rate (in percentages)
2005	163	224,5	3.5
2006	174	405,8	3.1
2007	225	366,0	3.5
2008	82	284,6	5.1
2009	98	264,3	5.4
2010	71	371,6	4.3
2011	87	249,0	4.1
2012	85	244,7	3.7
2013	110	306,8	2.8
2014	129	355,5	2.9
2015	99	369,1	3.4
2016	108	306,7	3.8
2017	84	380,4	2.7
2018	117	362,0	2.3
2019	130	408,7	2.3
2020	154	462,9	2.0
2021	129	535,4	1.4
Average	133	354,3	3.2

Table 12: Normal bond issues over the sample period.

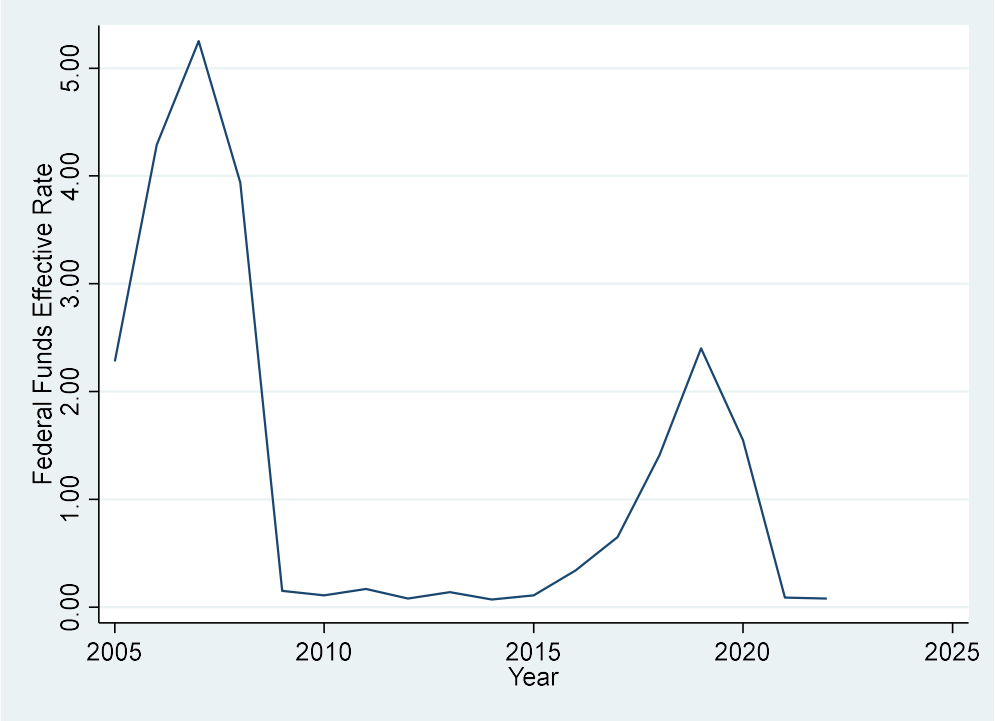
Year	Number of issuances	Average offering amount (in millions)	Coupon rate (In percentages)
2005	1058	273,4	6.6
2006	941	558,0	7.1
2007	1001	390,4	6.6
2008	682	451,4	6.9
2009	902	553,0	7.6
2010	1137	485,1	7.1
2011	1080	531,8	6.3
2012	1257	559,2	5.4
2013	1276	582,6	5.1
2014	1139	583,5	4.7
2015	1342	918,0	4.3
2016	998	879,3	4.2
2017	1155	995,5	4.3
2018	899	817,8	4.8
2019	1090	777,2	4.4
2020	1498	897,5	3.8
2021	1081	881,5	3.5
Average	1120	668,4	5,3

Table 13: Convertible bond and normal bond issues during 2020.

Months	Convertible	Normal bond
January	3	73
February	19	79
March	9	191
April	20	204
May	31	186
June	15	182
July	4	73
August	22	160
September	16	116
October	1	86
November	4	100
December	10	48

Appendix C: The development of the Federal Funds rate

Figure 4: The Federal Funds Effective Rate over the years 2005-2022.



Appendix D: Variable specification

Table 14: Variable specification if calculation was needed.

Variable	Formula	Data source
Slack	Cash and Short-Term Investments/ Assets Total	Compustat
Profitability	Income Before (Extraordinary Items (Cash Flow) + Depreciation and Amortization)/ Assets Total	Compustat
Dividends	Dividends Total/ Assets Total	Compustat
Firm size	Log (Assets Total)	Compustat
Debt	Total Liabilities/ Assets Total	Compustat
Tax	Income Taxes Total/ Assets Total	
Sales	Sales Turnover Net/ Assets Total	Compustat
Tobin's Q	(Assets Total + (Common Shares Outstanding * Price Close Annual Fiscal) – Common Ordinary Equity Total)/ Assets Total	Compustat
Stock performance	Annualized monthly returns	CRSP
Maturity	Date issue is due for repayment – Date issue was offered	Mergent FISD
Offering amount	The par value of debt initially issued/ Assets Total	Mergent FISD and Compustat